

# Toward a State-wide Health Information Technology Center: Key Features and Functions (Unabridged version)

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## Summary

With the passage of The American Reinvestment and Recovery Act of 2009 that includes the Health Care Information Technology for Economic & Clinical Health Act, the opportunity for states to develop a Health Information Technology Center (THITC) has emerged. The Center provides the intellectual, financial, and technical leadership along with the governance and oversight for all health information technology-related activities in the state. This Center would be a free-standing, not-for-profit, public-private partnership that would be responsible for operating one or more (in large states) Regional Health Information Technology Extension Centers (Extension Centers) along with several Regional Health Information Exchanges (HIEs) and one or more Regional Health Information Data Centers (Data Centers). We believe that if these features and functions could be developed, deployed, and integrated statewide, the health and welfare of the citizens of the State could be improved while simultaneously reducing the costs associated with the provision of care.

## 1.0 Introduction

With the recent passage of The American Reinvestment and Recovery Act of 2009 (ARRA) [1] that includes the Health Care Information Technology Act (HITECH), the need for a state-wide Health Information Technology Center (THITC) has emerged. Such a Center would provide the intellectual, financial, and technical leadership along with the governance and oversight for all health information technology-related activities in the state. To accomplish such an ambitious goal, we envision the state's Health Information Technology Center (HITC) to be a free-standing, not-for-profit, public-private partnership that would be responsible for operating one or more (in large states) Regional Health Information Technology Extension Centers (Extension Centers) [2] along with several Regional Health Information Exchanges (HIEs) [3] and one or more Regional Health Information Data Centers (Data Centers) [4] (see figure 1).

Many states have recently begun a statewide collaborative health information technology planning process "in order to obtain broad stakeholder input in the development of health information exchange strategic and operational plans" [5]. In addition, the U.S. Department of Health and Human Services has recently announced the availability of \$640,000,000 for the creation of approximately 70 Regional Health Information Technology (HIT) Extension Centers across the U.S. [6]. Briefly these HIT Extension centers are modeled on the Agricultural Extension Centers, created by President Woodrow Wilson under the Smith-Lever Act of 1914, that were designed "to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture, uses of solar energy with respect to agriculture, home economics, and rural energy, and to encourage the application of the same, ... in connection with the ...colleges in each State" [7].

Taken together these announcements have the potential to radically transform the health information technology landscape in many states. The goal of this article is to describe how all of these activities and potential funding sources could synergize to make the potential a reality.

The challenge and opportunity before us now is to design a replicable model for how various states and eventually, the entire United States, can develop the health information technology infrastructure (including the organizational, financial, and technical resources) required to meet the needs of the 21<sup>st</sup> century healthcare delivery system. Developing a Regional Health Information Technology Center will require interaction among local, state, and federal government officials; business leaders across the state; Health Information Technology

vendors involved in the design, development, and implementation of state-of-the-art electronic health record (EHR) technologies [8]; and clinicians and patients within the state.

While many may see the main challenge in developing a state-wide Health Information Technology Center to be a technical one, this is only one of the five elements for success that interviews with operating regional health information organizations (HIOs) have identified [9]. The others are:

- 1. Community Buy-in:** Engagement of key public and private healthcare stakeholders is mandatory. Failure to achieve and maintain this buy-in always results in failure of the entire enterprise. In addition, while an initial infusion of capital can bring people together, for long term success everyone (or entity) involved must realize some tangible benefit.
- 2. Governance:** A formal organizational governance structure that is representative of ALL stakeholders is essential. Again, failure to develop a sound governance mechanism for the HIOs may lead to failure. We see the formation of a non-profit, public-private partnership as one way to potentially alleviate some of the stresses (e.g., privacy, ownership, governance, etc.) that typically surround these types of activities.
- 3. Technical architecture:** A technical architecture that facilitates the safe, secure, and reliable exchange of electronic health information is vital. There are currently several successful architectures that have been developed and deployed. The key for a new organization is to find the architecture that best supports the key current and planned operational activities of the organization while simultaneously satisfying the patient privacy advocates in the region.
- 4. Information policy:** Developing and maintaining the required policies and procedures to govern all the identified data sources, transaction types, and standards for health information exchange, while ensuring data security and patient privacy is a major task [10]. Again, there are several freely available information policy templates from which to choose [e.g., 11].
- 5. Financing:** Obtaining the initial, and on-going, financial support for the development and operations of the health information organization is a monumental task. The current ARRA stimulus package provides a great starting point for any regional effort. If this initial seed funding can be used to leverage other financial assets, then the organization has the opportunity to develop into a self-supporting organization [12].

