

Health Information Technology Initiative

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Executive Summary

Health care lags behind other industries in adopting information technology by as much as 10–15 years. Correcting this situation and adopting a robust health information technology (HIT) infrastructure should result in lower health care costs and improved patient care. This will require changes in the way health care is provided today, including a broad acceptance of standards, transformation of the medical communities' culture, and revision of legislation and policy. The investment to accomplish these changes is huge, but the results would be an enormous success for the health care community.

A recent collaborative IDA/MITRE study of a joint DoD/VA hospital project in North Chicago clearly exposed some of the many difficulties involved in instantiating a modern effective HIT across organizations, even those with relatively overlapping patient communities. From that experience it is clear that a major obstacle to developing a robust HIT system lies at the intersection of technology, culture and policy. The current study was initiated to better understand the current state of HIT, the medical communities' attitudes regarding this matter, and what legislative/policy actions the administration, which has shown a strong interest, had taken towards moving forward their ideas in fixing the problem.

Early on in the study it became apparent that there were in place several well-funded programs and regulations that were finally making notable progress in instantiating an electronic health records (EHR) based health care system. The American Recovery and Reinvestment Act of 2009 (ARRA), which includes the Health Information Technology for Economic and Clinical Health Act (the HITECH Act), legislatively mandated the Office of the National Coordinator for HIT (ONC), within the Department of Health and Human Services (HHS), and established the Medicare and Medicaid EHR Incentive Programs that encourages meaningful use of certified EHRs and other HIT to improve quality of care. The Patient Protection and Affordable Care Act of 2010 builds on the HITECH Act and recognizes health IT as a critical enabler to broad transformations in health care. This legislation now supports progress in moving forward the HIT agenda, supporting adoption by physicians and hospitals of products that meet the evolving standards being developed, education across the whole medical community, and a wide range of research and development and pilot programs to test out new ideas.

The ONC is also responsible for the development of the Nationwide Health Information Network (NHIN). The NHIN is a collection of standards, protocols, legal agreements, specifications, and services that enables the secure exchange of health information over the internet. A number of challenging issues must be resolved as development of the NHIN proceeds. These include the question of a unique patient identity, which is complicated by privacy considerations. Other issues are related to the security of the patient records, control of access to all or parts of the record, and indeed who actually controls the record.

Another major issue is the gathering of patient data for entry into the EHR. Patients interact with the medical profession in many different ways, including, for example, emergency services, hospitals, pharmacies, their primary physician, multiple specialists, radiological and chemical laboratories, etc. All should be entering their interactions into the patients EHR. This should also place no additional burden on the professional for the data entry action. Many of the various tests and procedures commonly used are already available in digital form. But there is no culture in bringing these together in a single digital file. With the new supported processes in place now, there are efforts to normalize the data outputs of the medical tools in use, so that they all “speak the same language.” A “plug-and-play” program is under development replicating the PC and mobile phone capabilities for the instruments used by the medical profession. The most difficult problem is entering the interactive discussion between the physician and his patient into the EHR. Now there are tools becoming available with a quite high level of accuracy capable of voice recognition thereby making it possible for dictation to directly be entered into the EHR.

These recent accomplishments represent only a start, and success in this matter will depend upon the continuation and funding of these recent initiatives. Recent reports suggest that the current federal spending on HIT will grow from \$4.5B in 2011 to \$6.5B by 2016¹. This investment should enable substantial progress to be made, but it is important that sustainment of the effort will be required for another decade in order to reach a truly successful milestone. With such an effort there can be a reasonable expectation of a successful improvement of our health care system, resulting in reduced costs and better health care in the US.

¹ *Federal health IT market set to grow to \$6.5B by 2016*, Healthcare IT News (December 20, 2011); <<http://www.healthcareitnews.com/news/federal-health-it-market-set-grow-65b-2016>>.

Health Information Technology Initiative: Outline

- **Introduction**
- Federal Supported Activities
- Nationwide Health Information Network (NHIN)
- Automated Data Entry
- Summary & Conclusions

Study Objectives

To achieve a better understanding of the several standards issues and the difficult cultural and policy barriers and to discuss approaches for their solutions with the innovative application of existing and emerging technologies and policy options to advance the development of an Electronic Health Record (EHR) that spans the needs of all medical specialties and that all medical care systems can utilize.

Background

- Health care lags behind other industries in adopting information technology by as much as 10–15 years [1]
 - Only 20% of doctors and 10% of hospitals even use basic electronic health records (EHRs) [2]
 - Use for fully functional EHRs is worse—as low as 4% for doctors and 1.5% for hospitals [3, 4]
 - The administration has identified the development of a robust health information technology (IT) infrastructure as one of the key approaches for improving the quality and reducing the costs of health care
- Multiple entities are in various stages of developing the components of health information technology systems including
 - Electronic Medical Records, Electronic Health Records and Personal Health Records
 - Network components, such as the Nationwide Health Information Network (NHIN)
- Many of these efforts have little coordination resulting in multiple, not necessarily compatible, solutions for attaining a functional system to improve health care delivery and support the progress of personalized medicine

A number of recent government initiatives should improve the picture.

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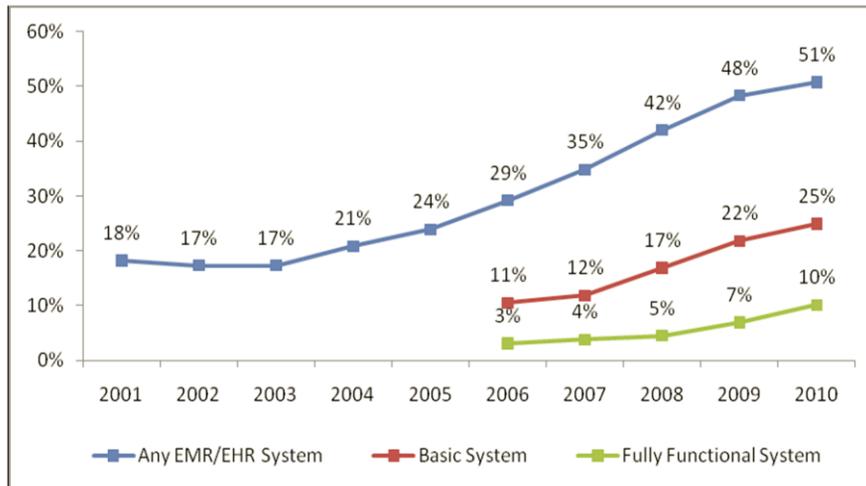
[1] Is IT the cure? *Economist* (May 8, 2003).

[2] HHS Secretary Kathleen Sebelius, 13 July 2010;
<<http://www.hhs.gov/secretary/about/speeches/sp20100713.html>>.

[3] *Electronic Health Records in Ambulatory Care — A National Survey of Physicians*, Catherine M. DesRoches, et al., *The New England Journal of Medicine* (NEJM) (July 3, 2008)

[4] *Use of Electronic Health Records in U.S. Hospitals*, Ashish K. Jha, et al., *NEJM* (April 16, 2009).

Percentage of Office-Based Physicians Using EHR Systems: United States, 2001-2010 [1]



Source: [National Center for Health Statistics \(NCHS\) Health E-Stat](http://www.cdc.gov/nchs/data/hestat/emr_ehr_09/emr_ehr_09.htm#emr_ehr_systems)

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[1] *Electronic Medical Record/Electronic Health Record Systems of Office-based Physicians: United States, 2009 and Preliminary 2010 State Estimates*, Chun-Ju Hsiao; Esther Hing; Thomas C. Socey; and Bill Cai, Division of Health Care Statistics; National Center for Health Statistics (NCHS) Health E-Stat; <http://www.cdc.gov/nchs/data/hestat/emr_ehr_09/emr_ehr_09.htm#emr_ehr_systems>.

From Reference [1]: The 2010 data are preliminary estimates, based on a mail survey. Estimates through 2009 include additional physicians surveyed as part of the core in-person National Ambulatory Medical Care Survey (NAMCS). Earlier 2009 estimates were revised to include those physicians. Estimates of basic or fully functional systems prior to 2006 could not be computed because necessary items were not collected in the survey. Fully functional systems are a subset of basic systems. Some of the increase in fully functional systems between 2009 and 2010 may be related to a change in survey instruments and definitions of fully functional systems between 2009 and 2010 (see source article for more details). Includes non-federal, office-based physicians. Excludes radiologists, anesthesiologists, and pathologists. Source: CDC/NCHS, *National Ambulatory Medical Care Survey*.

Current State of Affairs

- Two large, enterprise-wide, relatively advanced health care providers, each with many patients receiving care are:
 - Department of Veterans Affairs (VA), through the Veterans Health Administration (VHA) [1]
 - Department of Defense (DoD), through the Military Health System (MHS) [2]
 - Both providers have independently developed an EHR system for their patient care, requiring much effort to bring all relevant medical information together for a patient visit
- There are also sophisticated health IT providers (e.g., Kaiser Permanente, major academic medical centers, and certain regional medical networks) who implement integrated health care delivery systems
 - These work well within each separate system, but not generally across systems
 - One of the most important needs is to define the specifications for an EHR that spans the needs of all the medical specialties that all medical care systems, including those in the civilian sector, can utilize
- There are efforts underway in attacking these problems at some level and the technology to do this is within reach, but choices must be made with great care
 - The problems that are impeding progress here may be characterized as the need for
 - Standards for content, vocabulary, transport, and privacy/security
 - Incentives (or remove the barriers) related to costs, culture, and policy

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[1] The VA's EHR system is implemented using the Veteran's Information Systems and Technology Architecture (VistA).

[2] The DoD's EHR system is implemented using the DoD's AHLTA/Composite Health Care System (CHCS).

Major DoD and VA Data Sharing Initiatives [1, 2, 3]

- Federal Health Information Exchange (FHIE):
 - One-way transfer of text data from the DoD to the VA at separation from service (transfers occur monthly)
- Bidirectional Health Information Exchange (BHIE):
 - Bidirectional real-time viewing of text data for shared patients
- Clinical Data Repository/Health Data Repository (“CHDR,” CDR for DoD and HDR for VA)
 - Bidirectional real-time exchange of computable outpatient pharmacy and allergy data for shared patients (provides alerts on drug-drug interactions and drug allergies)
- Virtual Lifetime Electronic Record (VLER)
 - Pilot programs leveraging the Nationwide Health Information Network (NHIN) for health data sharing among the DoD, the VA, and civilian health care organizations (e.g., Kaiser Permanente)
- CAPT James A. Lovell Federal Health Care Center (JAL FHCC) [4]
 - *Joint* federal health care center: DoD and VA clinicians caring for DoD and VA patients
 - Single patient registration, single sign-on with patient context management, and orders portability (laboratory, pharmacy, radiology, and consults)
 - Legacy systems, legacy work flows, and reluctance to relinquish ownership limited success
- DoD and VA have had only limited success in their data sharing initiatives

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[1] *Military Health System (MHS)*, Independent Telecommunications Pioneer Association (ITPA) Monthly Luncheon, C. Campbell, 4 March 2010; <<http://www.sussconsulting.com/documents/Charles.Campbell.ITPA.Briefing.3.4.10.pdf>>.

