eHealth Workforce Development Workgroup Report: Stakeholder Recommendations for California's HIE Strategic Plan

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Abstract

The HITECH portion of the American Reinvestment and Recovery Act of 2009 (ARRA) provides funds for institutions of higher education, or consortia thereof, to train health information technology (HIT) workers. This report projects that approximately 9,000 additional highly skilled HIT workers with a broad range of skill sets will be required to support 90% EHR penetration in California over the next five years.

California possesses a wealth of academic resources which can assist in this effort. Community colleges, vocational schools, University of California, California State University, and private institutions can contribute to training these workers. Training programs that range from HIT certificates of less than six months in duration to advanced degrees in health informatics will be provided.

Meeting this workforce demand will require collaboration to petition for federal funds, refine curriculum, develop shared resources, share best practices, and collaboration on implementation. To do so, this workgroup recommends the creation of an independent oversight body to foster these connections and support the effective petitioning and use of federal and other funds to support the education of California's HIT workforce.

1. Introduction

1.1 Introduction

The $32 billion in health IT stimulus funds provided through the American Recovery and Reinvestment Act (ARRA) of 2009 to incent physician adoption of electronic health records (EHRs) and other health information technologies (HIT) will create unprecedented growth in demand for EHRs in a short period of time. Meeting this demand is not as simple as producing and selling more EHRs. Selecting, buying, installing, customizing, integrating, training and maintaining electronic health records is a complex and time consuming task, requiring expertise in a number of highly specialized fields. The new financial incentives made available through ARRA combined with the accelerated timeline for installing EHR and other HIT services make it clear that the existing HIT workforce will be insufficient to meet this dramatic increase in demand.

An insufficient supply of trained workers could have a significant impact on adoption and meaningful use of EHRs as intended by ARRA. Implementations could be delayed, costs to providers would increase, and insufficient training and support could contribute to less than optimal EHR installations. Without a sufficient workforce with the right skills, effectively implementing EHRs to achieve meaningful use and the goals of improved care quality and cost is in jeopardy.

The HITECH portion of ARRA provides a $2 billion pool of funds for which academic institutions or consortia thereof can apply to help prepare for and train the necessary workers to support EHR adoption. A portion of these funds can provide critical support to help California prepare the necessary HIT workforce. Because many states are resource constrained, it is expected that there will be significant competition for these funds. By improving our understanding of the magnitude and characteristics of projected demand for a qualified HIT workforce and opportunities to meet this demand, we can better organize stakeholders to collaborate to petition for HITECH funds and put these funds to effective use to enable successful EHR adoption for California healthcare providers.

1.2 Process and Objectives of the Workforce Workgroup

The California Health IT Initiative was convened to help prepare the State and relevant stakeholders to maximize the allocation of and productive use of ARRA and HITECH funds. CHHS invited interested stakeholders to convene and form workgroups that aligned with the various ARRA funding streams. Four workgroups were formed wherein stakeholders participated in one or more of the workgroups based on their interests and/or the interests of their constituents. The four workgroups were: Regional Extension Centers, Research & New Technology, Loan Funds, and Workforce Development. This report summaries the findings and recommendations of the Workforce Development Workgroup.

The charter of the Workforce Development Workgroup was as follows:

1) Estimate the magnitude, characteristics, timing, and geographical distribution of the demand for HIT workers and the corresponding education and training program requirements.
2) Develop recommendations to maximize impact of HITECH funds on education and training of a HIT workforce to meet this demand.
3) Develop a governance structure and sustainability model for a coalition of educational institutions to collaborate on this initiative.

1.3 Approach and Methodology

To undertake this analysis, the Workforce Workgroup was divided into three subcommittees, each comprised of a broad range of experts and stakeholders from across the State. Each of these workgroups conducted extensive research and interviews, drafted findings, and solicited feedback from stakeholder groups within and beyond the workgroup. Work was completed in a very compressed two-month time frame during June and July, 2009. The subcommittee tasks were divided as follows:

1. **Workforce Demand: Project demand for HIT workers**
    a. Assess existing workforce projections relative to accelerated and expanded HIT adoption goals.
    b. Develop additional projections to estimate workforce needs:
        i. Identify relevant phases of an HIT project for which workforce is needed
        ii. Identify workforce roles and associated skills and competencies required to complete each phase of a project
        iii. Categorize California provider organizations based on structure and size and current EHR use
        iv. Identify resource needs for each role by provider category
        v. Compute projected workforce demand
        vi. Project relative timing of roll-out to determine per-year demand
    c. Estimate the current HIT workforce ~~supply relative to projected~~ demand.
    d. Project additional workforce needs to meet demand

2. **Workforce Education and Training: Recommend steps for how to train necessary workers**
    a. Conduct environmental scan of relevant HIT educational resources, cataloging programs, institutions, and capacities at the vocational, community college, extension, bachelors, masters, and doctorate levels.
    b. Assess capacity relative to demand.
    c. Identify programs that align with workforce demand and HITECH requirements.
    d. Recommend steps to augment relevant programs and develop new programs and educational models to meet increased demand for HIT workers.

3. **Governance and Sustainability: Develop a structure for a coalition of stakeholders to achieve these aims**
    a. Determine characteristics of a coalition structure.
    b. Determine where the coalition should reside.
    c. Determine role that the coalition should play in supporting the funding and development of new programs and guidelines.
    d. Determine model for ongoing support of HIT workforce recruitment and retention.

1.3.1 Priority Targets – Aligning With Funding Streams

Sections 3015 and 3016 of the HITECH Act (Appendix 1) provide guidance as to how these funds are to be used. This analysis is focused primarily on programs that would meet these criteria.

- Section 3015 targets funds for HIT demonstration programs that integrate HIT into clinical education.
- Section 3016 provides support for the education of the HIT workforce to assist with adoption, stipulating that priority will be given to existing programs and those less than six months in duration.

Additionally, the US Department of Labor was allocated approximately $220 million in grants for workforce development, including the HIT workforce, in ARRA (funding opportunity SGA/DFA PY 09-01). Eligible applicants are public entities and private nonprofit organizations and it is expected that 54-65 grants of $2-$5 million will be awarded.

1.4 Challenges

There are a number of challenges associated with projecting demand for HIT professionals and recommending how the education system can help meet this demand. Some of the challenges impacting the data presented in this report include:

- US Bureau of Labor Statistics (BLS) does not define HIT professions with specificity, making it difficult to get reliable current workforce numbers and projections of increased demand.
- The transition from paper to digital health records represents a significant change in the field of health information management. While Registered Health Information Administrator (RHIA) and Registered Health Information Technician (RHIT) programs have been training workers to provide critical health information management functions, these tasks are both changing and expanding with the broad adoption of digital health records. Because of this, HIT education and career tracks tailored to these new roles and skillsets have not been developed.
- Few research reports define the HIT workforce and project needs. Existing reports do not provide sufficient data to estimate California's emerging HIT needs.
- ARRA will create unprecedented spending growth, making it difficult to predict how quickly the market will react and capacity can be increased.

- Standard models have yet to be developed for providing support and service for HIT implementation, adoption, maintenance and practice change as there is a high degree of variability between projects. This variability relates to the size and capacity of the impacted clinical practice, as well as availability of in-house resources versus external resources provided by vendors and others.
- HIT implementation and support services can be provided by a combination of consultants, vendors, internal resources and collaborative ventures. These players also have different abilities to attract, utilize, leverage, and pay for staff.
- HIT support needs and capabilities vary dramatically across provider types, sizes, and geographic locations. Many of the providers that will require HIT adoption support are small to medium practices and community clinics, which have many barriers to adoption and lack HIT infrastructure and staff.
- A relatively small number of formal health information technology education programs currently exist; HIT professionals in the field come from a variety of backgrounds and tracks.
- Different stakeholders will have different perspectives and priorities for addressing these challenges.