These five key elements for success are all interconnected and influence each other (see model diagramed in figure 2 below); meaning that decisions about how any particular model element is designed or subsequently changes, affects all of the other model elements. In other words, each of these elements is necessary, but not sufficient for the success of an HIO, meaning that a successful HIO must address all of these model elements in a coordinated effort. In addition, since we are still at very early stages of development of the HIO concept the degree to which these interactions and/or influences affect other elements in the model are still unknown quantities.

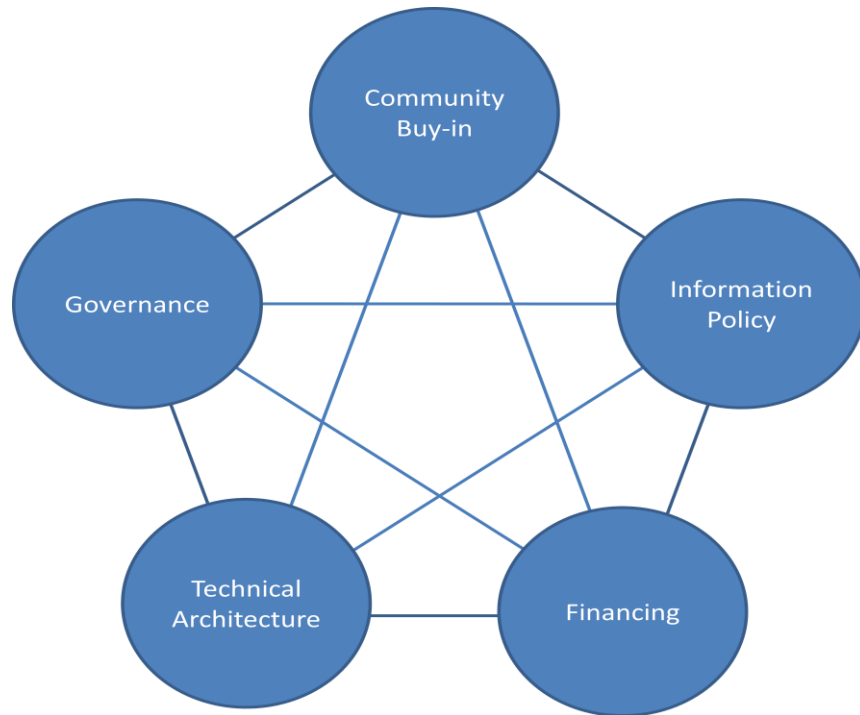


Figure 2. Diagram showing the interactions between the five key success factors for Regional Health Information Exchanges.

## 2.0 The Basic Building Blocks of the State-wide Health Information Technology Center

### 2.1 The Regional Health Information Technology Extension Centers

Briefly, the Extension Centers should provide the clinical informatics research and development expertise to facilitate the funding, selection, implementation, and evaluation of Electronic Health Records (EHRs) and HIEs for solo physicians in private practice, to federally qualified health centers, to small rural critical access hospitals, to large academic teaching hospitals, to community-wide health information exchanges. In addition, the Extension Centers should be responsible for developing the educational curricula, accreditation criteria and overseeing the HIT-related workforce development activities across the state. The actual workforce development activities should take place within the existing local community and state-run undergraduate colleges and universities across the state [13]. The following services may be offered by the extension centers.