[2] *VA/DoD Health Information Sharing*, Cliff Freeman, June 2010; <http://www.va.gov/VADODHEALTHITSHARING/docs/VADoD_June_2010Presentation.ppt>.

[3] *VA-DoD Sharing Yesterday, Today, and Tomorrow—Clinician’s Perspective*, Government Health IT Conference, P. Goyal and S. Ondra, 15 June 2010; <http://www.govhealthitconference.com/2010/docs/1-1_Goyal_Ondra.pdf>.

[4] *Technical Assessment of DoD/VA Approach for Orders Portability: A Joint IDA/MITRE Study*, A. Brenner, et al., December 2010, IDA Document D-4219.

Major DoD and VA Data Sharing Initiatives (continued)

- A February 2011 GAO report [1] concluded that DoD and VA lack mechanisms for identifying and implementing efficient and effective IT solutions to jointly address their common health care system needs
 - Consequently they are having difficulty developing a patient digital medical record available to both DoD and VA health care providers
- The report recommends that DoD and VA
 - Address their common health care business needs by improving their joint
 - Strategic planning
 - Enterprise architecture
 - IT investment management
 - Strengthen their joint IT system planning efforts for VLER and the JAL FHCC
- In March 2011, Secretary Gates and Secretary Shinseki announced an agreement to create a joint common platform for their departments' medical records
 - Involvement at the highest levels of both the DoD and VA is likely to move such a difficult enterprise forward

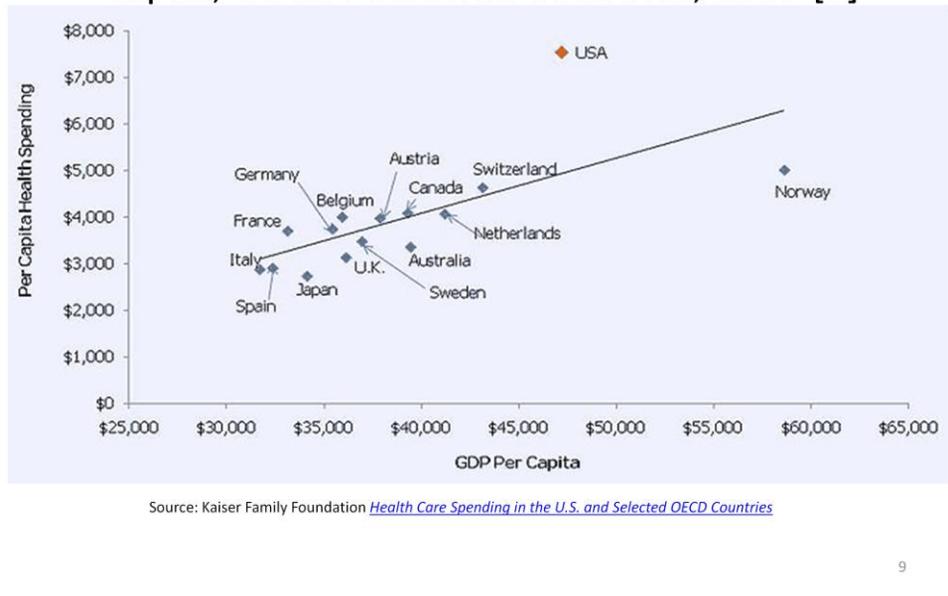
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[1] *DOD and VA Should Remove Barriers and Improve Efforts to Meet Their Common System Needs*, GAO-11-265 .

Forces Impacting Adoption of Health IT

- Costs (see following slides for graphs)
 - Per capita cost for health care in the US far exceeds that of other advanced nations
 - Life expectancy is lower than in most other developed countries
- Improved patient care, resulting from:
 - Coalescence of medical records from all medical providers
 - Improved diagnostic and pharmaceutical decisions with knowledge based tools
 - Reduced medical errors
 - Increased patient participation in their personal health care
- Availability of a large number of anonymous health records to facilitate medical research
- Adoption requires changes to:
 - Standards for content, vocabulary, transport, privacy/security
 - Culture
 - Legislation and policy
- Initial investment is huge, but
 - Industry is investing and the medical profession is interested
 - Government can play an important role in coordination and funding
 - The pay-off of success is enormous

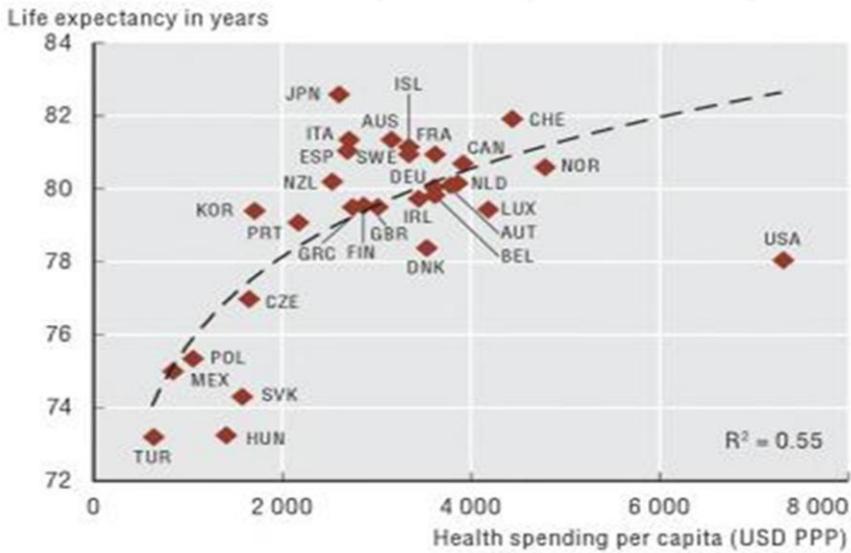
Total Health Expenditure per Capita and GDP per Capita, US and Selected Countries, 2008 [1]



[1] From the Kaiser Family Foundation *Health Care Spending in the U.S. and Selected OECD Countries*; <<http://www.kff.org/insurance/snapshot/OECD042111.cfm>>. The data for this Kaiser Snapshot is from the Organization for Economic Co-operation and Development, *OECD Health Data (2010)*, OECD Health Statistics (database), accessed February 14, 2011. See <<http://www.oecd.org/health/healthdata>>.

Note the positions of the outliers USA and Norway.

Life Expectancy vs. Per Capita Health Spending [1]



Source: OECD Publishing, *Health at a Glance 2009: OECD Indicators*, 2009

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[1] Source: Organization for Economic Co-operation and Development (OECD) Publishing, *Health at a Glance 2009: OECD Indicators* (2009); <http://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-2009_health_glance-2009-en>.

The level of total health expenditure per capita is shown in U.S. dollars, adjusted for purchasing power parity (PPP).

Note the positions of the USA, Norway (NOR) and Japan (JPN).

Why EHR? [1]

- Better Decisions and More Coordinated Care with EHRs
 - With more complete patient information, providers improve their ability to make well-informed treatment decisions quickly and safely
- Moving Beyond the Paper Record
 - By making it easier to use and share information, EHRs can help health care providers do a better job of managing patient care
 - When fully functional and exchangeable, the benefits of EHRs offer far more than a paper record can. EHRs can:
 - Improve quality and convenience of patient care
 - Increase patient participation in their care
 - Improve accuracy of diagnoses and health outcomes
 - Improve care coordination
 - Increase practice efficiencies and cost savings
 - Facilitate enterprise level research program

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[1] *Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care*, Chaudhry B, et al., *Annals of Internal Medicine* (2006).

From ONC; <<http://www.healthit.gov/providers-professionals/benefits-electronic-health-records-ehrs>>.

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The Government Takes Charge

- To control the rapidly increasing costs of health care, the Obama Administration initiated a multifaceted set of initiatives utilizing health IT including:
 - New legislation
 - New regulations
- Substantial funding was provided to support these initiatives
- Initially there was much doubt concerning the likely success of the effort [1]
 - To the surprise of many, health IT has been quite successful, as will be seen later in this briefing

These efforts are beginning to have the necessary effects to accelerate the adoption of health IT.

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[1] *Wiring the Health System — Origins and Provisions of a New Federal Program*, David Blumenthal, NEJM 365, 24 (December 15, 2011); <<http://www.nejm.org/doi/full/10.1056/NEJMSr1110507?viewType=Print&viewClass=Print>>.

Recent Relevant Legislation

- American Recovery and Reinvestment Act of 2009 (The Recovery Act) [1]
 - The Recovery Act includes the Health Information Technology for Economic and Clinical Health Act (the HITECH Act) (see below) which establishes the Medicare and Medicaid EHR Incentive Programs that encourage meaningful use of certified EHRs and other health information technology (IT) to improve quality of care.
- Health Information Technology for Economic and Clinical Health Act of 2009 (The HITECH Act)
 - The HITECH Act, passed as part of the Recovery Act, allocated billions of dollars for the health care system to adopt and meaningfully use health IT to improve health. A number of provisions in the HITECH Act strengthen the privacy and security protections for health information established under the Health Insurance Portability and Accountability Act of 1996 (HIPAA).
- Patient Protection and Affordable Care Act of 2010 (the Affordable Care Act) [2]
 - The Patient Protection and Affordable Care Act of 2010, later amended by the Health Care and Education Reconciliation Act of 2010 (collectively, the Affordable Care Act), builds on the HITECH Act and recognizes health IT as a critical enabler to broad transformations in health care.

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[1] P.L. 111-5, *American Recovery and Reinvestment Act of 2009* (ARRA), 111th Congress.

[2] P.L. 111-148, *Patient Protection and Affordable Care Act of 2010*, 111th Congress.

HITECH Programs [1, 2]

- Beacon Community Program
 - A grant program for communities to build and strengthen their health IT infrastructure and exchange capabilities
- State Health Information Exchange Cooperative Agreement Program
 - A grant program to support States in establishing health information exchange (HIE) capability among health care providers and hospitals in their jurisdictions
- Health Information Technology Extension Program
 - A grant program to establish health IT Regional Extension Centers to offer technical assistance, guidance and information on best practices to support and accelerate health care providers' efforts to become meaningful users of EHRs
- Strategic Health IT Advanced Research Projects (SHARP) Program
 - A grant program to fund research focused on achieving breakthrough advances to address problems that have impeded EHR adoption; four \$15M projects funded
 - Privacy and Security of Health IT
 - Patient-Centered Cognitive Support (for adaptive clinical decisions)
 - EHR as a Network Platform Architecture (enabling third party apps to securely access data)
 - Secondary Use of EHR Data (to support development of new best practices)

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[1] The material on this slide is extracted, with some modifications, from the descriptions of HITECH Program provided at http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__hitech_programs/1487.