1.5 Assumptions and Scope

Undertaking such a large and complex analysis in such a short period of time necessitates making use of a number of assumptions in order to confine the scope of the report:

- Consistent with the goals of HITECH, the workforce projections support a 90% adoption of EHRs at meaningful use among provider organizations in California by 2014. Alternative projections will be made to reflect a more conservative adoption rate given the high degree of difficulty of meeting the target goal.
- Implementation will be phased over this time period according to provider type, size, and location.
- Workforce for a given project will be supplied by one or a combination of the following sources:
    - The provider organization itself through the redeployment of existing employees
    - HIT vendors and their partners
    - HIT consultants
    - Health systems or other providers
    - Consortia of community health centers, medical groups or purchasing cooperatives/shared services groups made up of providers of different types in a specific geographic area.
    - Regional Extension Centers (REC)
    - State-developed or sponsored purchasing/shared service organizations.
    - Private shared services organizations
- Provider organizations for which HIT workforce and training needs will be projected include:
    - hospitals and health systems,
    - physician practices,
    - community health centers and
    - public health departments.

ARRA prioritizes EHR adoption in individual or small primary care practices (especially rural), clinics/FQHCs, and public or critical care hospitals. Regional extension centers will service some subset of these practices in California but will not be able to meet all the need.

- The workforce required to support provider organizations through the various stages of EHR implementation is largely short-term or project-based and therefore can be provided by service organizations or vendors, mobilized to support many concurrent and sequential projects. At the completion of a project, ongoing support, maintenance, training, upgrades, and enhancements will also be required.
- While this project is focused upon supporting the near-term adoption of EHRs consistent with the provisions of HITECH, long-term need for HIT workers is also considered.
- Most, if not all, EHR user training for clinicians will occur on the job given their ongoing duties. This training is likely to be very short-term in nature and take place during the implementation and optimization phases.
- Workforce projections are for EHR and other common HIT applications.
- Migration of skilled workforce to other states will clearly be a factor that will affect the supply of workers, but for the sake of this analysis will hold it constant.
- The under-supply of clinical workers, such as nurses and allied health, is a well-documented issue that is certainly relevant to this topic but outside the scope of this evaluation.
- Workforce will be needed to train staff on basic computer and internet skills and to install basic IT infrastructure in provider organizations prior to HIT implementation is outside the scope of this analysis.

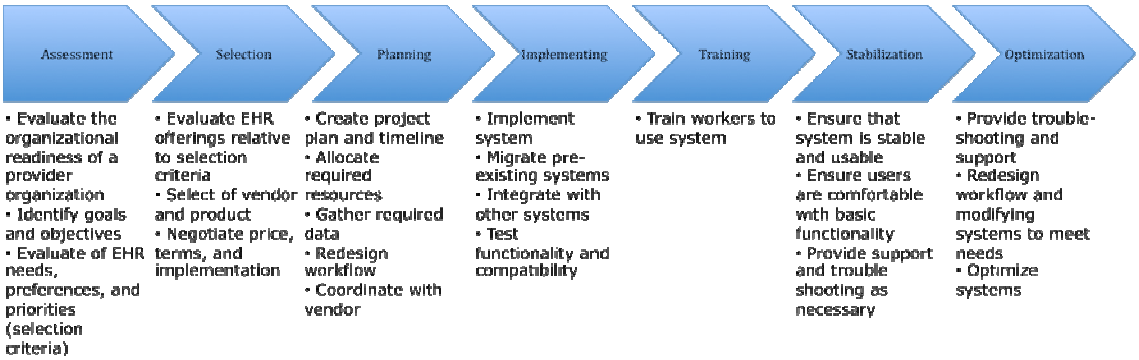
2. Findings and Analysis

Subcommittee 1: Workforce Demand

Required Characteristics of the HIT Workforce

Electronic Health Record (EHR) implementations vary widely in their resource requirements based on provider type, practice size, technology selection, desired integration, and much more. This makes it difficult to develop a common staffing model that can be applied to any EHR project. Based on literature research and interviews with vendors and healthcare providers experienced in EHR adoption, common tasks necessary for successful EHR implementation were identified, as described in Table 1:

Table 1: EHR Implementation Process



As demonstrated by the table above, successful EHR implementation requires a diverse set of skills, including a mix of strategic, operational, technical, and clinical skills. The skills can be categorized into the following roles and brief descriptions (additional details are outlined in Appendix 2):

- **Project Consultant**: Articulates business case for EHR implementation and conducts requirements gathering, system selection, vendor negotiation, and readiness assessment and planning
- **Implementation Specialist:** Health informatician providing strategic vision and guidance for larger implementations (this function is likely to reside with Project Manager for small implementations)
- **Project Manager:** Manages implementation tasks to successfully achieve objectives on time and budget
- **Technology Analyst:** Installs, configures, and tests selected technology according to objectives and plan
- **Interface Specialist:** Integrates installed technology with health information exchanges and other peripheral systems
- **Clinical Expert:** Captures clinical and workflow requirements for system selection, implementation, configuration, and integration and supports training
- **Trainer:** Trains users to effectively integrate EHR into daily tasks

Skill set requirements will also likely differ by type of project. For smaller projects, it is likely that individuals will have to fill multiple roles and therefore require broad skill sets, while larger projects will allow individuals to specialize to a greater degree. The increased complexity of larger projects requires a higher staffing ratio than smaller implementations.

Implementation is more than just installing software, it also involves vital steps around planning and preparation, workflow redesign, training, and optimization. Cost and time limitations lead

some practices to skip or minimize some of these steps, which can lead to catastrophic consequences. Dr. David Brailer, the first Director of the Office of the National Coordinator (ONC), estimated that 50% of practices that do not get help implementing their EHR are likely to fail[1], resulting in lost money, time, productivity, and patients. Doctors who experience a failed implementation are also less likely to try again. A selection of relevant best practices include:

- Practices should conduct a strategic analysis and readiness assessment prior to undertaking an EHR implementation. This includes ensuring that objectives are aligned, participants are well informed, and expectations are set and helps ensure that an implementation can be planned and executed to meet goals.[2]

- Training for effective use of an installed system requires a disproportionate share of implementation resources, estimated at 1/3 to 1/2 of the total implementation budget[3]. Vendors are not likely to provide exhaustive training services. Their focus will be on quickly installing their software, providing sufficient but minimal training, and moving on to the next project. Additional training resources, likely independent from vendors, will be necessary.

- Workflow redesign is a critical element of EHR implementations. Practices cannot expect that adding a technology system on top of a broken workflow process will fix the problem. Instead, processes should be modified to better adapt to and take advantage of an electronic environment.[4]

- In the few months following implementation, users will be getting accustomed to only the basic functionality of a system and most will be unable to grasp deeper functionality. Approximately three to six months following an implementation, when users are more comfortable with the system, an additional training should take place with the aim of making necessary changes, training on additional features, and optimizing use.

Supply of HIT workers

There are very few resources that can provide accurate information regarding the existing supply of HIT workers. The Bureau of Labor Statistics (BLS) does not have up-to-date and standard codes reflecting the roles required for EHR implementation or other HIT functions. Health and workforce researchers have worked to gain insight into this issue, with little success:

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[1] The American Health Quality Association, Supporting Adoption, Implementation, and Use of Health Information Technology: Lessons Learned in the Medicare Doctors Office Quality-IT Initiative, 2008

[2] Texas Medical Association, Electronic Medical Record Implementation Guide, The Link to a Better Future, 2007

[3] Primary research with vendors and providers experienced in EHR implementation

[4] Farzad Mostashari, Micky Tripathi, and Mat Kendall, A Tale of Two Large Community Electronic Health Record Extension Projects, Health Affairs, Volume 28, Number 2, March/April 2009

- There already exists a well-documented shortage of health workers in general[i5], which will make it hard to recruit new workers out of these roles to meet increased HIT demand. At the same time, traditional health information management (HIM) roles associated with paper-based records may be rendered obsolete by EHRs, and these workers could be repurposed.

- Dr. William Hersh of Oregon Health Sciences University estimates that there is a supply of 108,390 HIT professionals in the US[6]. As a portion of population, this would translate to a supply of approximately 13,000 workers in California. This likely undercounts the true number of HIT workers as the analysis was limited to in-house IT staff in hospital settings only, not accounting for consultants, vendors, public sector workers, etc.