#### 2.1.1 Implementation Consulting Services

The extension center could provide implementation consulting services to any healthcare delivery organization, large or small, within its service area. Special consideration should be given to those individuals or organizations serving the uninsured. The extension centers should have the tools and personnel capable of carrying out the following types of activities either in-person or via tele-consulting:

- ***Pre-implementation readiness assessments*** – The extension center should develop and be able to utilize implementation readiness assessment tools (e.g., Community Clinic EHR Readiness Assessment Tool [14] or Texas Medical Association’s EMR Readiness Assessment [15]).
- ***EHR System selection*** – The extension center should be capable of helping an organization determine their clinical computing needs and matching these needs to available EHR systems. They should identify or create these selection tools (e.g., Electronic Medical Record Buying Guide for Small Physician Practices. [16] or Texas Medical Associations EMR Product Comparison Tool [17]).
- ***Pre-implementation planning*** – The extension center should have model implementation project planning tools and the ability to help an organization customize these plans for the local environment [18]. In addition, the extension center should help organizations develop processes for converting their paper records to electronic ones.
- ***Workflow process analysis, redesign, and optimization*** – The extension center should be capable of helping organizations map and analyze their current workflow processes, and if necessary, redesign them to optimize the use and capabilities of the new EHR systems [19].
- ***Post-implementation system evaluation*** – The extension center should be capable of evaluating the success or failure of any clinical HIT-related implementation using tools such as the Agency for Healthcare Research & Quality’s (AHRQ) Health Information Technology Evaluation Toolkit [20].

### 2.1.2 An Internet-accessible set of Best Practices for Safe EHR use

The extension center should develop an internet-accessible resource consisting of Best Practices for assessing, instituting, and evaluating whether organizations have implemented and are using their EHRs safely and effectively. These “best practices” should be based on the eight dimension, socio-technical model of safe and effective EHR use [21]. For each dimension they could develop assessment tools along with lists of best practices that have been developed. Briefly, these eight dimensions include:

- ***Right Hardware and Software*** – Hardware and software must be capable of supporting the clinical activities. It must be fast, reliable, and appropriately protected to ensure the safety, privacy, and integrity of the clinical and administrative data it contains.
- ***Right Content*** – EMR vocabulary used to encode the clinical findings, enter orders, and store laboratory results must be standardized and used to encode all data. The clinical knowledge that forms the basis of the clinical decision support must be evidence-based and appropriate for the user’s practice as well as periodically updated.
- ***Right Human-Computer User Interface*** – The EMR’s user interface must be friendly and intuitive: easy to learn and use. The interface should present all the relevant patient data in a format that allows the clinicians to rapidly perceive the problem, formulate a response, and document his/her actions.
- ***Right People*** – Users must be appropriately trained and re-trained and interact closely with the informatics experts and clinical application coordinators responsible for designing and maintaining the systems.
- ***Right Workflow / Communication*** – the EMR must fit into the workflow of the clinic or hospital and enhance situational awareness of its users who often practice in time pressured settings.
- ***Right Organizational Policy & Procedures*** – the organization must make adjustments to previous policies or new policies that account for the EMR use
- ***Right State and Federal Rules and Regulations*** – both the State and Federal governments must continue to work to create the appropriate regulatory environment that should enable these systems to continue evolving while maintaining appropriate safety and privacy oversight.

- **Right Monitoring** -- organizations or users must continually evaluate the performance of EMRs through robust, monitoring systems and test if automated processes are working as expected after implementation.

### 2.1.3 Help Desk Support

The extension center should provide 24x7x365 telephone accessible help desk capabilities for all member organizations. In addition, personnel in the center should have the ability to connect (e.g., using an application like Microsoft's Remote Desktop Connection) to the local organization's EHR instance and actually guide them through their problem.

### 2.1.4 EHR Demonstration and Training Laboratory

The extension center should provide a physical or internet-accessible location where health care providers from any organization within the service area can come to compare and contrast any of the extension center's approved EHR systems. In addition, the extension center should have simulation laboratories in which healthcare providers can come and use one or more EHRs in a simulated in-patient (e.g., a nursing station and a hospital room) or out-patient (e.g., registration desk and examination room) clinical setting.