[2] See backup slides for HITECH funding for ONC and CMS focused initiatives.

HITECH Programs (continued)[1]

- Community College Consortia to Educate Health Information Technology Professionals Program
 - A grant program that seeks to rapidly create non-degree health IT education and training programs that can be completed in six months or less
- Curriculum Development Centers Program
 - A grant program to provide \$10 million in grants to institutions of higher education to support health IT curriculum development
- Program of Assistance for University-Based Training
 - A grant program to rapidly increase the availability of individuals qualified to serve in specific health IT professional roles requiring university-level training
- Competency Examination for Individuals Completing Non-Degree Training Program
 - A grant program to provide \$6 million in grants to an institution of higher education to support the development and initial administration of a set of health IT competency examinations

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[1] The material on this slide is extracted, with some modifications, from the descriptions of HITECH Program provided at <http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__hitech_programs/1487>.

Office of the National Coordinator for Health IT (ONC)[1]

- ONC legislatively mandated in the HITECH Act (2009)
 - Organizationally located in the Department of HHS
 - Created by Executive Order in 2004
- ONC is the principal Federal entity charged with coordination of nationwide efforts to implement and use the most advanced health IT and electronic health information exchange (HIE)
- ONC's missions include
 - Promoting development of a nationwide health IT infrastructure that allows for electronic use and exchange of information [2]
 - Providing leadership in the development, recognition, and implementation of standards and the certification of health IT products
 - Health IT policy coordination
 - Strategic planning for health IT adoption and HIE
 - Establishing governance for the Nationwide Health Information Network (NHIN)
- ONC also supports several initiatives to facilitate nationwide adoption of health IT, thereby reaching diverse stakeholder groups imperative for success of the HITECH Act

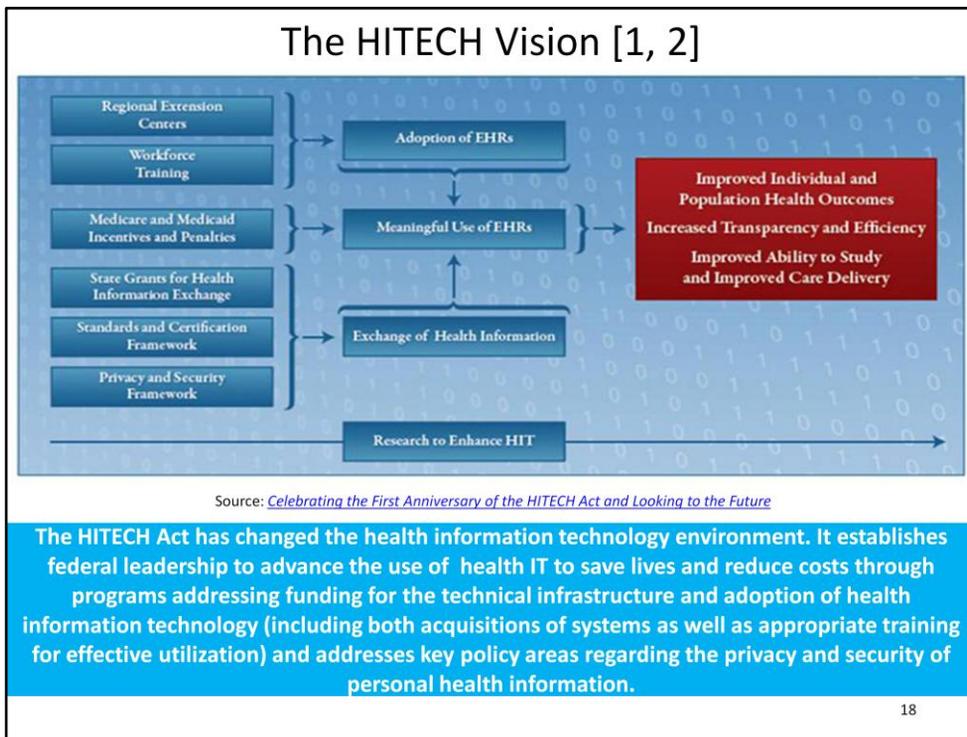
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[1] The material on this slide is extracted, with some modifications, from the description of the ONC provided at http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__onc/1200.

[2] As stated in the source cited above, these include:

- Ensures secure and protected patient health information
- Improves health care quality
- Reduces health care costs
- Informs medical decisions at the time/place of care
- Includes meaningful public input in infrastructure development
- Improves coordination of care and information among hospitals, labs, physicians, etc.
- Improves public health activities and facilitates early identification/rapid response to public health emergencies
- Facilitates health and clinical research
- Promotes early detection, prevention, and management of chronic diseases
- Promotes a more effective marketplace
- Improves efforts to reduce health disparities

The HITECH Vision [1, 2]



[1] *Celebrating the First Anniversary of the HITECH Act and Looking to the Future*, ONC, U.S. Department of Health & Human Services, 2010;
<http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__onc/1200>.

[2] From *CMS EHR Meaningful Use Criteria Summary* at
<https://www.cms.gov/EHRIncentivePrograms/30_Meaningful_Use.asp>:
The criteria for meaningful use will be staged in three steps over the course of the next five years.

- Stage 1 (2011 and 2012) sets the baseline for electronic data capture and information sharing.
- Stage 2 (expected to be implemented in 2013) and Stage 3 (expected to be implemented in 2015) will continue to expand on this baseline and be developed through future rule making.

New Health IT Funding [1, 2, 3, 4]

- Health IT Funding under Recovery & HITECH Acts
 - \$2 billion in direct funding for health IT efforts channeled through HHS and ONC
 - \$300 million reserved for support of regional health information exchange efforts
 - \$20 million reserved for NIST to work on health IT enterprise integration
 - \$17.2 billion in incentives through the Medicare and Medicaid reimbursement systems to assist providers in adopting EHRs
- Other health IT related Stimulus spending
 - \$85 million for health IT, including telehealth services, within the Indian Health Service
 - \$1.5 billion for construction, renovation, and equipment for health centers through the Health Resources and Services Administration
 - \$500 million for SSA to improve processing of disability/retirement claims (\$40M for health IT)
 - \$1.1 billion for comparative effectiveness research within the Agency for Healthcare Research and Quality (AHRQ), National Institutes of Health (NIH), and HHS
 - \$50 million for information technology within the Veterans Benefits Administration
 - \$2.5 billion for the U.S. Department of Agriculture's Distance Learning, Telemedicine, and Broadband Program
 - \$4.7 billion for the National Telecommunications and Information Administration's Broadband Technology Opportunities Program

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[1] *Federal Stimulus Funding for Health Information Technology*; Florida Association of RHIOs;

<<http://floridarhios.com/news-stimulus-61109.html>>.

[2] *Health Care Reform and Health IT Stimulus: ARRA and HITECH*, American Health Information Management Association;

<<http://www.ahima.org/advocacy/arrahitech.aspx>>.

[3] *American Recovery & Reinvestment Act*, Graybar Services;

<<http://www.graybar.com/industries/commercial/healthcare/stimulus>>

[4] *Your Guide to Meaningful Use*, eRECORDS; <http://erecords.com/mu_faq.html>

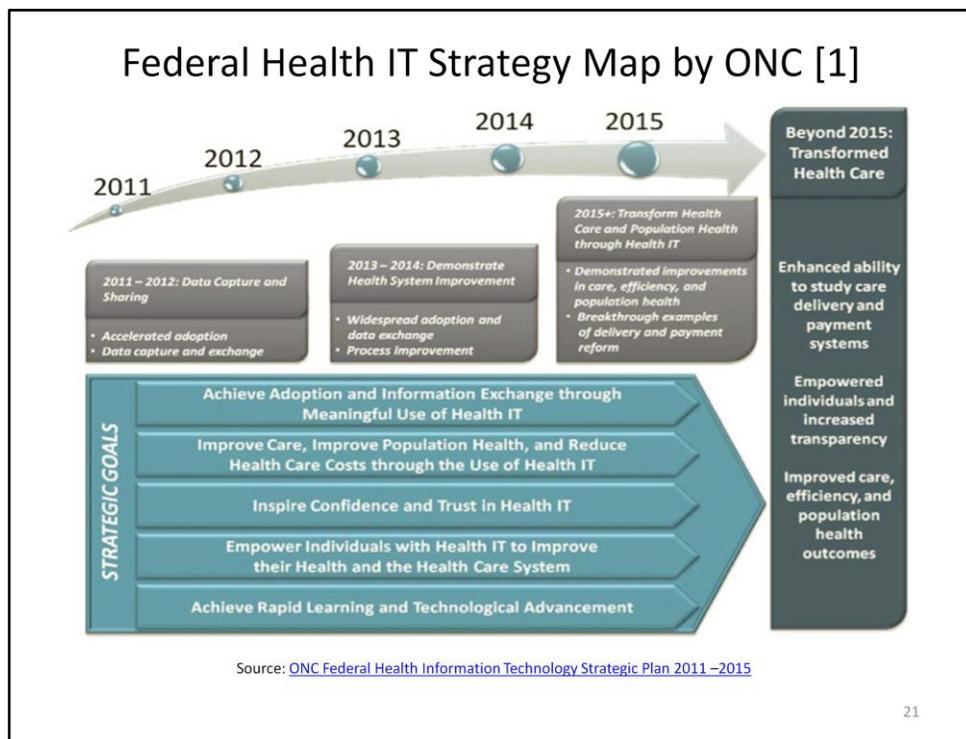
ONC Initiatives [1]

- Cyber Security
 - ONC and HHS provide best practices for safeguarding protected health information in EHRs
- Innovations
 - Initiatives within ONC and HHS designed to spur and support health technology innovation
- Nationwide Health Information Network (NHIN) [2]
 - A collection of standards, protocols, legal agreements, specifications, and services to enable secure health information exchange (HIE)
- Federal Health Architecture
 - An e-government line of business initiatives to increase efficiency and effectiveness in all government operations
- Rural Health IT
 - HHS and Agriculture agreement to leverage existing programs to help expand health IT infrastructure in rural America
- State-Level Health Initiatives
 - Initiatives designed to ensure that states and regional efforts to achieve HIE are aligned with the national agenda
- Adoption
 - An initiative supporting two national health IT adoption surveys: one of physician offices and one of hospitals
- Clinical Decision Support
 - Provides clinicians, staff, patients or other individuals with filtered knowledge and person-specific information, to enhance health and health care

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[1] The material on this slide is extracted, with some modifications, from the descriptions of ONC initiatives provided at http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__onc_initiatives/1497.

[2] Nationwide Health Information Network is also sometimes shown as NwHIN.



[1] Source: *ONC Federal Health Information Technology Strategic Plan 2011-2015*, available at http://healthit.hhs.gov/portal/server.pt/community/federal_health_it_strategic_plan_-_overview/1211.

The text below, which describes the goals shown in the figure, is taken from the “Overview: Federal Health IT Strategic Plan 2011-2015,” available at http://healthit.hhs.gov/portal/server.pt/community/federal_health_it_strategic_plan_-_overview/1211.