- The California EDD Labor Market Information Division, using Bureau of Labor Statistics data, estimated a total of 125,500 jobs in HIT-related categories in California in 2006 and a projection of 154,100 in 2016 (see Table, Appendix 3). This represents a 23% increase (28,600 jobs). While they provide a starting point, these estimates are not sufficient to project the current supply or the post-ARRA HIT workforce needs because: 1) they were established prior to the expected dramatic increased ARRA-generated demand; and 2) the occupational classifications used only have partial overlap with those required for broad EHR implementations for reasons previously mentioned. The potential for having the EDD update these projections to address these issues is being explored.

- The American Health Information Community (AHIC) EHR workgroup in Washington DC reported that there was no data available on existing personnel against which to compare their demand projections[7].

- Regional Health Information Administrators (RHIA) and Regional Health Information Administrators (RHIT) collect, analyze, disseminate, and manage electronic heath records. As such, they are an important portion of the existing HIT workforce. The current supply of these workers in California is 4,238[8].

While determining an accurate baseline supply of HIT workers in California from existing data is difficult, the limited number of vendors, consultants and providers interviewed for this project do not perceive a shortage given there is an adequate supply to meet pre-ARRA demand levels. Some vendors and consultants, the likely source of a larger number of workers required to support EHR adoption, expressed confidence in their ability to recruit and train needed workers to accommodate the increased demand, while others described concern about a limited supply of professionals with the level of HIT and provider operational experience required to achieve meaningful use targets.

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[5] Out of Order, Out of Time, Association of Academic Health Centers 2008, Office of State Health Planning and Development (OSHPD), California State Rural Health Association, UCSF Center for California Health Workforce Studies

[6] William Hersh MD, Characterizing the Health Information Technology Workforce: Analysis from the HIMSS Analytics Database, April 2008

[7] William Yasnoff, Estimating the Workforce Needs for Building the NHIN, AHIC EHR Workgroup, 2007

[8] California Health Information Association

- The geographic distribution of HIT professionals is an important factor for widespread HIT adoption as a nominally sufficient workforce can be effectively insufficient if geographic distribution does not match provider demand. The shortage of health and IT workers in rural areas is a well-documented problem which is likely to affect EHR implementation. While there is insufficient data to estimate the current HIT workforce by geographic areas, the clustering of RHIAs and RHITs may serve as a proxy for HIT workers. This data (see Appendix 10) is not granular enough for complete insight, but suggests that the supply of rural workers is indeed likely to be a challenge in HIT implementations.

- Med IT Jobs Mail, a health IT-specific recruitment service, does not seem to have an excessive supply of health IT listings. This, along with previously mentioned vendor feedback, could support an assumption that the aggregate market is somewhat in equilibrium at current demand levels (with the exception of geographic distribution previously mentioned). At the same time, there is likely little slack in the system and limited ability to respond to a rapid rise in demand.

- A large number of workers needed to support EHR adoption may be redirected from other jobs within provider organizations and trained on the job so that there is potential new internal supply source that can be tapped to meet provider demand.

- The growing number of displaced workers from multiple sectors due to the economic crisis may create an opportunity for recruitment and short-term training programs to increase the supply of workers able to support EHR

- Returning military veterans could be a valuable source of technically skilled labor

Demand for HIT Workers

For all of the limitations inherent in trying to calculate the supply of HIT workers, estimating and projecting demand can be even more difficult. Accordingly, the following analysis provides a reasonable range wherein HIT workforce demand can be estimated.

A top-down analysis using existing studies and findings and applying them to California provides the following:

- In 2001, BLS cited a 49% growth in demand for HIT workers by 2010. The 600% increase in EHR spending that will be stimulated by ARRA dramatically exacerbates this growth. Other BLS data previously cited projected a shortfall of 28,600 HIT workers in 2016.

- Dr. William Hersh at Oregon Health Sciences University has estimated the need for 40,784 additional HIT workers nationally[9]. This would translate to an increased demand of 4,900 in California. For the reasons previously stated, this appears to be a significantly low estimate of the broader demand for HIT workers.

- Preliminary results from an unpublished study by the American Health Information Management Association (AHIMA) gathered estimates from subject matter experts

[9] William Hersh MD, Characterizing the Health Information Technology Workforce: Analysis from the HIMSS Analytics Database, April 2008

project a national shortfall of 55,000-75,000 HIT workers. This would translate to a shortage of 6,600 – 9,000 HIT workers in California.

- Doctor's Office Quality Information Technology (DOQ-IT) report suggested that a ratio of 1:20 between implementation resources and projects should be sufficient for EHR implementations. It is not clear whether this was confined to a single role, such as the person assisting with EHR selection and planning, or whether it should apply across a full implementation project. The staffing model used for this report indicates that multiple resources will need to be fully committed to a single project for certain periods, and only be able to maintain a handful of others concurrently.

Because these estimates contain a wide range and high degree of uncertainty, other factors were analyzed using the following process:

1. Segmenting California healthcare providers according to type and size.
2. Determining existing EHR penetration by segment and calculating remaining demand. Estimating the portion of providers who report current use of EHRs but who are likely to require additional services to achieve "meaningful use".
3. Staging the portion of each category that is likely to implement EHRs over each of the next five years.
4. Developing staffing ratios, project duration, and efficiency ratios for EHR projects in each segment and for implementation and maintenance phases
5. Applying staffing ratios to segmented and time-phased demand to determine total annual workforce demand for EHR implementations .
6. Estimating the existing workforce that will be available to staff this effort.
7. Calculating the total predicted incremental annual demand by provider type, project type, and worker type.

The analysis (details available in Appendix 4) predicted the annual demand for HIT workers to support EHR implementations in California as follows:

	2010	2011	2012	2013	2014
Project Consultant	268	385	503	600	600
Implementation Specialist	307	434	568	672	682
Project Manager	425	588	768	899	910
Technology Analyst	770	1,014	1,325	1,525	1,557
Interface Specialist	333	476	624	743	750
Subject Matter Expert	1,125	1,511	1,978	2,304	2,335
Trainer	1,133	1,520	1,989	2,317	2,350
Total Demand	4,361	5,929	7,755	9,059	9,185
Incremental Demand	2,262	1,567	1,827	1,304	125

As lack of adequate labor resources could be a detrimental factor impacting the successful implementation of EHRs in California, it is critical to proactively take steps to meet this workforce demand. Timing is also critical as sufficient planning, preparation, approval, and execution are needed before a solution will reach market, at which point training new workers still require significant lead time.

Subcommittee 2: Education and Training

Educational Needs

Due to the unique qualifications and requirements of each group, for purposes of this report, HIT workers were defined according to the following categories for the assessment and development of education and training resources:

- **New Clinicians:** Clinicians will comprise the majority of ultimate users of HIT and the importance of HIT competencies for all clinicians has been extensively discussed by the Institute of Medicine in Crossing the Quality Chasm[10] and Health Professions Education[11]. These individuals cannot be expected to intuitively understand or be able to rapidly learn a complex system on the job, therefore it is neccesary to determine how to train them in the skills and competencies they will need to effectively integrate and use HIT as a tool to improve care quality and cost. Physicians, nurses, allied health, etc.

[10] Committee on Quality of Health Care in America, Institute of Medicine, Crossing the Quality Chasm, A New Health System for the 21st Century, 2001

[11] Health Professions Education: A Bridge to Quality, Institute of Medicine, 2003

will need to have an understanding of and be comfortable using EHR and other HIT upon completion of their studies, requiring us to evaluate how best to incorporate HIT curriculum into all types of clinical studies

- **Existing Workforce:** Training clinicians already working in provider settings is an equally important task. A unique challenge is that some of these workers will require training in basic computing skills before they can be proficient in using some HIT applications. Work constraints will require that this training be done primarily on the job, though only partly by vendors and with the remainder either in-house or through consultants, Regional Extension Centers, or other training organizations. For this reason, we will need to train the trainers who will teach clinicians in California how to effectively use EHRs. These workers that trainclinicians can be considered as a portion of HIT workers in the next section.