### 2.1.5 Loans for EHR-related hardware and software purchases

The extension center should work with healthcare providers and organizations to help them secure the funding required to purchase the hardware and software necessary to outfit their offices, clinics, or hospitals. It is hoped that these loans can come from Federal or State-sponsored funds [22].

### 2.1.6 Maintain an evidence-based Clinical Decision Support Repository

The extension center should create and maintain an evidence-based clinical decision support repository consisting of at a minimum the interventions necessary to allow healthcare providers and organizations to achieve "meaningful use". In addition, the center should develop and maintain at least a starter set of alerts and reminders necessary to help providers improve their delivery of preventive medical services. They should also maintain charting templates and order sets for commonly occurring clinical conditions.

### 2.1.7 Educational Resources

The extension center should be the home for educational resources designed to help clinicians and health information technology professionals learn how to work with state of the art health information technologies. The center should have resources to help beginners learn the basics, as well as, for more experienced individuals to become experts. Towards these ends, the center should develop, collect, and disseminate best practices for the design, development, implementation, and evaluation of all types of health information technologies. These tools and techniques should include all of the items necessary to enable clinicians to provide the highest quality, most cost-effective care possible. As such the center should have courses and educational resources covering such diverse topics as: informatics, process redesign and improvement, usability, quality improvement using health information technology, software design and testing, user interface design and testing, etc. To deliver all of this information the center should have at a minimum:

- **Monthly Webinar** – Each month the center should produce a live webinar featuring a leading health information technology expert describing one or more key elements necessary to achieve success in the health information technology arena. These webinars should be archived and available for viewing on the web. Many states may consider partnering with an existing organization such as the Scottsdale Institute.
- **Yearly In-person, 1-2 day Conference** – Each year, the center should hold an in-person 1-2 day conference that should serve as a chance for all interested parties to meet in person, learn the latest

news from other local, state, and national efforts, and learn about new tools, techniques, and resources that are available [e.g., 23]

- **2-3 day Short Courses** – The center should provide 2-3 day in-person, intensive, “short courses” for both clinicians and HIT professionals. These courses should focus on teaching the most up-to-date information to enable experienced individuals to move ahead much faster.
- **On-line, self-paced courses** – The center should offer on-line, self-paced courses on a myriad of topics related to the design, development, implementation, use, and evaluation of all aspects of health information technology. Students should be able to receive undergraduate, graduate, or continuing medical education credits for this work.
- **Certificates, Master’s, Doctoral, Post-doctoral programs** – The center should offer certificates and degrees at all levels to ensure that the next generation of HIT professionals is well-trained.
- **Internship and Fellowship Programs** – The center, in conjunction with the various regional Health Information Technology Exchanges, and Data Centers (see below) should provide internship and fellowship programs to enable students at all levels from around the state to gain the hands-on experience necessary to complement their coursework.

## 2.2 The Regional Health Information Exchanges

The local and regional Health Information Exchanges (HIEs) should provide the technical, financial, privacy oversight and governance of all aspects of an electronic portal through which individual patients’ health data can be transferred between and among authorized users, in accordance with agreed-upon information exchange policies and standards, and subject to strict privacy and security protections. Users of an HIE can include patients, providers, public health officials, payers, and researchers. The HIEs would provide, at a minimum, the following features and functions to the local healthcare community.

### 2.2.1 Master Patient Index

The local HIEs would be required to provide a “region-wide”, master patient index (MPI) that uses a probabilistic matching algorithm to uniquely identify all patients in their service area. This MPI contains each patient’s full name, date of birth, address (street, city, State, zip code, telephone number(s), gender, race, insurance provider, and a list of all healthcare providers and/or organizations (including the internal medical record number used to identify that patient within each organization) who have treated this patient [24]. Each of these “local” MPIs would also be responsible for synchronizing their information with the statewide MPI on a periodic (e.g., nightly) basis [25].