Federal Health IT Strategic Plan Overview; *Recent legislation has established an agenda and committed significant resources for health IT. The updated Federal Health IT Strategic Plan 2011 – 2015 is ONC’s plan, developed in collaboration with other federal partners, for realizing Congress and the Administration’s health IT agenda.*

Goal I, “Achieve Adoption and Information Exchange through Meaningful Use of Health IT,” discusses the centerpiece of the government’s health IT strategy over the next five years. “Meaningful use” is aimed at widespread adoption and information exchange in its first two stages, and will then build to improved health outcomes in the third stage.

Goal II, “Improve Care, Improve Population Health, and Reduce Health Care Costs through the Use of Health IT,” discusses the specific ways health IT is contributing to the goals of health care reform: improved care, improved population health, and reduced per capita costs of health care. Widespread adoption of EHRs, information exchange, quality improvement initiatives, and health care reform pilots are required to implement The Affordable Care Act.

Goal III, “Inspire Confidence and Trust in Health IT,” focuses on government efforts to update its approach to privacy and security issues related to health IT and to build greater confidence and trust in EHRs and health information exchange among providers and the public.

Goal IV, “Empower Individuals with Health IT to Improve their Health and the Health Care System,” discusses how the government is designing health IT policies and programs to meet individual needs and expectations, providing individuals with access to their information, helping to facilitate a strong consumer health IT market, and better integrating individuals and clinicians’ communications through health IT.

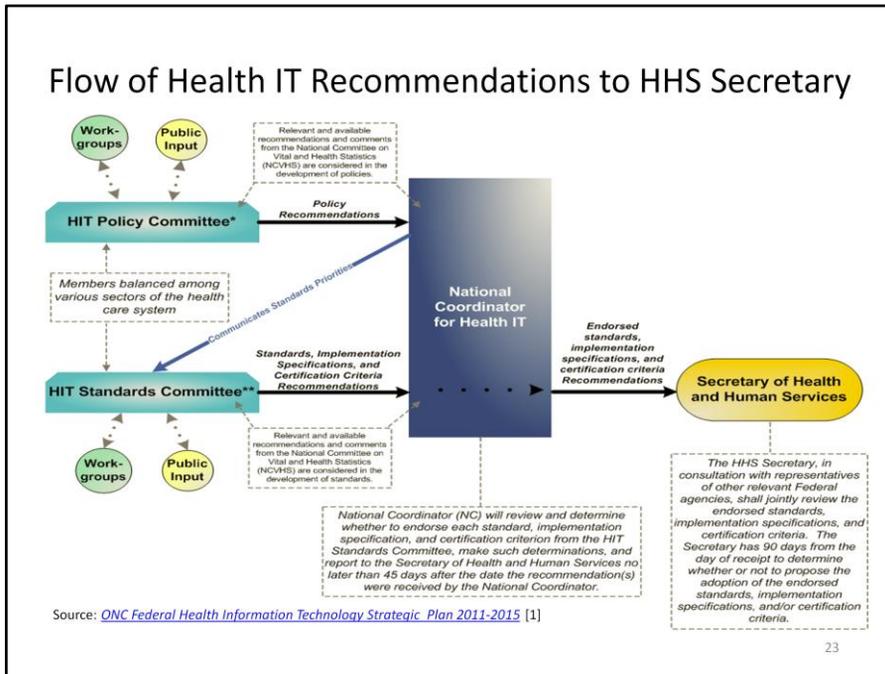
Goal V, “Achieve Rapid Learning and Technological Advancement,” focuses on demonstrating ways health IT and meaningful use can enable innovation and appropriate use of health information to improve knowledge about health care across populations. In the long run, the government is pursuing a vision of a “learning health system,” in which a vast array of health care data can be appropriately aggregated, analyzed, and leveraged using real-time algorithms and functions.

Health IT Federal Advisory Committees [1]

- The Recovery Act established two major Health IT Federal Advisory Committees
 - Health IT Policy Committee
 - Makes recommendations to the ONC on policies for the development and adoption of a nationwide health information infrastructure
 - Health IT Standards Committee
 - Makes recommendations to the ONC on standards, implementation specifications, and certification criteria for the electronic exchange and use of health information
- Both Federal Advisory Committees have established several workgroups that meet periodically and make recommendations to their parent committees to pass to the ONC
- Membership in the committees represents a broad range of stakeholders from government, academia, and the private sector
- As an example of the work of the Health IT committees, the Health IT Policy Committee approved recommendations on an EHR security policy framework at its December 7, 2011, meeting

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[1] The Health IT Committees operate under the rules of the Federal Advisory Committee Act, which became law in 1972.



[1] *ONC Federal Health Information Technology Strategic Plan 2011 – 2015*; ONC, Appendix C;

<http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_0_4318_1211_15583_43/http%3B/wci-pubcontent/publish/onc/public_communities/f_j/onc_website__home/fed_health_strategic_plan/fed_health_it_strategic_plan_home_portlet/files/final_federal_health_it_strategic_plan_0911.pdf>

Recent Relevant Regulations

- Medicare and Medicaid Programs: Electronic Health Record Incentive Programs Final Rule [1]
 - This rule implements the Recovery Act provisions that provide incentive payments to eligible professionals and eligible hospitals that adopt and use certified EHR technology in a meaningful way. The programs seek to help improve care, efficiency, and population health. This rule also specifies the initial criteria that eligible providers must meet to qualify for the Medicare and Medicaid EHR incentive payments, and it includes other incentive programs participation requirements.
- Health Information Technology: Initial Set of Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology Final Rule [2]
 - Under this rule, the HHS Secretary has adopted the initial set of standards, implementation specifications, and certification criteria that are required for the certification of EHR technology. The rule has been aligned to support the achievement of meaningful use stage 1 by eligible professionals and hospitals under the Medicare and Medicaid EHR Incentive Programs.
- Permanent Certification Program for Health Information Technology Final Rule [3]
 - This final rule establishes a permanent certification program for the purpose of certifying health IT. This final rule is issued pursuant to the authority granted to the National Coordinator for Health Information Technology (ONC) by the HITECH Act. The ONC will use the permanent certification program to authorize qualified organizations to certify certain types of EHR technology, such as Complete EHRs and/or EHR Modules. The permanent certification program could also be expanded to include the certification of other types of health IT.

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[1] Federal Register, Part II, Department of Health and Human Services, Centers for Medicare & Medicaid Services, 42 CFR Parts 412, 413, 422 et al.;
< <http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf>>.

[2] Federal Register, Part III, Department of Health and Human Services, 45 CFR Part 170;
< <http://edocket.access.gpo.gov/2010/pdf/2010-17210.pdf>>.

[3] Federal Register, Department of Health and Human Services, 45 CFR Part 170, RIN 0991-AB59;
< <http://origin.www.gpo.gov/fdsys/pkg/FR-2011-01-07/pdf/2010-33174.pdf>>.

Progress in EHR Adoption

- Historically significant barriers to adoption and use of EHR to exchange information included:
 - Cost and perceived lack of financial return for investing in them
 - Low provider demand
 - Technical and logistical challenges involved in installing, maintaining, and updating
- The Recovery Act instantiated the Medicare and Medicaid EHR Incentive Programs [1] under the Centers for Medicare & Medicaid Services for adoption and “meaningful use” of EHRs [2, 3]:
 - Incentive payments of up to \$44,000/physician over 5 years for Medicare providers
 - Incentive payments of up to \$63,750/physician over 6 years for Medicaid providers
 - Similar incentives are available to eligible hospitals, starting at \$2M
- The number of physicians and hospitals registered for involvement has exceeded expectations (see following slide for graph)

EHR Incentive Programs and the Recovery Act payment reforms are attracting the cooperation of the medical profession in collection and use of health care data.

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[1] As of November 2011, over 157,000 eligible professionals and hospitals have registered for the Medicare and Medicaid Electronic Health Record (EHR) Incentive Programs; <http://www.cms.gov/EHRIncentivePrograms/Downloads/Monthly_Payment_Registration_Report_Updated.pdf>.

In order to attest, successfully demonstrate meaningful use, and receive an incentive payment under the Medicare EHR Incentive Program, eligible hospitals must indicate that they agree with several attestation statements.

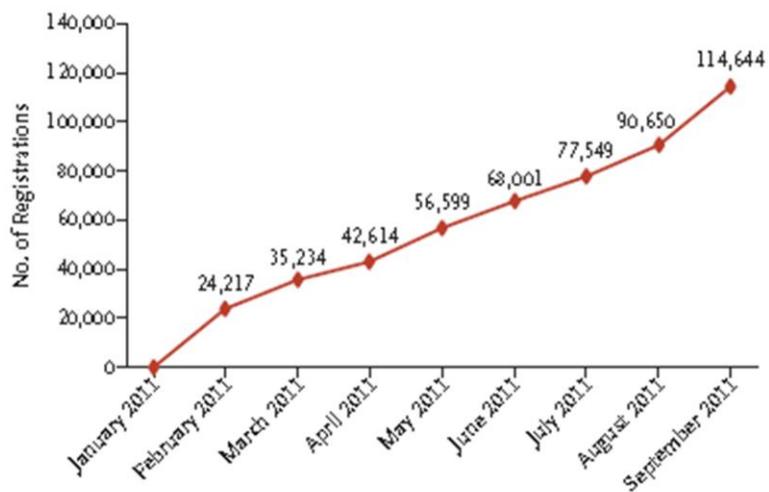
Eligible hospitals must agree that the information submitted:

- is accurate to the knowledge and belief of the hospital or the person submitting on behalf of the hospital.
- is accurate and complete for numerators, denominators, exclusions, and measures applicable to the hospital.
- includes information on all patients to whom the measure applies.
- for clinical quality measures (CQMs), was generated as output from an identified certified EHR technology.

[2] *Medicare and Medicaid Programs; Electronic Health Record Incentive Program; Final Rule*, <<http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf>>.

[3] See timeline in backup slides.

Provider Registrations for Meaningful-Use Payments [1]



Source: [Implementation of the Federal Health Information Technology Initiative: Part Two of Two](#), NEJM

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[1] *Implementation of the Federal Health Information Technology Initiative: Part Two of Two*, David Blumenthal, NEJM 365, 25 (December 22, 2011); <http://www.nejm.org/doi/pdf/10.1056/NEJMSr1112158>.