- **HIT workers:** As previously discussed, HIT workers will need a broad set of skills to support effective EHR implementation, including strategic, operational, technical, and clinical roles. There will be no single answer to training these workers, but rather a common effort across different types of institutions to train workers at various levels and with a range of skills. Programs are likely to depend on existing programs offered by institutions, availability of funding to modify existing programs and develop new programs, processes for curriculum development and approval, student recruitment and retention, and more. Some of these programs will be developing new workers entering or re-entering the workforce, while others will complement the existing skill sets of workers seeking to transition from peripheral roles into HIT roles.

Educational Resources

California has a multi-tier educational system with a variety of institutions and programs at each level which may be relevant to this effort:

- **Community Colleges (listing in Appendix 5):** California Community Colleges are an important asset in this effort given their broad distribution and access, affordability, relevant course content, and high-quality faculty. Community colleges offer 2-year Associates degrees as well as a great deal of continuing education for professionals. Nonetheless, only 7 of California's 109 community colleges offer Associates degrees in HIT. These programs are located in urban areas across the state in San Diego, Orange County, LA County, Santa Barbara, Fresno, Sacramento, and San Francisco. While this represents strong coverage of population centers, there is no program available in the Inland Empire or north of Sacramento. This program level is deemed consistent with current demand for HIT workers and could possibly be scaled up to meet increased demand. Additionally, there are a variety of other community college programs that could be drawn upon for this effort, including Allied Health, Computer Information Systems, Computer Network and Engineering, Computer Science, Nursing, Health Education, Medical Imaging Sciences, Medical Records, Medical Billing, Pharmacy, Physician Assistant, and more. Some of these programs have many of the necessary elements in place to execute this opportunity, while others may need to redesign curriculum in a bit more depth if they are to meet demand

    - These programs offer a variety of campus-based and online courses

- Students can choose to simply take continuing education classes or complete a certificate or Associate degree.
- The current funding environment for community colleges is difficult due to state budget challenges. Amidst falling budgets, expanding programs is likely to require expanding resources, particularly to fund additional instructors.
- The standard process to approve curriculum changes or additions at the community college level can be long and require multiple approvals. This poses some challenges in rapidly modifying and deploying curriculum to meet demand. Nonetheless, there also exists a mechanism to fast track curriculum on an emergency basis, which could apply in this scenario.
- Students in HIT programs at community colleges frequently lack access to actual EHR software. Effectively teaching students to use EHR software requires securing them broad and affordable access to high-quality training modules.
- Schools of continuing education deliver programs at no charge when reimbursed by state apportionment. This represents an interesting opportunity to fund HIT programs and attract students.
- Contract education provides the community colleges the ability to contract with an employer to provide industry specific curriculum outside of normal apportionment. These programs could work with consortia of provider organizations to focus training on immediate needs.
- The Regional Health Occupations Resource Centers, which exist in several community colleges throughout the state have strong ties to health care employer groups and could be good resources to assist with incumbent worker retraining efforts.

- **Vocational Colleges and Private Certificate Programs (listing in Appendix 6):** Private, for-profit vocational colleges offering AS degrees and certificate programs will represent an important training resource for California HIT workers.
  - These colleges already provide a range of relevant training in health care.
  - Being private, these institutions face fewer hurdles in curriculum design and approval, allowing them to quickly adapt to market demand. This responsiveness will be critical to quickly developing relevant crossover and starter programs for HIT workers.
  - The programs offer in person and online courses.
  - Compared to community colleges, these programs can be expensive, creating a barrier for certain workers.
  - Only some of these programs and institutions are accredited by the Commission for Accreditation for Health Informatics and Information Management (CAHIIM) and/or regional accrediting agencies (including Western Association of Schools and Colleges). Less oversight and standardization means that students and

employers may not know exactly what they are getting and that units may not be transferable as a worker progresses through a career path.

- **University Extension (listing in Appendix 7):** University extension programs are open enrollment, for-profit ventures affiliated with universities, including the University of California and California State Universities.
    - These programs combine many of the advantages of community colleges or vocational colleges and 4-year universities, making use of broad reach, solid resources, and strong faculty.
    - There is a mix of online and in-person offerings.
    - These programs can be more flexible and responsive than other university programs, which require extensive approval for changes. At the same time, this can lead to a high degree of variability in course content, competencies, and quality.
    - These programs are generally more expensive to student.s
- **Bachelors Level:** The University of California System (UC), California State University System (CSU), and private universities offer a range of programs relevant to HIT
    - UC and CSU train a large proportion of clinicians in California, including physicians, nurses, allied health, and more. This makes these institutions key players in the integration of HIT into clinical curriculum.
    - There is only one CAHIIM-accredited bachelors program focused specifically on HIT, offered at Loma Linda University. Cal State Dominguez Hills approved a program several years ago, but it lacked funds to hire a program director. Nonetheless, there are a variety of bachelors level programs at UC, CSU, and private universities which can help prepare workers who can contribute to EHR implementations and other HIT projects. Beyond those clinical programs mentioned above, these can include public health, computer science, business administration, and more.
- **Masters and Doctorate Level (listing in Appendix 8):** Post-graduate degrees in health informatics offer a unique combination of health and technical knowledge and are likely to be a key source for the high-level leaders that will be able to drive complex EHR projects. The American Health Information Management Assocation (AHIMA) and American Medical Informatics Association (AMIA) have reported a shortfall of these workers, particularly at the leadership level[12].
    - There currently exist only a handful of these programs in California, though more are being developed. Existing programs have a variety of focus areas, ranging from clinical informatics to biomedical informatics, making some more

[12] Building the Workforce for Health Information Transformation, AHIMA and AMIA, 2006

relevant to the applied practice setting and others more focused on research applications

Through the use of online learning tools and widespread adoption of high-speed broadband such as the California Telehealth Network (CTN), and linkages to the California's educational broadband network (CENIC) some of this training can be offered through distance learning modalities. This will ensure that training is as geographically accessible as possible to meet the needs of California's rural providers.

It should be noted that traditional educational organizations are not the only places where HIT workers will receive training. EHR vendors generally have robust training programs for employees, which are necessary given the unique nature of each product. Additionally, many workers with a portion of the necessary skills will learn on the job without formal training. These factors will diminish the load that must be borne by educational institutions in addressing the HIT workers shortfall.

One important consideration as these types of programs potentially proliferate is the standardization and certification of subject matter and content so that employers can rely on certifications as proxies for employee skill sets. CAHIIM, the accreditation body for degree-granting institutions in HIT, cannot accredit certificate programs. But, AHIMA is currently developing a methodology to do so and can fill an important void in determining which HIT certificate programs have appropriate content and standards. Accredited (both CAHIIM and regional accreditation) programs also allow for the transfer of units from one institution to another, allowing workers to more effectively use education to support articulated programs of study and career pathways.

Subcommittee 3: Governance and Sustainability

This workgroup was tasked with developing a structure for governance and sustainability to support the working assumption that a coalition of institutions and organizations working together to petition for funds and develop and implement programs will be more effective than individual institutions acting alone. Developing a consortium of stakeholders allows for broader inclusion, more comprehensive requirements gathering, improved program and curriculum development, best practices sharing, and collaboration on implementation. The objective of this effort is therefore to develop a model that will effectively manage this process and maximize the ability of California educational institutions to train HIT workers.

The Subcommittee convened experts from around the State, developed selection criteria, and evaluated potential institutions to serve this role. The Subcommittee was also tasked with considering recruitment and retention of students and developing metrics to monitor success and impact of this initiative.

Criteria for Selecting an Entity for Workforce Development

- Hub of knowledge and activity: Single forum for convening, decision-making and programs among key HIT education, training, employer and government stakeholders. UC, CSU, community college, private education and training institutions.

- Health workforce development expertise.