### 2.2.2 Master Healthcare Provider Index

In addition, the local HIE should provide a master healthcare provider index (MHPI) that includes all the healthcare providers in the HIE’s service area. The MHPI should contain each provider’s full name, their professional credentialing information (e.g., state license number, DEA number, professional degrees), primary practice address (e.g., street, city, State, zip code, telephone number(s)), and a list of all healthcare organizations for which he/she has privileges to practice. This MHPI is used to verify the login information of all providers and assign their level of authorization to view and/or update patient records. Each of these “local” MHPIs would also be responsible for synchronizing their information with the statewide MHPI on a periodic (e.g., nightly) basis.

# Texas HITECH Regional Extension Centers Plan

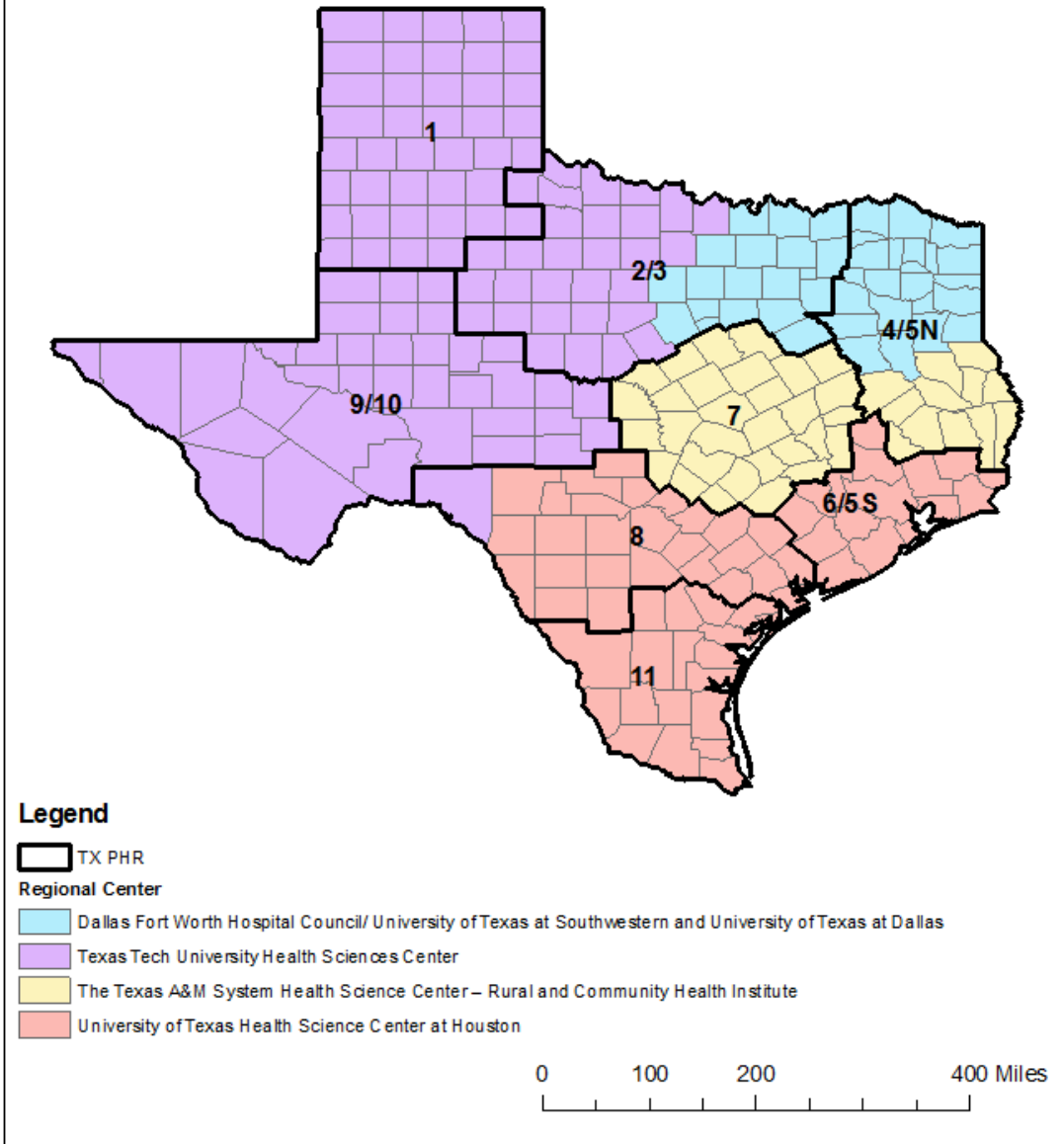


Figure 3. Map illustrating how Texas has organized their Regional Extension Centers.

### **2.2.3 Ability to review and submit patient-specific documents**

The HIE should provide multiple methods for all healthcare providers ranging from ambulatory clinicians in solo practice up to large academic hospitals to submit electronic copies of their free-text visit notes (for outpatient visits) or a discharge summary (for inpatient encounters) at a minimum in a secure manner. The ideal HIE would provide the ability for any clinician using an approved EMR to simply “press a button” and submit a fully coded continuity of care document that contains the patient’s information in an XML-formatted document [26].

The HIE should also provide a method for clinicians to “look-up” past visit information on any patient who they are caring for. This pre-visit or on-admission patient summary should contain at least the most recent three outpatient visit summaries and all hospitalizations within the last year. Finally, there must be an audit trail capability included within this lookup procedure. This audit log must record the name of all providers who have accessed any patient-specific records and the time and date this access occurred [27].

### **2.2.4 Provide access to and delivery of clinical laboratory and other diagnostic result reports**

The HIE should develop interfaces to local standalone and hospital-based clinical laboratories as well as national clinical reference laboratories. In addition to creating these interfaces, the HIE should create a service to guarantee delivery of these results to the appropriate ordering clinician [28]. Such a service would reduce the cost of test result delivery for all involved.