CMS “Meaningful Use” Stage 1 (2011-2012) Objectives [1]

- Core Set of 15 Objectives
 1. Record patient demographics
 2. Record vital signs and chart changes
 3. Maintain up-to-date problem list of current and active diagnoses
 4. Maintain active medication list
 5. Maintain active medication allergy list
 6. Record smoking status for patients 13 years of age or older
 7. For individual professionals, provide patients with clinical summaries for each office visit; for hospitals, provide an electronic copy of hospital discharge instructions on request
 8. On request, provide patients with an electronic copy of their health information
 9. Generate and transmit permissible prescriptions electronically (does not apply to hospitals)
 10. Computer provider order entry for medication orders
 11. Implement drug–drug and drug–allergy interaction checks
 12. Implement capability to electronically exchange key clinical information among providers and patient-authorized entities
 13. Implement one clinical decision support rule and ability to track compliance with the rule
 14. Implement systems to protect privacy and security of patient data in the EHR
 15. Report clinical quality measures to CMS or states

- Plus Menu Set of 10 Objectives (5 of which must be met) [2]

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[1] References:

The Centers for Medicare and Medicaid Services (CMS) Meaningful Use Final Rule specifies minimal thresholds for the objectives. For example, the threshold for Objective 9 is that over 40% of prescriptions are transmitted electronically using certified EHR technology.

Medicare and Medicaid Programs; Electronic Health Record Incentive Program; Final Rule; <<http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf>>.

The ‘Meaningful Use’ Regulation for Electronic Health Records, Blumenthal, D., and M. Tavenner, *New England Journal of Medicine* (5 August 2010).

Do it Yourself Presentation on the Meaningful Use Final Rule, Halamka, J., <<http://geekdoctor.blogspot.com/2010/07/do-it-yourself-presentation-on.html>>.

[2] Menu Set of Objectives (5 of 10 must be met at specified threshold level to qualify for incentive payments):

- Implement drug formulary checks
- Incorporate clinical laboratory test results into EHRs as structured data
- Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, or outreach
- Use EHR technology to identify patient-specific education resources and provide those to the patient as appropriate
- Perform medication reconciliation between care settings
- Provide summary of care record for patients referred or transitioned to another provider or setting
- Submit electronic immunization data to immunization registries or immunization information systems
- Submit electronic syndromic surveillance data to public health agencies
- Record advance directives for patients 65 years of age or older (*applies to hospitals*)
- Submit electronic data on reportable laboratory results to public health agencies (*applies to hospitals*)
- Send reminders to patients (per patient preference) for preventive and follow-up care (*applies to eligible professionals*)
- Provide patients with timely electronic access to their health information (*applies to eligible professionals*)

ONC Initial Set of Standards for EHRs (as specified in Final Rule of 28 July 2010 [1, 2])

- Content exchange standards
 - Content of patient summary record, electronic prescription, electronic submission of lab results to public health agencies, electronic submission to public health agencies, electronic submission to immunization registries, and quality reporting
- Vocabulary standards
 - Code sets/terminology/nomenclature for clinical problems, procedures, lab test results, medications, immunizations, and race and ethnicity
- Privacy and security standards
 - Encryption algorithms, hash algorithms, in-transit encryption and integrity protection, and logging of accesses (including creates, writes, reads, deletes) to health information, logging of disclosures

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[1] *Health Information Technology: Initial Set of Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology; Final Rule*; <<http://edocket.access.gpo.gov/2010/pdf/2010-17210.pdf>>.

[2] ONC considered specifying transport standards, but backed off due in part to controversy over SOAP vs. REST protocols.

Content Exchange Standards [1]

- Patient summary record
 - Health Level Seven (HL7) Clinical Document Architecture (CDA) Release 2, Continuity of Care Document (CCD)
 - Or ASTM Continuity of Care Record (CCR)
- Electronic prescribing
 - National Council for the Prescription Drug Programs (NCPDP) SCRIPT, Version 8.1
 - Or NCPDP SCRIPT, Version 10.6.
- Electronic submission of lab results to public health agencies
 - HL7 2.5.1
- Electronic submission to public health agencies for surveillance or reporting
 - HL7 2.3.1
 - Or HL7 2.5.1
- Electronic submission to immunization registries
 - HL7 2.3.1
 - Or HL7 2.5.1
- Quality reporting
 - CMS Physician Quality Reporting Initiative 2009 Registry XML Specification

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[1] Source: *Health Information Technology: Initial Set of Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology; Final Rule*; <<http://edocket.access.gpo.gov/2010/pdf/2010-17210.pdf>> .

Vocabulary Standards [1]

- Problems
 - International Classification of Diseases, 9th Edition, Clinical Modification (ICD9-CM)
 - International Health Terminology Standards Development Organization Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) July 2009 version
- Procedures
 - ICD9-CM
 - Health Care Financing Administration Common Procedure Coding System , as maintained and distributed by HHS, and Current Procedural Terminology, Fourth Edition, as maintained and distributed by the American Medical Association
- Laboratory test results
 - Logical Observation Identifiers Names and Codes (LOINC) version 2.27
- Medications
 - Any source vocabulary that is included in RxNorm
- Immunizations
 - HL7 Standard Code Set CVX - Vaccines Administered, July 30, 2009, version
- Race and Ethnicity
 - Office of Management and Budget Standards for Maintaining, Collecting, and Presenting Federal Data on Race and Ethnicity, Statistical Policy Directive No. 15, October 30, 1997

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[1] Source: *Health Information Technology: Initial Set of Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology; Final Rule*; <<http://edocket.access.gpo.gov/2010/pdf/2010-17210.pdf>>.

Privacy and Security Standards [1]

- Encryption and decryption of electronic health information
 - General: Any encryption algorithm identified by the National Institute of Standards and Technology (NIST) as an approved security function in Annex A of the Federal Information Processing Standards (FIPS) Publication 140-2
 - Exchange: Any encrypted and integrity protected link
- Record actions related to electronic health information
 - The date, time, patient identification, and user identification must be recorded when electronic health information is created, modified, accessed, or deleted; and an indication of which action(s) occurred and by whom must also be recorded
- Verification that electronic health information has not been altered in transit
 - A hashing algorithm with a security strength equal to or greater than secure hash algorithm SHA-1 as specified by the National Institute of Standards and Technology (NIST) in FIPS Publication 180-3 (October 2008)) must be used to verify that electronic health information has not been altered
- Record treatment, payment, and health care operations disclosures
 - The date, time, patient identification, user identification, and a description of the disclosure must be recorded for disclosures for treatment, payment, and health care operations

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[1] Source: *Health Information Technology: Initial Set of Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology; Final Rule*; <<http://edocket.access.gpo.gov/2010/pdf/2010-17210.pdf>>.

Health Information Technology Initiative: Outline

- Introduction
- Federal Supported Activities
- **Nationwide Health Information Network (NHIN)**
- Automated Data Entry
- Summary & Conclusions

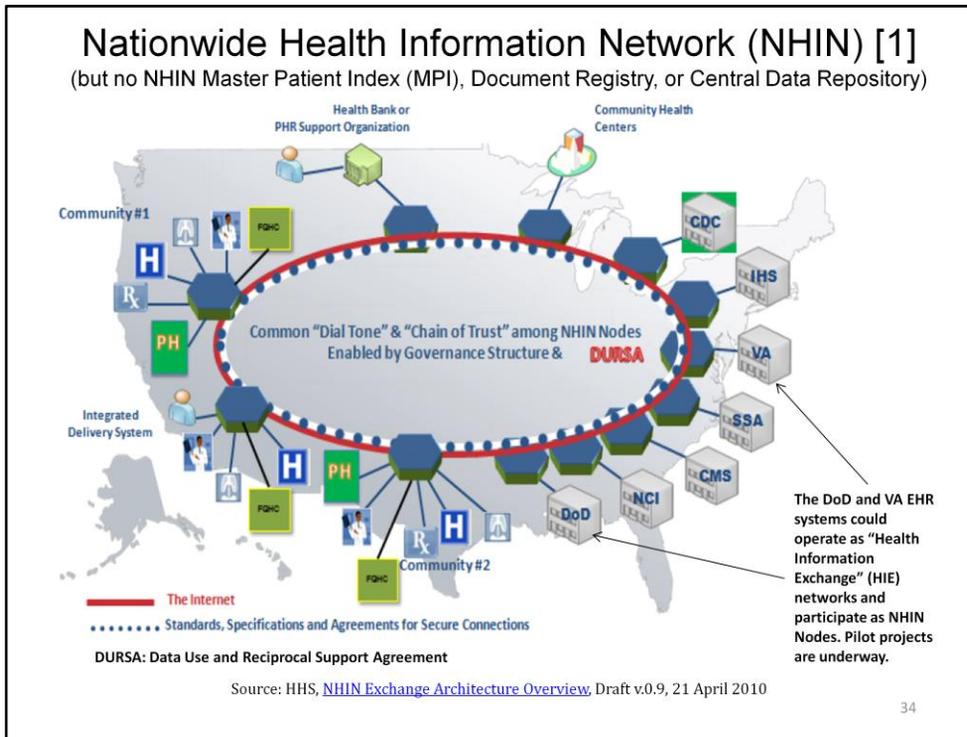
Nationwide Health Information Network [1]

- The Nationwide Health Information Network (NHIN) is a collection of standards, protocols, legal agreements, specifications, and services that enables the secure exchange of health information over the internet [2]
 - ONC guides the technical and policy development of the NHIN
 - The NHIN Exchange, a confederation of trusted entities, bound by mission and governance to securely exchange health information leads in exchanging data based on early NHIN specifications
 - The Direct Project develops standards and services required to enable secure, directed health information exchange at a more local and less complex level among trusted providers in support of stage 1 Meaningful Use incentive requirements
 - CONNECT is a free, open source software solution that supports health information exchange – both locally and at the national level, using NHIN to make sure that health information exchanges are compatible with other exchanges being set up throughout the country

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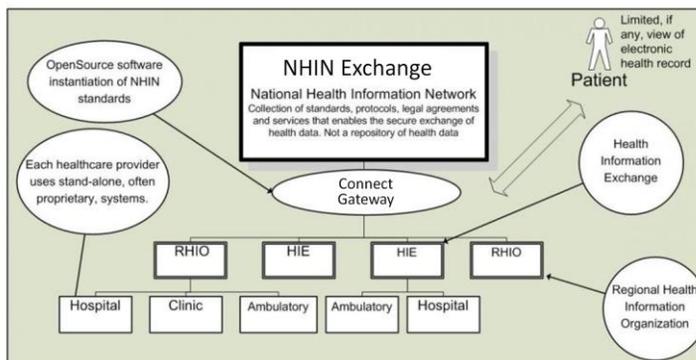
[1] Source: *The Nationwide Health Information Network, Direct Project, and CONNECT Software*; <<http://healthit.hhs.gov/portal/server.pt?open=512&mode=2&objID=3340>>.

[2] Notably, the NHIN is not a collection of physical components such as links, routers, and data servers. The understanding of what is the NHIN has been evolving since its earliest definitions. It initially was a “network,” then a “network of networks.” Now it’s well understand that NHIN is a collection of standards and agreements that enable the various nodes to share health data.



[1] Figure is modified and annotated from: *NHIN Exchange Architecture Overview*, Draft v.0.9, HHS (21 April 2010);
 <http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_11113_911643_0_0_18/NHIN_Architecture_Overview_Draft_20100421.pdf>.