- Infrastructure and capacity to develop and administer federal grant proposals
- Health IT expertise
- Neutral broker among stakeholders
- Access to a variety of funding sources
- Synergy and integration of Health IT workforce efforts with other major statewide and regional health workforce plans and initiatives for California: Forum for sharing promising practices and addressing common needs across professions.

Potential Organizations:

The Workforce Workgroup received a proposal from the California Health Workforce Alliance (CHWA), which has offered to serve as the consortium responsible for convening stakeholders, submitting proposals, securing funding and functioning as the ongoing coordinating entity for California Health IT Workforce.

CHWA is a public-private partnership dedicated to implementation of coordinated, systematic strategies to meet California's emerging health workforce needs. It was established to fill a critical need for a dedicated infrastructure, expanded resources and a single, inter-sectoral point of convergence for state-wide and regional health workforce development efforts. CHWA is a unique forum for convening, collaboration and coordinated action among health employers, health professions education institutions, public and private higher education, government agencies, foundations, business, associations, labor and advocates. These CHWA partners have come together to increase the scale, sustainability and impact of short and long-term health workforce development efforts. A key focus is on pursuing agreed upon priority initiatives and targeted investments that maximize and make optimal use of limited public and private resources. Ensuring an optimal Health IT workforce for California and maximizing public and private funding to support its development is a key immediate priority for CHWA.

Other potential homes for the consortia are being sought and investigated.

Reporting Requirements

HITECH requires that grants must include metrics that track progress against goals and the impact of HIT workforce development on the quality and efficiency of health care.

1. Progress against goals: The coalition of institutions will determine a master plan for workforce development and write a comprehensive grant proposal on behalf of educational providers. Participating educational/apprenticeship programs and institutions must submit requests for funds with detailed forecasts for target populations (e.g, unemployed, veterans, auto-workers, displaced workers, etc). Applicant students must be surveyed regarding their background status and the grantees must report the number of applicants, acceptances, matriculations and graduations by background and by program. The coalition is responsible for determining the remaining gaps and actively promoting development of programs to close them.

2. Impact on quality and efficiency of healthcare: For the short-term nature of the workforce grants it is likely that the only measurable analysis of impact on quality and

efficiency of healthcare will be by tracking the impact of workforce development on the achievement of meaningful use incentive payments. The Regional Extension Center (REC) is charged with providing internship/apprenticeship opportunities for eligible graduates of community college and extension programs. In order to receive certification as a HIT Practice Consultant, graduates must "watch one, do one, teach one" installation of EHR's and receive a satisfactory review from two practices, in addition to agreeing to adhere to REC best practice recommendations. Experienced consultants can get certified by providing two practice references and agreeing to REC procedures. Once an HIT Practice Consultant is certified, he or she will be listed on the REC website as a recommended consultant. When the key milestones of EHR implementation are achieved, the consultant will submit a supplemental payment request to the REC with a complete provider satisfaction survey. Results of the surveys will be published on the REC certified consultant site.

The names of recipients of meaningful use incentives will be public information. The REC will maintain a database of certified consultants and the practices where they were deployed. This data will be analyzed and summarized for the ONC as needed to meet grant requirements.

Governance

Depending on the selected entity, it is expected that the coalition will have its own operational governance structure, which based on the criteria offered in this report would include key HIT education, training, employer and government stakeholders. UC, CSU, community college, private education and training institutions would be actively engaged in this effort. The governance structure would also benefit from a larger advisory board that represents the healthcare community of providers, payers, industry, patients, regional and local extension centers.

3. Recommendations

Based on the analysis represented in this report, the following recommendations should be incorporated into the strategic plans of relevant institutions around the state. These include the following:

1. **Build or identify a coalition:**

    a. Finalize criteria, identify and screen potential organizations, and select body to oversee Consortium

    b. Collaborate with relevant labor agencies, including Workforce Investment Boards (WIBs) and Regional Health Occupational Resource Centers (RHORCs)

    c. Explore additional and matching funding sources

2. **Integrate HIT core competencies into training for all clinicians:** Section 3015 of ARRA provides funding for demonstration programs and acting to put these in effect should be a top priority of the Consortium. The selected organization should provide a forum

for collaboration on funding requests, curriculum and best practice development, and "training the trainers" for clinical education programs

a. The American Health Information Management Association (AHIMA) and The American Medical Informatics Association (AMIA) have done outstanding work to detail HIT core competencies for clinicians, and this can provide an important starting point for curriculum development. This includes a core competencies matrix, which details the HIT skills that clinicians should possess upon graduation[13]

b. Technology Informatics Guiding Education Reform (TIGER) is a program that has developed HIT guidelines for nursing education and can be used as an initial outreach model[14ii]

3. **Build the immediate HIT workforce through "crossover" training programs:** Section 3016 of ARRA provides funding for existing programs six months in duration or less for training HIT workers. Short-term certificate programs through the state's wealth of community college, vocational, and university extension programs can offer valuable training to those workers with a portion of the skill set necessary for a variety of HIT functions: IT workers can be trained in healthcare essentials and clinical workers can be trained in HIT. These programs can rapidly respond to meet immediate demand. The Consortium should convene these stakeholders to collaborate on funding requests, curriculum development, and rollout.

   a. **Curriculum development:** Curriculum should be updated and standardized to suit the evolving needs of HIT employers and users. The California Department of Labor has already begun convening stakeholders to collaborate on this development and the consortium should join this effort

   b. **Hands-on training:** One key roadblock to training students on electronic health records is the limited access these students and institutions have to computing and software resources. AHIMA has set up the Virtual Lab to try to address this problem, but it is under-resourced, leading to expensive access and insufficient functionality. California should do it's part to ensure that this or a similar project is adequately funded, possibly in partnership with the HIT vendor community, to ensure students have broad-based, affordable access to EHRs in a functional and realistic environment.

   c. **Recruitment and retention:** Attaining and keeping students for these programs, particularly ahead of broadly recognized demand for these skills, will require effective promotion and communication of the opportunities that exist, development of programs around the schedules and requirements of the

[13] American Health Information Management Association and American Medical Informatics Association, Joint Workforce Taskforce: Health Information Management and Informatics Core Competencies for Individuals Working With Electronic Health Records, October 2008

[14] Evidence and Informatics Transforming Nursing, Technology Informatics Guiding Education Reform, 2007

workers likely to make use of them, and making them affordable through aid programs. Utilize the Framework developed by the Connecting the Dots Initiative (funded by the California Endowment) to guide workforce development efforts (Appendix 9). Workforce Investment Boards (WIBs) and Regional Health Occupational Resource Centers (RHORCs) can be critical resources and allies in this process as they already possess effective programs and resources to this effect

d. **Assistance from RECs to train "on-the-job" workforce:** Regional extension centers should collaborate on delivery of training, programs, and services as there will be significant overlap in workforce and customer base. Other organizations, such as physician academies and specialty groups, may also have an incentive to promote training and education and should be enlisted. Define service model and the percent of overall HIT workforce needs that RECs should meet.

4. **Develop Health Informatics Leaders:** While California possesses a handful of top-quality health informatics programs, the highly specialized skill-set required for HIT leaders is likely to be in short supply.

    a. UC and CSU should consider developing a HIT Baccalaureate degree or focus area for public health, computer science, and business students.

    b. Health Informatics post-graduate programs currently focused on research applications should be encouraged to develop a focus on clinical and applied health informatics at Certificate, Masters, and PhD levels.

5. **Develop a system for defining and tracking the HIT workforce**: Accurately counting and monitoring the HIT workforce is critical to meeting these goals going forward. The coalition should work with OSHPD, the Labor Agency, and others to modify occupational definitions and existing data capture and tracking systems to accurately assess and monitor current and future supply and demand.