### **2.2.5 Provide a system to facilitate initiation, scheduling, and completion of clinical referrals**

The HIE should provide a means for primary care providers to identify appropriate clinical specialists and send them all the patient-specific information required to facilitate the first referred visit. In addition, the HIE should facilitate the process of sending information from the specialist back to the primary care provider thus completing the referral process [29].

In addition the HIE should provide a secure, electronic mail-like messaging system that is HIPAA compliant. Such a system would facilitate provider-to-provider messaging. Using such a system, the HIE could facilitate a “Virtual referral” in which a primary care provider sends a message to a specialist asking that he/she review the patient’s electronic medical record and provide an opinion on the appropriate next step(s). Such a service would reduce the cost of care provided to patients and should be reimbursable by the patient’s payor.

### **2.2.6 Provide asynchronous clinical decision support**

The HIE should provide a summary of overdue health maintenance procedures (i.e., mammograms, PAP smears, colon cancer screening, etc.) for each patient along with the previous visit summaries. In addition, the HIE should check each patient’s summary as it is submitted for potential drug-drug, drug-allergy, and drug-laboratory interactions and send a secure message to the provider and post a warning on the patient’s chart. Finally, if a provider would like a “synchronous” check of his/her work, then they should be able to submit a provisional Continuity of Care Document (CCD) to the HIE for a quick review.

In addition to providing this asynchronous clinical decision support service, the HIE should provide a “library” of clinical decision support content that any affiliated provider can instantiate within his/her existing electronic medical record system. This library should contain a “starter set” of CDS content that covers basic drug-drug, drug-allergy, drug-condition, drug-laboratory interactions, along with a list of default doses for the top 250 most commonly prescribed medications. In addition, it should contain clear, unambiguous computer-interpretable definitions of the US Preventive Services Task Force (USPSTF) preventive care screening criteria [30].

### **2.2.7 Create aggregate reports of provider compliance with “meaningful use” definition**

Each HIE should also have the ability to create aggregate reports on all providers and organizations in their service area that can be used to assess compliance with the meaningful use definition and overall organizational performance.