The original NHIN vision has evolved into two visions—the original NHIN Exchange vision, shown below [1], and ...



Source: Gershater, J., [Health Internet vs NHIN: in pictures](http://thehealthitblog.com/2009/12/02/health-internet-vs-nhin-in-pictures), 2 December 2009

In NHIN Exchange, individual hospital and clinics share data through:
 1) an NHIN Connect Gateway (which implements the heavyweight set of NHIN standards for patient discovery, document sharing, etc. [2]) and
 2) participation in an NHIN Node (e.g., an RHIO or HIE).

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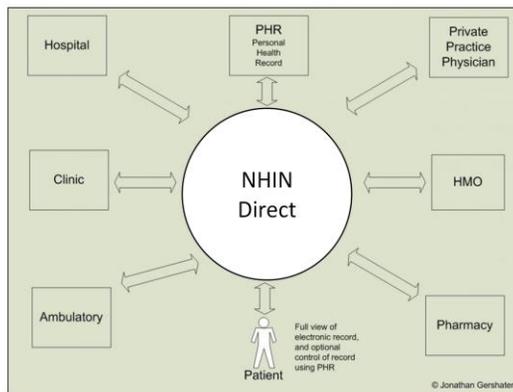
[1] Source: Gershater, J., *Health Internet vs NHIN: in pictures*, 2 December 2009; <<http://thehealthitblog.com/2009/12/02/health-internet-vs-nhin-in-pictures>>.

An RHIO or HIE always has a Master Patient (MPI) and a clinical document registry (index). It may also have a central data repository holding clinical documents. However, it may alternatively have a distributed data repository. In this case, clinical documents are stored locally at individual hospitals or clinics, and the RHIO/HIE document registry provides links to the documents.

NHIN Exchange is a decentralized architecture—having no MPI, no document registry, and no central data repository—but instead relying on a heavyweight set of patient discovery and document sharing standards, including content, vocabulary, transport, and security/privacy standards.

[2] See the list of NHIN specifications in the backup slides.

A recent complementary vision, intended for near-term application, known as NHIN Direct [1]



Source: Gershater, J., [Health Internet vs NHIN: in pictures](http://thehealthitblog.com/2009/12/02/health-internet-vs-nhin-in-pictures), 2 December 2009

In NHIN Direct, an individual provider or patient pushes data directly to another known and trusted NHIN Direct participant using common Internet protocols such as SMTP/SMIME (for secure signed and encrypted email).

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[1] Source: Gershater, J., *Health Internet vs NHIN: in pictures*, 2 December 2009; <http://thehealthitblog.com/2009/12/02/health-internet-vs-nhin-in-pictures>.

NHIN Direct addresses only transport and security/privacy (not content and vocabulary) standards. It supports secure transport (push) of health data to a known and trusted recipient. It can be viewed as a replacement of fax.

NHIN Challenges

- Patient identity [1]
 - Federal law prohibits national patient ID
 - Lack of national patient ID means that probabilistic patient matching must be done, leading to false negatives (not all patient data is found) and false positives (another patient's data becomes associated with a patient); error rate tends to rise as patient population increases
 - Lack of national patient ID represents a health data sharing risk, in terms of privacy (false positives), quality of care and patient safety (false negatives and false positives), cost (administrative burden, duplicative/unnecessary procedures)
 - Recent studies have argued for a national patient ID [2, 3, 4]
 - Recent President's Advisory Council on Science and Technology (PCAST) Report on Health IT does not consider lack of national patient ID a risk [5]

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[1] *Future of Patient Identification*, Fernandes, Lorraine, and O'Connor, Michele; Journal of AHIMA , Vol. 77-1, Page 36-40 (January 2006).

[2] *Identity Crisis: An Examination of the Costs and Benefits of a Unique Patient Identifier for the U.S. Health Care System*, RAND (2008).

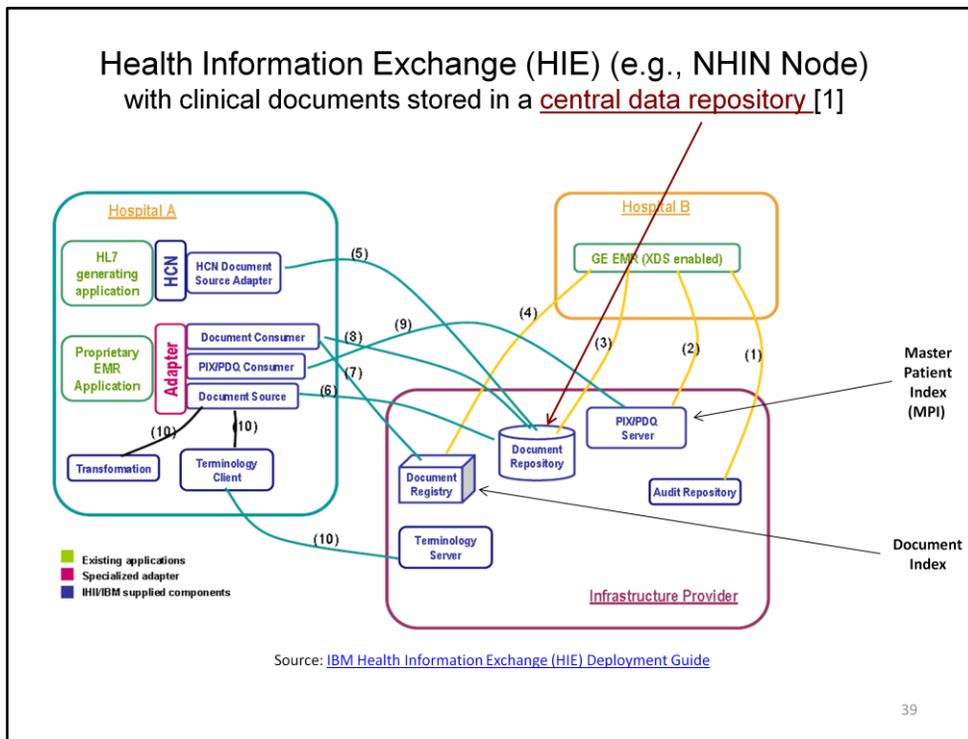
[3] *Patient Identity Integrity*, Health Information and Management Systems Society (HIMSS) (December, 2009).

[4] *HIMSS Comments on the President's Advisory Council on Science and Technology (PCAST) Report on Health IT*, HIMSS (19 January 2011).

[5] *Report to the President Realizing the Full Potential of Health Information Technology to Improve Healthcare for Americans: The Path Forward*, President's Advisory Council on Science and Technology (PCAST) (December 2010); <<http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-health-it-report.pdf>>.

NHIN Challenges (continued)

- Continued Standards Development
 - Content
 - Vocabulary
 - Transport
 - Security/privacy
- Health Information Exchange (HIE) implementation
 - Master Patient Index (MPI)
 - Should data repository be centralized or distributed?
- Role of Personally Controlled Health Record (PCHR)
 - Should EHR follow patient, or be tied to “primary” health provider or HIE?



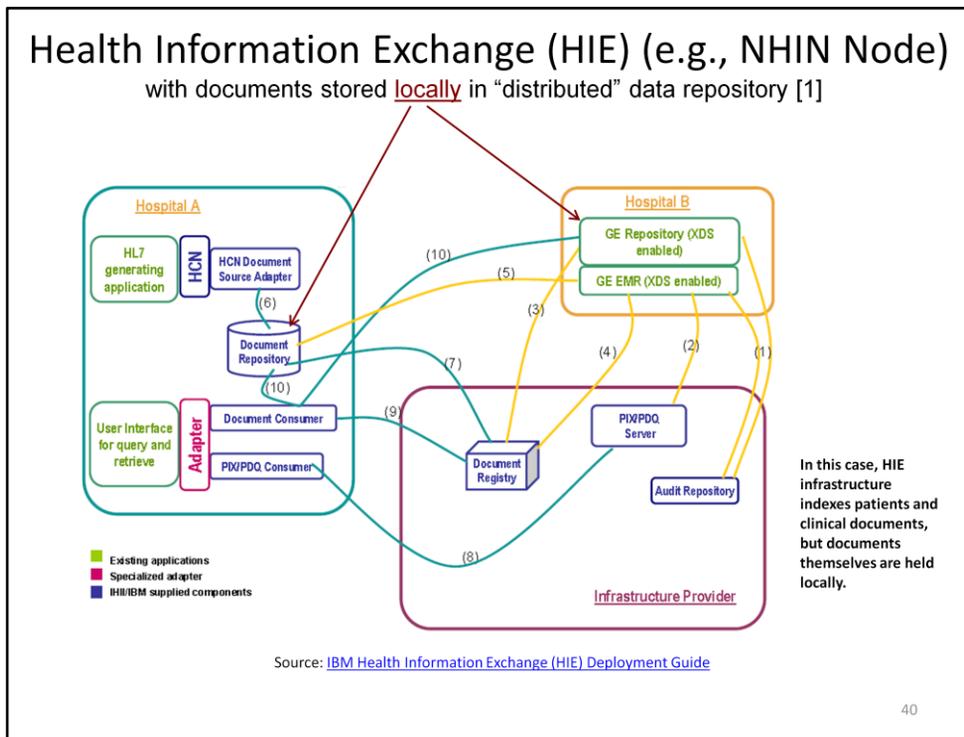
[1] Source of illustration and text: Witting, K., et al., *Deployment Guide: Setting up an XDS Affinity Domain* [equivalent to Regional Health Information Organization (RHIO) or, as it is now known, Health Information Exchange (HIE)] using IHII [Interoperable Healthcare Information Infrastructure] components, IBM Healthcare and Life Sciences (16 June 2006); < http://www.research.ibm.com/jam/IHII_DeploymentGuide.pdf>.

Hospital B has a GE EMR system which is already enabled for XDS [Cross-Enterprise Clinical Data Sharing]. The GE system will only need to be configured to communicate with the components supplied by the infrastructure provider: (1) the GE system will audit all protected health information operations to the audit repository supplied by the infrastructure, (2) the GE system will use the PIX/PDQ [Patient Identifier Cross-referencing/Patient Demographics Query] Server provided by the infrastructure to get patient ids, (3) the GE system will submit and retrieve documents from the Document Repository supplied by the infrastructure, (4) the GE system will query the Document Registry supplied by the infrastructure.

Hospital A uses applications which are not enabled for XDS transactions. Two mechanisms are used at this hospital to communicate with the infrastructure:

- HCN [Healthcare Collaborative Network] will be used to receive HL7 messages and generate CDA R2 documents. The HCN Document Source Adapter will submit those documents to the infrastructure provided repository (5).
- A proprietary EMR application will be enabled for XDS transactions by writing a custom adapter. The adapter will interact with the application and the IHII provided client side components to submit (6), query (7) and retrieve (8) documents. As part of those transactions the adapter will use the PIX/PDQ Consumer to resolve the patient id (9). As part of document submission the Document Source will make use of Transformation to extract metadata from the document and Terminology Client to convert terminology to the XDS Affinity Domain defined terminology (10).