4. Next Steps

The coalition and all relevant stakeholders should act immediately to put this plan into action as petitioning funds, developing and implementing programs, and attracting and training students will require an extremely long lead-time. Preparing HIT workers is critical to support the current and forthcoming demand for successful EHR implementations. Accordingly, the following steps should be taken:

1. **Select or create an HIT workforce coalition**

    a. Organization should be an independent, not for profit entity with expertise in and focus on health workforce issues

2. **Issue HIT charter and process overview, actively inviting relevant stakeholders to engage**

    a. Clinical HIT Training Group

i. UC, CSU, and private educational institutions

ii. Collaborate to petition funds and develop programs to integrate HIT into clinical curriculum

1. Develop best practices
2. Train the trainer

b. HIT/HIM Workers Group

i. Community Colleges, vocational schools, UC, CSU, university extension, and private institutions.

ii. Collaborate to petition funds and develop programs to train HIT workers:

1. Immediate and longer term opportunities
2. Standardized educational track development
3. Curriculum development
4. Best practices
5. Access to software resources
6. Accreditation body for certificate programs
7. Recruitment and retention
8. Employer engagement

c. Health Informatics Group

i. UC, CSU, and private institutions

ii. Collaborate to petition funds and develop programs to train Health Informaticists

3. Set first meeting to bring collaborators together and capture goals and guidelines

a. Ensure representation from rural providers and educators

4. Engage outside collaborators and funding partners

a. WIBs and RHORCs

b. Engage HIT vendors, consultants and service providers in workforce strategy development and funding

c. Explore collaboration potential with other key states for education and training model development, shared learning and innovation

5. Develop and submit California stimulus funding proposals on behalf of key stakeholders

a. ARRA/HITECH

b. Department of Labor

6. **Work with OSHPD, EDD, and Labor Agency to establish job classifications, data collection and reporting**

7. **Develop programs for recruitment and retention across segments**

    a. Work with Health Jobs Start Here, California Hospital Association, RHORCs, and Workforce Investment Boards to undertake an initiative to promote HIT and HIM jobs in California and lay out career and educational pathways. Develop pool of funds to incent and support HIT career and educational pursuit.

8. **Measure, monitor, and report on impact of initiatives**

    a. Revise as necessary to achieve goals.

APPENDICES

1. Relevant sections of ARRA/HITECH
2. EHR Implementation Roles
3. HIT Employment Projections, California EDD Labor Market Information Division
4. Projected demand for HIT workers in California
5. Community College HIT programs in California
6. Vocational School HIT programs in California
7. University extension programs in California
8. Post-graduate programs in California
9. CHWA Health Workforce Pathway
10. Distribution of RHIA and RHITs in California

APPENDIX 1:

Selections from American Recovery and Reinvestment Act, 2009

''SEC. 3015. DEMONSTRATION PROGRAM TO INTEGRATE INFORMATION

TECHNOLOGY INTO CLINICAL EDUCATION.

''(a) IN GENERAL.—The Secretary may award grants under this section to carry out demonstration projects to develop academic curricula integrating certified EHR technology in the clinical education of health professionals. Such awards shall be made on a competitive basis and pursuant to peer review.

''(b) ELIGIBILITY.—To be eligible to receive a grant under subsection (a), an entity shall—

''(1) submit to the Secretary an application at such time, in such manner, and containing such information as the Secretary may require;

''(2) submit to the Secretary a strategic plan for integrating certified EHR technology in the clinical education of health professionals to reduce medical errors, increase access to prevention, reduce chronic diseases, and enhance health care quality;

''(3) be—

''(A) a school of medicine, osteopathic medicine, dentistry, or pharmacy, a graduate program in behavioral or mental health, or any other graduate health professions school;

''(B) a graduate school of nursing or physician assistant studies;

''(C) a consortium of two or more schools described in subparagraph (A) or (B); or

''(D) an institution with a graduate medical education program in medicine, osteopathic medicine, dentistry, pharmacy, nursing, or physician assistance studies;

''(4) provide for the collection of data regarding the effectiveness of the demonstration project to be funded under the grant in improving the safety of patients, the efficiency of health care delivery, and in increasing the likelihood that graduates of the grantee will adopt and incorporate certified EHR technology, in the delivery of health care services; and

''(5) provide matching funds in accordance with subsection (d).

''(c) USE OF FUNDS.—

''(1) IN GENERAL.—With respect to a grant under subsection (a), an eligible entity shall—

''(A) use grant funds in collaboration with 2 or more disciplines; and

''(B) use grant funds to integrate certified EHR technology into community-based clinical education.

''(2) LIMITATION.—An eligible entity shall not use amounts received under a grant under subsection (a) to purchase hardware, software, or services.

SEC. 3016. INFORMATION TECHNOLOGY PROFESSIONALS IN HEALTH CARE (P. 143)

(a) IN GENERAL.—The Secretary, in consultation with the Director of the National Science Foundation, shall provide assistance to institutions of higher education (or consortia thereof) to establish or expand medical health informatics education programs, including certification, undergraduate, and masters degree programs, for both health care and information technology students to ensure the rapid and effective utilization and development of health information technologies (in the United States health care infrastructure).

(b) ACTIVITIES.—Activities for which assistance may be provided under subsection (a) may include the following:

(1) Developing and revising curricula in medical health informatics and related disciplines.

(2) Recruiting and retaining students to the program involved.

(3) Acquiring equipment necessary for student instruction in these programs, including the installation of test-bed networks for student use.

(4) Establishing or enhancing bridge programs in the health informatics fields between community colleges and universities.

(c) PRIORITY.—In providing assistance under subsection (a), the Secretary shall give preference to the following:

(1) Existing education and training programs.

(2) Programs designed to be completed in less than six months

Appendix 2: HIT Implementation Resource Matrix (available in WorkforceProjections.xls)

	Role	Project Consultant	Implementation Speciailist	Project Manager	Technology Analyst	Interface Specialist	Subject Matter Expert	Trainer
	Role Type	Strategic	Strategic	Operational	Technical	Technical	Strategic and Operational	Operational
Project Phase		-Familiarity with vendor offerings -Ability to understand and gather provider goals, objectives, and priorities -Understanding of meaningful use guidelines -Ability to assess vendor strengths and weaknesses relative to provider priorities -Ability to negotiate with vendor -Ability to assess provider readiness and support preparation	-Ability to develop and communicate a vision for how EHR can improve care quality, efficiency, etc. -Ability to communicate effectively with multiple stakeholders within clinic and vendor setting -Ability to redesign workflow to optimize EHR use -Ability to promote change management -Understanding of EHR best practices	-Ability to plan and manage a complex project -Effective communication skills -Ability to map and redesign workflow throughout all departments - business, office, quality, etc. -Ability to lead change management -Understanding of HIPAA and privacy requirements - Ability to build and manage a team	-Ability to extract and convert data from existing applications -Ability to create a stable application environment -Ability to manage vendor relationships -Understanding of best practices of security and data backup -Understanding of HIPAA and privacy requriements -Database management -Ongoing maintenance -Upgrade management -Ability to set up and customize data extraction and reporting Ability to map quality measures to EHR architecture -Detailed knowledge of interface and clinical terminology standards - Ability to collaborate to develop system architecture	-Ability to build interfaces for health information exchange -Ability to build interfaces to other clinical applications	-Knowledge of provider practice environment -Understanding of clinical processes and workflow -Knowledge of provider coding and documentation requirements -not clinical -Training skills (application and workflow) -Knowledge of revenue cycle processes - Knowledge of the structure of quality measures	-Extensive understanding of EHR functionality -Extensive understanding of clinical workflow -Ability to train new users
Assessment	-Evaluate the organizational readiness of a provider organization -Identify goals and objectives -Evaluate of EHR needs, preferences, and priorities (selection criteria)	-Evaluate goals and objectives -Assess organizational readiness -Gather priorities and requirements	-Develop/evaluate goals and objectives -Set project vision -Assess organizational readiness -Identify Physician Champion and Super User	-Improve organizational readiness -Set budget guidelines -Evaluate funding options -Ability to promote change management	-Assess current technology in use and network -Assess ability to adopt new technolgies -Identity technology preferences		-Assess compatibility of clinical workflow with EHR -Align EHR objectives with clinical objectives -Assist with needs assessment	
Selection	-Evaluate EHR offerings relative to selection criteria -Select of vendor and product Negotiate price, terms, training and implementation	-Develop short list of products -Check product references -Conduct thorough product evaluations and vendor demos -Select top products -Negotiate contract	-Help select product to best meet practices goals and objectives		-Provide technical perspective on system selection		-Provide clinical perspective on selection of system	
Planning	-Create project plan and timeline -Allocate required resources -Gather required data -Redesign workflow -Coordinate with vendor	-Ensure all appropriate resources are retained for project	-Communicate vision and expectations -Develop quality measurement and data sharing plan	-Develop implementation timeline and work plan -Coordinate with vendor -Adjust patient schedule to accommodate implementation time -Conduct limited workflow redesign to support implementation	-Develop data migration plan -Order necessary hardware -Develop data security plan and backup		-Provide guidance on workflow and functional preferences	
Implementing and testing	-Implement system -Migrate pre-existing systems Integrate with other systems -Test functionality and compatibility		Support and oversee implementation to ensure that it meets organizational goals	-Manage project to schedule and budget	-Implement and configure system -Test sytem -Migrate data	-Integrate with other applications -Test data sharing capacity	-Develop templates	
Training	-Train workers to use system		-Oversee training	-Oversee training	-Conduct technical training		-Conduct training	-Conduct training
Stabilization and support	-Ensure that system is stable and usable -Ensure users are comfortable with basic functionality -Provide support and trouble shooting as necessary		-Provide guidance for stabilization	-Support stabilization	-Monitor system -Support users and provide trouble shooting		-Support users and provide trouble shooting	-Conduct training
Optimization	-Provide trouble-shooting and support -Redesign workflow and modifying systems to meet needs Optimize systems		-Follow up 6-12 months post implementation for optimization	-Workflow adjustments to support HER	-Provide additional training to use more advanced functionality -Modify system to meet needs	-Upgrade interfaces as necessary and appropriate	-Workflow adjustments to support EHR	-Conduct training
	Relevant Educational Certifications and Experience	-MBA -MPH -Bachelors -Health informatics degree -Other relevant experience	-Health Informatics masters and doctorate -MBA -MPH -Extensive HIT experience	-MBA -MPH -Bachelors -Other relevant experience	-Health informatics masters and doctorate -Computer Science bachelors, masters, and doctorate -AS -HIT Certificate -Extensive software and HIT experience	-HIT certificate, AS, bachelors, masters, or doctorate -Computer science certificate, AS, bachelors, masters, or doctorate -Extensive software, hardware, and HIT experience	-All types of clinical degrees -HIT certificate, AS, bachelors -Extensive clinical experience	-All types of clinical degrees -HIT certificate, AS, bachelors