### **2.2.8 Provide patients with a viewing mechanism for all their clinical data**

The HIE should provide a secure, internet-accessible viewing mechanism for all patients with data stored in the HIE. In addition this viewing mechanism should allow all patients to review the audit log that summarizes who has accessed their personal data. This viewing mechanism should also provide patients with links to high-quality medical reference information.

### **2.2.9 Reporting data to Public Health Agencies**

The HIE should send electronic messages to the appropriate public health agencies for all reportable conditions identified. In addition, the HIE could work with the public health agencies to provide a syndromic surveillance capability for their service region. Finally, the HIE could provide a post-marketing surveillance capability for the FDA and pharmaceutical companies to help identify potentially hazardous medications, procedures, or devices in a timely manner.

Many states have multiple local or regional HIE initiatives in varying stages of development [31], from business plan and funding stages to fully operational with several of the above features and functions.

## **2.3 The Health Information Technology Data Centers**

Finally, the Health Information Technology Data Center(s) should provide the robust, tier-3 level<sup>1</sup> [32], hardware, software, and operational expertise required to a) remotely host EHRs for physicians and hospitals throughout the region, as well as, b) the statewide master patient index and record locator services required by the regional health information exchange’s. In addition, the data centers should be responsible for creating and maintaining a statewide clinical data warehouse that could create state-wide healthcare quality reports, for example. In addition to being responsible for disaster recovery, off-site data storage, system response time and reliability, architectural scalability, and physical and virtual security of all clinical systems and patient data, the following sections describe each of the capabilities in more detail [33].

### **2.3.1 Low-cost, remotely hosted, Electronic Health Records for the Community**

To encourage and facilitate clinicians working in small practices and rural critical access hospitals to adopt state-of-the-art electronic health record systems (EHRs), we recommend that the Data Centers function as “value-added resellers (VARs)” and remote hosting facilities for one or more brands of existing approved EHRs. By making such EHRs available to clinicians via existing Internet connections, the process of purchasing, installing, configuring, and maintaining an EHR is greatly facilitated. In addition, the Data Centers, in cooperation with the Extension Center’s informatics experts and local health information exchanges’ policies and procedures, should configure the EHRs to ensure that all clinical users, with the appropriate authorization privileges, can seamlessly exchange patient-specific clinical information with any other provider in the community. Likewise, the Data Centers should install and maintain a basic set of clinical decision support functionality for all clinicians. In this way, the entire community can quickly begin using their EHR to control costs, improve care, and increase efficiency.

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<sup>1</sup> A Tier 3 Data Center allows any planned site infrastructure activity (e.g., preventive maintenance, replacement, or addition of components, etc.) without disrupting the computer hardware operation. Such a center is referred to as concurrently maintainable, promises 99.982% availability (annual downtime < 1.6 hours), and takes 15-20 months to implement.

### 3.0 Summary

If states want to become leaders in the delivery of high-quality, low-cost, safe, and effective healthcare for all their citizens in the 21<sup>st</sup> Century, they must develop the information technology infrastructure to support the appropriate collection and sharing of all patients' healthcare information. We have outlined the three main components that form the foundation of this infrastructure: **Regional Extension Centers** to provide the clinical informatics research and development expertise, develop the educational curricula, accreditation criteria and oversee the HIT-related workforce development activities across the state; **Regional Health Information Exchanges** to provide the technical, financial, privacy, oversight and governance of all aspects of an electronic information exchange utility through which individual patients' health data could be transferred between and among authorized users, in accordance with agreed-upon information exchange policies and standards, and subject to strict privacy and security protections; and **Regional Data Centers** to provide the robust, hardware, software, and operational expertise required to host remotely EHRs for physicians and hospitals throughout the region, as well as, the statewide master patient index and record locator services required by the regional health information exchanges. In addition, the state must work to improve the accessibility, affordability, and reliability of its Internet connectivity through which all of these components will communicate.

Once all of these pieces are in place and operational, we would expect states to begin reaping the transformational improvements in healthcare quality and cost that each of their citizens deserves.

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