Hospital A also audits all protected health information operations to the audit repository, these connections are not shown on the diagram.



[1] Source of illustration and text: Witting, K., et al., *Deployment Guide: Setting up an XDS Affinity Domain* [equivalent to Regional Health Information Organization (RHIO) or, as it is now known, Health Information Exchange (HIE)] using IHII [Interoperable Healthcare Information Infrastructure] components, IBM Healthcare and Life Science (16 June 2006); http://www.research.ibm.com/jam/IHII_DeploymentGuide.pdf.

Hospital B has GE systems which are enabled for XDS and provide document creation, storage and retrieval. The system is a document repository. The GE system will only need to be configured to communicate with the components supplied by the infrastructure provider: (1) the GE system will audit all protected health information operations to the audit repository supplied by the infrastructure, (2) the GE system will use the PIX/PDQ Server provided by the infrastructure to get patient ids, (3) the GE repository system will register documents stored in its local repository with the Document Registry supplied by the infrastructure, (4) the GE system will query the Document Registry supplied by the infrastructure, (5) the GE system will retrieve documents from wherever the Document Registry element indicates they are located, for example, Hospital A’s repository.

Hospital A is a simplified version of the previous example. It generates documents using HCN and the HCN Document Source Adapter. The documents are saved in the local repository (6) and registered with the infrastructure provided registry (7). A user interface is enabled for XDS to query and retrieve documents. It uses the PIX/PDQ Consumer to identify patients by querying the PIX/PDQ Server (8). The Document Consumer queries the infrastructure provided Document Registry (9) and retrieves documents from the two local repositories (10).

As in the previous example, Hospital A also audits all protected health information operations to the audit repository, these connections are not shown on the diagram.

Health Information Technology Initiative: Outline

- Introduction
- Federal Supported Activities
- Nationwide Health Information Network (NHIN)
- **Automated Data Entry**
- Summary & Conclusions

The Data Entry Problem

- The medical profession has been one of the slowest groups in taking advantage of modern IT to facilitate their activities
 - Many physicians still operate as independent entrepreneurs, without the culture and wherewithal to instantiate an IT infrastructure
 - Hospital groups tend to do better within their own group
 - These have the personnel and financial capability to instantiate a modern IT infrastructure
 - But the applications tend to be focused on management and financial functions
 - Consequently most patient/physician interactions are recorded by hand
- Outside of a single physician group office or a hospital group, there is no way to construct a complete patient file
- Also, the multiplicity of actions required in a single group office tends not to be integrated for a single patient; consequently [1]
 - The Medical Coding Data is entered by hand
 - Suggested post-visit behavior is transmitted verbally and (probably not) documented
 - Prescriptions are written by hand
 - Billing is conducted by hand on yet a separate IT system
- When the visit claims appears in the insurance company, all data once again is entered into yet a different data base
- All this results in unnecessary wasted time and effort and is error prone

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[1] Consider another example of the “balkanization” of medical information for a single patient entering an emergency room (ER) in a hospital, with the following encounters, each associated with an independent IT system, mostly incompatible with all the others:

- Emergency department information system (EDIS)
- Pre-hospital care (ambulance) documentation system
- Hospital ADT (admission/discharge/transfer) system
- Computerized clinical laboratory system
- Electronic data management (medical records) imaging system
- Hospital pharmacy system
- Vital-signs monitoring system
- Hospital radiology ordering system
- Picture archiving storage (PACS) systems

Extracted from: *Computers in Patient Care: The promise and the Challenge*, Stephen V. Cantrill; Communications of the ACM, Vol. 53 No. 9, pages 42-47 (2010).

Progress on Data Entry

- The several funded incentives programs in the Recovery & HITECH Acts are driving adoption of EHR with support for health IT education and research and development
 - These include incentives for development of tools for automatic EHR data entry
 - Incentives for the development of voice recognition tools are explicitly listed
- Some medical specialties, e.g., diagnostic radiology, are already well positioned to enter their data into an EHR, since
 - Most of their diagnostic tools, e.g., classic X-rays, CTs and MRIs, produce digitized data
 - Direct patient interaction is minimal
 - Their “clients” are other clinicians
 - Health IT tools are already available enabling a totally digital data environment
- Progress is ongoing to digitize and format data from monitors and other diagnostic tools used in most other medical specialties, facilitating the entry of that data into EHRs

Notional Medical Workflow for Diagnostic Radiology

- Leaving aside processes involved in decisions to order a particular high-tech diagnostic imaging engagement for a patient, including whether the patient:
 - Meets best clinical care guidelines
 - Meets reimbursement guidelines
- The workflow process is well organized to generate a totally digital EHR dataset
 - Technician performs necessary tasks for imaging tool to gather (digital data) image(s)
 - Radiologist examines image(s) and at that time develops (speaks) diagnostic report
 - Simultaneously, speech recognition tools generate a text version of the report
 - The spoken report record is digitized and is maintained as the official report
 - (If appropriate, a medical transcriptionist checks and corrects the text version against the spoken version; unresolved issues are brought to the radiologist's attention)
 - This could be done in close to real time
 - Both the digitized official report and the converted text report, along with the digital image data are sent to the originating clinician
- The three components of the radiology record are entered into the patient's EHR
 - This may happen only after verification that the text and official records match

This process could be a model for numerous other medical specialties

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Instantiating Radiology Workflow

- Medical imaging tools amenable to the radiology workflow
 - X-ray based, including
 - Projection radiography (the normal “X-ray”)
 - Fluoroscopy
 - Computed tomography (CT)
 - Nuclear medicine, including
 - Scintigraphy; 2D gamma-ray images
 - SPECT; 3D tomographic gamma-ray images
 - Positron emission tomography (PET)
 - Magnetic resonance imaging (MRI); no radiation involved
 - Ultrasound
 - Simple modes
 - Doppler mode
 - 3D created from multiple 2D scans
- Non-imaging medical diagnostic tools, producing maps or graphs
 - Electrocardiograph (EKG)
 - Electroencephalograph (EEG)
 - Magnetoencephalograph (MEG)

Speech Recognition Tools in all Medical Specialties

- With the maturation of speech recognition tools, it should become possible to document all (currently handwritten) patient records using this technology [1, 2]
- Following the early support for the radiologists, the same approach can be used by most clinicians in direct contact with their patients
- As proposed with the radiologists, the digitized spoken record is the official record
 - An associated automatically generated text document is also generated
 - The text document may be checked by a medical transcriptionist if appropriate
- Speech recognition should decrease the clinician's documentation time burden
- Some clinicians may not be willing to make the required transformation
 - With time, the number of such individuals will decrease
- With basic clinician/patient interaction documented electronically, an important part of the patient's medical record will be available as part of the EHR
 - There is still the issue of standards for the format of this record to be resolved
- A major transition problem is the non-availability of legacy, handwritten medical records
 - For a long time, these will have to be handled as in the past

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[1] *Speech Recognition Technology: An Outlook for Human-to-Machine Interaction*, Tim Erdel and Steve Crooks, *Journal of Healthcare Information Management, Healthcare Information and Management Systems Society and Jossey-Bass, Inc.*; V 14, no. 2 (Summer 2000);
<<http://www.himss.org/content/files/jhim/14-2/him14203.pdf>>.

[2] See history of speech recognition technology in backup slides.

Natural Extensions to Speech Recognition

- Use of speech recognition opens the opportunity to make diagnostic and pharmaceutical knowledge-based tools available to the clinician, while he or she is still in contact with the patient
 - The same platform that makes available the speech recognition software can also serve as a portal to the appropriate tools and databases to assist the clinician in diagnosis and prescription decisions
- Currently pharmacists play an important role in identifying adverse drug-drug interactions (DDI)
 - Bringing that capability to the physician during direct interaction with the patient and a complete patient EHR should substantially decrease the occurrence of bad DDIs
- Recently, WellPoint, in association with IBM, announced a program to develop a Watson-based knowledge facility to help improve patient care through the delivery of up-to-date, evidence-based health care [1]
 - Watson uses an analytic technique that analyzes natural language, identifies relevant sources from a very large data repository, generates relevant hypotheses, scores the evidence, and merges and ranks the hypotheses which it presents to the clinician
 - With time, Watson technology could be quite successful in achieving better diagnoses
- More generally, with the portal at their finger tips, large numbers of medical providers will be able to access clinical decision support and other applications as software as a service (SaaS) tools in the “Cloud”

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[1] *WellPoint and IBM Announce Agreement to Put Watson to Work in Health Care*, IBM News Release (September 12, 2011);
< <http://www-03.ibm.com/press/us/en/pressrelease/35402.wss>>.

Monitors and Other Medical Tools

- Before the digital revolution, most medical monitoring instruments were analog
 - Results were typically displayed on a cathode ray tube (CRT)
 - The digital revolution made possible the digital signal processing (DSP) chip capable of digitizing and further analyzing the signal, resulting in more powerful digital versions of these tools
 - Some of these digital tools, e.g., the EKG, are now able to make diagnostic analyses of the physiological signals and to assign the appropriate diagnostic code
 - Some are even capable of transmitting the digitized data to a network for entry into an EHR, using the HL7 standard
- The various monitors for hospital, office, or home use can be classified as [1]
 - Handheld
 - Monitor/Defibrillator
 - Networkable/non-networkable
 - Mains powered or mains + battery
 - Portable
 - Tabletop
 - Wired/Wireless data transmission
- At the present time, most of these, although digital, are standalone and not yet designed to interface with a network and transmit the data into an EHR
 - But this is in transition and a number of pilot projects and even some products now exist with the necessary capability

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[1] <http://en.wikipedia.org/wiki/Medical_monitor>

Medical Device Interoperability

- In 2008, the American Health Information Community (AHIC) identified gaps in achieving a successful EHR, indicating the need for “common device connectivity” [1]
 - The SHARP program has identified the Massachusetts General Hospital, which is developing a Prototype Healthcare Intranet to fill this gap, as an NIH Affiliate
- The Prototype Healthcare Intranet is developing technology, software, standards, and tools to provide higher quality patient data by enabling medical device manufacturers to create products that will interoperate with other manufacturers’ devices, EHRs, and Health IT systems
- Massachusetts General Hospital has established a not-for-profit consortium of medical, academic, and supplier organizations—the Medical Device Plug-and-Play (MDPnP) Interoperability Program— to develop the Prototype Healthcare Intranet [2]
 - The program was awarded a 5-year \$10M grant in October 2010 by NIH
 - DoD, NSF, and NIST support the program
- Medical device interoperability will facilitate the use of in-home mobile and wireless devices to monitor patients in their normal environments gathering vital clinical data in real time [3]

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[1] *Common Device Connectivity AHIC Extension/Gap*, ONC, Department of Health and Human Service (December 31, 2008).