Appendix 3: California HIT Employment Projections

California
Occupational Employment Projections
2006-2016

		Annual Average Employment		Employment Change		Average Annual Job Openings			Wages & Training		
SOC Code	Occupational Title	2006	2016	Numerical	Percent	New Jobs	Net Replace-ments [1]	Total [2]	Median Hourly [3]	Median Annual [3]	Education & Training Levels [5]
00-0000	**Total, All Occupations**	**17,173,500**	**19,683,800**	**2,510,300**	**14.6**	**251,030**	**381,210**	**632,240**	**$17.31**	**$36,007**	
11-3021	Computer and Information Systems Managers	36,400	43,400	7,000	19.2	700	590	1,290	$58.96	$122,651	4
11-9111	Medical and Health Services Managers	21,500	25,300	3,800	17.7	380	400	780	$44.98	$93,565	4
15-1051	Computer Systems Analysts	53,900	69,100	15,200	28.2	1,520	1,430	2,950	$37.32	$77,628	5
29-2071	Medical Records and Health Information Technicians	13,700	16,300	2,600	19.0	260	370	630	$15.98	$33,225	6

March 2006 Benchmark
Table includes the self-employed, unpaid family workers, private household workers, and farm employment.
N/A - Information is not available.
Occupations with employment below 1,000 in 2006 are excluded.
Occupation subtotals may not add to the totals due to rounding and the suppression of data.

[1] Net Replacements openings are an estimate of the number of job openings expected because people have permanently left an occupation. It estimates the net movement of 1) experienced workers who leave an occupation and start working in another occupation.
[2] Total Job Openings are the sum of new jobs and net replacements. If employment change is negative, job openings due to growth are zero and total job
[3] Median Hourly and Annual Wages are the estimated 50th percentile of the distribution of wages; 50 percent of workers in an occupation earn wages below, and
[4] In occupations where workers do not work full-time, or year-round, it is not possible to calculate an hourly wage.
[5] Occupational training and education classifications were developed by the Bureau of Labor Statistics (BLS). For more information on the classifications, please
http://www.labormarketinfo.edd.ca.gov/?

Education & Training Levels:
1 - First Professional Degree
2 - Doctoral Degree
3 - Master's Degree
4 - Bachelor's Degree or Higher and
5 - Bachelor's Degree
6 - Associate Degree
7 - Post-Secondary Vocational Education
8 - Work Experience in a Related Occupation
9 - Long-Term On-the-Job Training
10 - Moderate-Term On-the-Job Training
11 - Short-Term On-the-Job Training

Appendix 4: Demand Model

By provider type	2010	2011	2012	2013	2014
Small MD practice	2,586	3,878	5,171	6,348	6,464
Medium MD practice	234	312	325	377	156
Large MD practice	105	119	122	124	77
Community Clinic	603	905	1,206	1,206	1,508
Small Hospital	347	354	463	463	456
Critical Access	0	58	88	117	263
Medium Hospital	774	802	1,060	1,003	1,003
Large Hospital	244	262	302	342	209
Public Hospital	75	75	75	187	262
Public Health Dept	20	41	61	102	142
Total demand	**4,988**	**6,806**	**8,873**	**10,270**	**10,541**
Incremental demand	**3,231**	**1,818**	**2,067**	**1,397**	**271**
By project type	**2010**	**2011**	**2012**	**2013**	**2014**
New EHR Implementation	1,964	2,617	3,451	4,066	4,192
New EHR Maintenance	2,486	3,437	4,527	5,403	5,471
Existing EHR Upgrade	146	199	227	197	207
Existing EHR Maintenance	316	449	552	509	577
HIE	10	15	20	25	30
Total demand	**4,923**	**6,718**	**8,778**	**10,201**	**10,477**
Incremental demand	**3,166**	**1,795**	**2,060**	**1,423**	**277**
By worker type	**2010**	**2011**	**2012**	**2013**	**2014**
Project Consultant	253	364	476	567	569
Implementation Specialist	423	575	751	872	879
Project Manager	790	1,071	1,403	1,643	1,672
Tech Analyst	265	386	507	612	614
Interface	368	511	668	780	795
Clinician	1,146	1,510	1,973	2,274	2,315
Trainer	1,146	1,510	1,973	2,274	2,315
Total demand	**4,392**	**5,928**	**7,750**	**9,021**	**9,159**
Incremental demand	**2,634**	**1,536**	**1,822**	**1,271**	**138**

Note: For complete analysis, please see WorkforceProjection.xls

Appendix 5: Listing of California Community Colleges offering HIT programs

College/Training Program	City	Program	CAHIIM Accredited	Regionally ACCREDITED	# of Grads per Year	Capacity	Able to Expand	Online Capability	Course Management System	Onsite/Campus Capability
Cypress College	Cypress	AS Degree HIT AS Degree Med Staff Services Science Medical Record Clerk Health Information Coding Certificate Medical Insurance Billing Specialist	YES	YES	7 1 2 13 5	Seat counts for lecture classes are 30. Directed Practice classes are 15 students	YES	YES Hybrid Online Program	Blackboard Illuminate through CCCConfer	YES
Fresno City College	Fresno	AS Degree HIT	YES	YES	8	35 new students each fall, however students are allowed to start in spring as well.	Yes	YES	Blackboard	No (HIT courses online, General Ed courses online and onsite)
San Diego Mesa College	San Diego	AS Degree HIT	YES	YES						
Santa Barbara City College	Santa Barbara	AS Degree HIT	YES	YES	25	427 declared majors	Only with additional resources	YES	Moodle	No
Santa Barbara City College	Santa Barbara	Health Information Coding Certificate	AHIMA Approved	YES	87	235 declared majors	Only with additional resources	YES	Moodle	No
East Los Angeles College	Monterey Park	AS Degree HIT Health Information Coding Certificate	YES	YES						
Cosumnes River College	Sacramento	AS Degree HIT Health Information Coding Certificate	YES	YES				YES		
City College of San Francisco	San Francisco	AS Degree HIT Health Information Coding Certificate	YES	YES						

Source: CAHIIM/AHIMA

2007-2008 Enrollment in CAHIIM Accredited HIT Programs in CA									
	FT Enrollment	PT Enrollment	Total Enrollment	FT Grads	PT Grads	Total Grads	FT Attrition	PT Attrition	Total Attrition
Community Colleges	266	935	1201	30	60	90	23	359	382
FT=Full Time Students									
PT=Part Time Students									

Appendix 6: Listing of Vocational Programs in California

College	Program or Programs	Description
Los Angeles Trade & Technical College	Computer Information Systems	More focused on information systems concepts than health-specific applications
American Career College	Health Claims Examiner/Medical Biller	Focused on billing software, word processing, cost analysis, data entry. Also includes modules on claim forms. Although this program mentions electronic billing, it is not focused on the electronic health records piece.
DeVry	AS Health Information Technology	Program is focused on health data, application systems for health information and electronic health information databases. The program also refers to insurance/managed care systems and how it applies to the health information technology exchange.
Everest College	Computer Information Science & Medical Insurance Billing/Coding	The computer information science is focused on programming and information systems concepts. The Medical Insurance Billing/Coding is focused on electronic health records, billing, coding, electronic claims submission and transcription.
ITT Technical Institute	Health Information Technology	Very focused on the health care delivery process, electronic health care records, anatomy and physiology, coding, reimbursement methodologies, health care data sets and specialized registries. Additionally, they cover management courses.
Western Career College	Health Information Technology and Health Care Administration	Focused on the health care delivery process, including electronic data interchange, billing, coding, and electronic medical records. Also covers data analysis and reporting, health insurance, and HIPAA. The Health Care Administration Program is focused on front office work, with brief coverage of billing, coding, and electronic health records
San Joaquin Valley College	Health Care Administration	Focused on medical insurance principles, computer concepts, coding, billing, economics, and finance. They also have an Administrative Health Care Management program that is focused on medical records software, billing, and Microsoft office applications.
Kaplan College	Medical Office Specialist and Medical Office Administration	Programs are focused on billing, coding, medical terminology, medical records (from a chart aspect). Was told that they are not looking into any electronic health records system, though they do cover medical records management and how to control records within health care facilities

Appendix 7: University Extension Programs in California

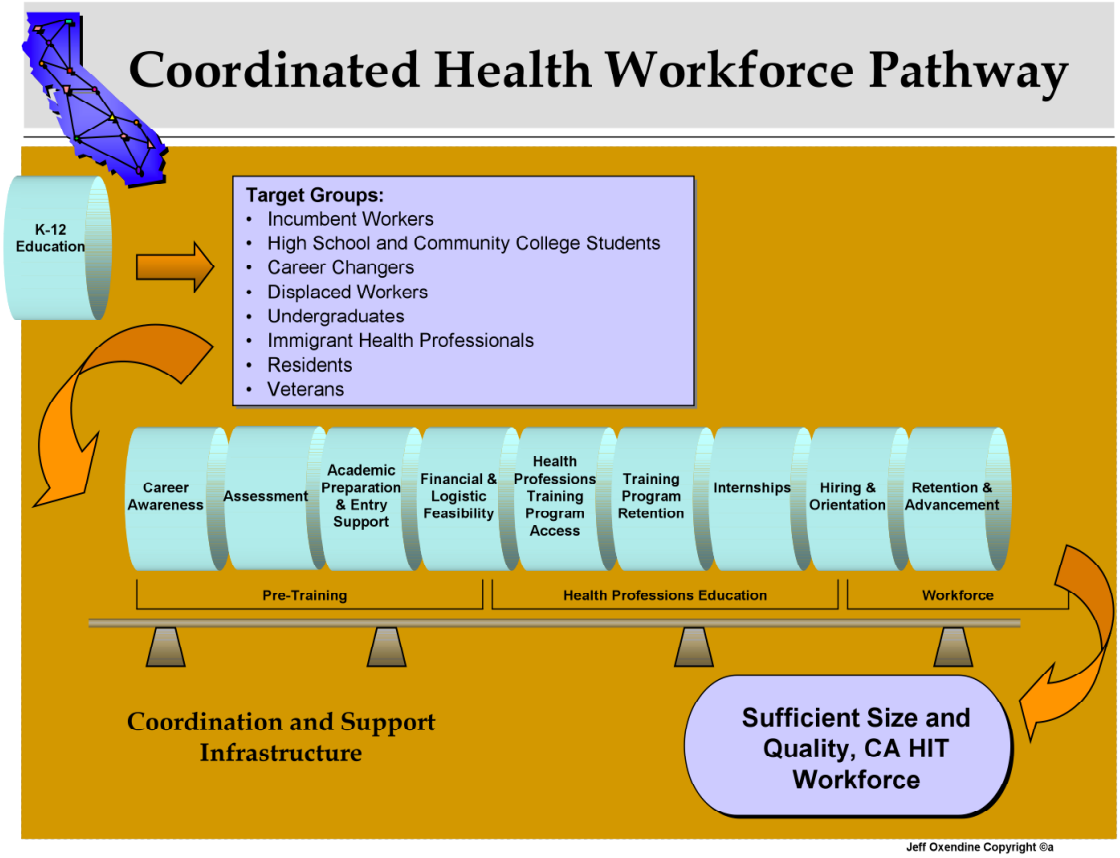
UCs with relevant Extension Program offerings	CSUs with relevant Extension Program offerings
Berkeley	Bakersfield
Davis	Channel Islands
Irvine	Chico
UCLA	Dominguez Hills
Merced	Fresno
Riverside	Fullerton
San Diego	East Bay
Santa Barbara	Humboldt
Santa Cruz	Long Beach
	Los Angeles
	Monterey Bay
	Northridge
	Cal Poly Pomona
	Sacramento
	San Bernardino
	San Diego
	San Francisco
	San Jose
	San Marcos
	Stanislaus

Appendix 8: Post-graduate programs in California

Note: UCSD appears to be developing or offering a PhD in Biomedical Informatics, but little information is currently available. UCLA formerly had a graduate degree with a focus on Health Information Management in the School of Public Health

Institution	Degree(s)
Claremont Graduate University	Masters – Health Informatics
Stanford	Masters, PhD – Biomedical Informatics Postdoctoral training Professional education/non-degree Certificate – Bioinformatics or Clinical Informatics
UC Berkeley	Masters – Information Management Systems
UC Davis	Masters – Health Informatics Certificate – Health Informatics PhD – Health Informatics (in development)
UC Irvine	PhD – Informatics in Biology and Medicine
UCLA	PhD – Medical Imaging Informatics, Biomedical Engineering
UCSF	PhD – Biological and Medical Informatics, Clinical and Translational Informatics

Appendix 9: California Health Workforce Alliance (CHWA) Health Workforce Pathway



Appendix 10: Distribution of RHIAs and RHITs in California

Region	Number	%	Area
GOCHIA	372	9	Orange County
IAHIA	405	10	Inland Area (Riverside, San Bernardino)
NCHIA	979	23	North Coast – San Francisco and North
SCHIA	1288	30	Los Angeles/ Santa Barbara
SDHIA	413	10	San Diego
SHIA	205	5	Fresno
SVHIA	576	14	San Diego
TOTAL	4,238	100	California

Source: CHIA

Sources

[i] Out of Order, Out of Time, Association of Academic Health Centers 2008, Office of State Health Planning and Development (OSHPD), California State Rural Health Association, UCSF Center for California Health Workforce Studies

[ii] Evidence and Informatics Transforming Nursing, Technology Informatics Guiding Education Reform, 2007