[2] <<http://mdpnp.org>>

[3] Dr. Alan D. Snell, Chief Medical Information Officer, St. Vincent’s Health, quoted in *Computer*, Vol. 43, No. 7 (July 2010).

Health Information Technology Initiative: Outline

- Introduction
- Federal Supported Activities
- Nationwide Health Information Network (NHIN)
- Automated Data Entry
- **Summary & Conclusions**

Summary of Health IT Status

- Cost of health care in the U.S. has been rising very rapidly
 - Efforts to bring these costs under control have made little headway over the last 20+ years
- Reasons for failure are due to the multifaceted attributes of the matter
 - Health care practices are very diverse
 - Large investments are required to make the necessary transformations
 - Many independent stakeholders
 - Existing IT systems and tools are not interoperable; not even transformable
 - No one clearly in charge
- Consequently much effort, but little progress until recently
- Recent changes make it possible, with strong leadership, to make progress
 - Recent legislation, accompanied by robust funding, established an organizational structure matched to the difficulty of the job
 - Strong executive leadership with aggressive ideas is in place
 - IT capability is rapidly improving
 - Stakeholder understanding that the proposed changes will both reduce costs and improve the delivered health care is growing

Summary of Health IT Status (continued)

- Incentives designed to attract or rein in the several classes of stakeholders are in place and appear to be working
 - For the independent physician community, there are modest monetary incentives to begin participation in the nascent stages of a standard EHR construct
 - Similar incentives are in place to gain the involvement of the hospitals
 - IT providers must be certified if their products are to be used by the medical community
 - The medical research community, both professional and commercial sectors, has opportunities to gain funding for innovative new approaches to facilitating transformation
- Working groups have been established to:
 - Develop strategic plans, organize a governance structure, and develop appropriate policies
 - Recommend initiatives for certification of products and adoption of the developing capabilities
 - Develop standards for vocabulary, content exchange, privacy and security, and information transmission
- The ONC, who is responsible for many of these matters, continues to develop innovative approaches to encourage the whole community to embrace this transformation

Progress in achieving a useable EHR and a transformed health IT infrastructure for future efficiencies and improved health care is encouraging.

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Issues of Concern

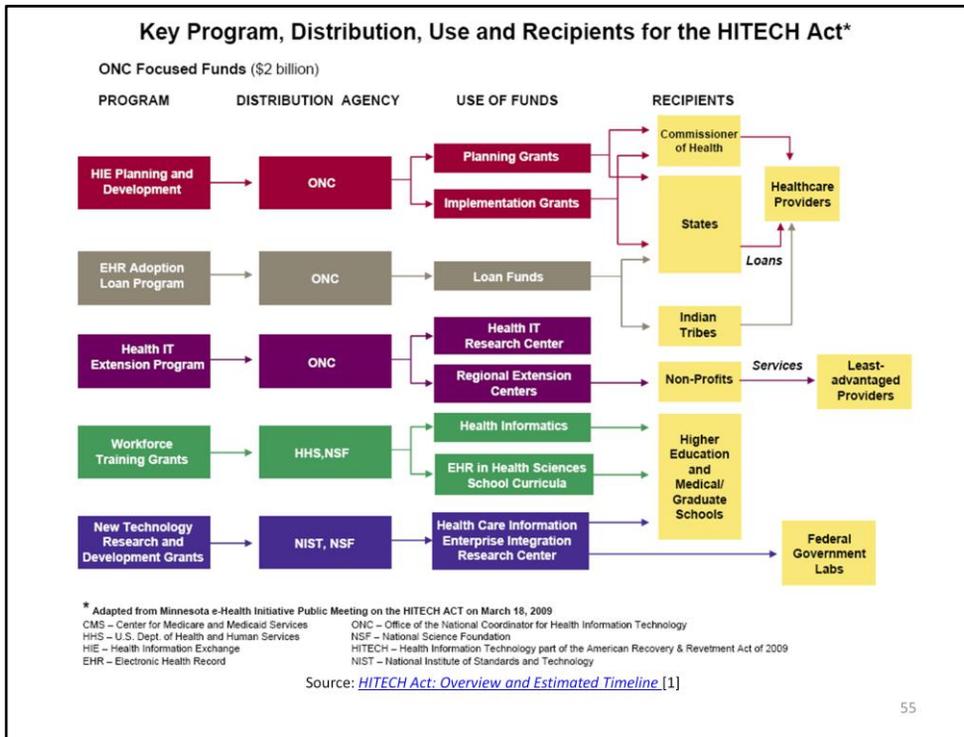
- Recent progress in achieving an EHR-based health care system is good
 - Current momentum must be maintained
- Most important is continued funding to support all the activities required for the transformation [1]
 - Substantive achievement of the goal will take at least another decade of actions
- Continued efforts that will be required include:
 - Evolving and instantiating the various required standards
 - Support of the required cultural changes in the medical community
 - Support of innovative approaches in concepts and in the development of hardware and software products to support the transformation
 - Changes in legislation and policies to support the transformation
- More difficult issues to be addressed and solved include:
 - Patient identity
 - Privacy and security
 - Transformation from legacy systems and processes to new approaches capable of supporting an EHR-based health care environment

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[1] A recent report indicates that federal health IT funding is predicted to grow in the near term. This must continue for at least 10 years for success. See: *Federal health IT market set to grow to \$6.5B by 2016*, Healthcare IT News (December 20, 2011); <<http://www.healthcareitnews.com/news/federal-health-it-market-set-grow-65b-2016>>.

Backup

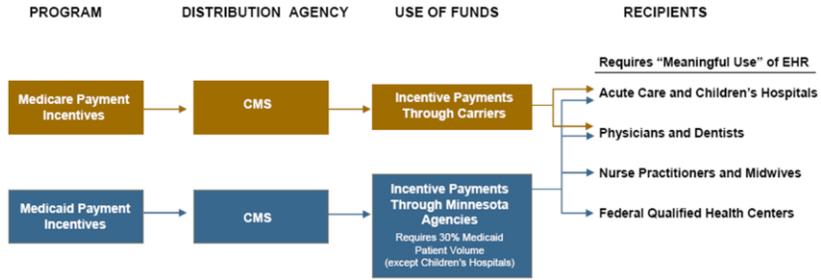
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[1] *HITECH Act: Overview and Estimated Timeline*;
 <https://www.mmigroup.com/PDF/HITECH_Act.pdf>

Key Program, Distribution, Use and Recipients for the HITECH Act*

CMS Funds (\$29 billion)



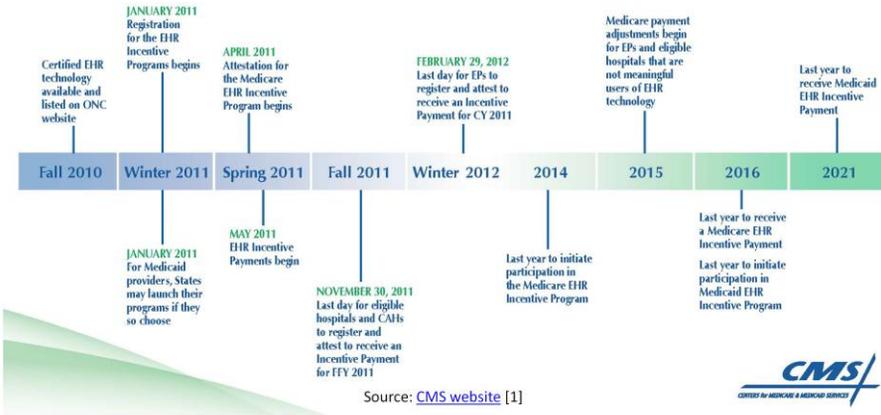
* Adapted from Minnesota e-Health Initiative Public Meeting on the HITECH ACT on March 18, 2009
 CMS – Center for Medicare and Medicaid Services ONC – Office of the National Coordinator for Health Information Technology
 HHS – U.S. Dept. of Health and Human Services NSF – National Science Foundation
 HIE – Health Information Exchange HITECH – Health Information Technology part of the American Recovery & Reinvestment Act of 2009
 EHR – Electronic Health Record NIST – National Institute of Standards and Technology

Source: [HITECH Act: Overview and Estimated Timeline](#) [1]

[1] *HITECH Act: Overview and Estimated Timeline*;
 <https://www.mmigroup.com/PDF/HITECH_Act.pdf>



CMS Medicare and Medicaid EHR Incentive Programs Milestone Timeline



[1]

<<http://www.cms.gov/EHRIncentivePrograms/Downloads/EHRIncentProgTimeline508V1.pdf>>

NHIN Specifications [1]

- Specifications Currently in Effect
 - Access Consent Policies Production Specification
 - Administrative Distribution Production Specification
 - Authorization Framework Production Specification
 - Document Submission Production Specification
 - Health Information Event Messaging Production Specification
 - Messaging Platform Production Specification
 - Patient Discovery Production Specification
 - Query for Documents Production Specification
 - Retrieve Documents Production Specification
 - Web Services Registry Production Specification

- Revised Specifications (Production Effective Date TBD)
 - Messaging Platform v3.0 approved by NHIN Technical Committee (NTC) on 6/27/2011
 - Patient Discovery v2.0 approved by NTC on 6/27/2011
 - Query for Documents v3.0 approved by NTC on 6/27/2011
 - Retrieve Documents v3.0 approved by NTC on 6/27/2011
 - Authorization Framework v3.0 approved by NTC on 7/25/2011
 - Web Services Registry v3.0 approved by NTC on 7/25/2011
 - ESMD XDR Production Specification
 - Administrative Distribution Production Specification
 - Document Submission Production Specification

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[1] *Nationwide Health Information Network (NHIN): Resources*; <http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__nhin_resources/1194>.

Current State of (Medical) Speech Recognition

- History
 - ~ 1952; First speech recognition tool
 - 1964; IBM shoebox demonstrated at New York World's Fair
 - 1982; First computer based commercial product by Covox
 - 1982; Dragon Systems founded [1]
 - 1990; First Dragon Systems useful product
 - 1997; "Dragon Naturally Speaking" product
 - 1998 – 2007; Increasingly capable versions of Naturally Speaking products deployed, including those with extensions to support legal and medical vocabularies
 - 2000 – 2005; Dragon Systems acquired and name changed, emerges as Nuance Communications, Inc.
 - 2008 – 2011; Versions 10 and 11 of Naturally Speaking deployed; finally accuracy now reaches 99%
- Speech recognition products are now available at a useful accuracy level

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[1] Although there is competition Dragon Naturally Speaking has the largest market share; it is arguably the most effective product on the market.

Acronyms

ADT	Admission/Discharge/Transfer	CHCS	Composite Health Care System	EDIS	Emergency Department Information System
AHIC	American Health Information Community	CHDR	Clinical Data Repository/Health Data Repository	EEG	Electroencephalograph
AHLTA	[DoD's EHR]	CMS	Centers for Medicare and Medicaid Services	EHR	Electronic Health Record
AHRQ	Agency for Healthcare Research and Quality	CPT	Current Procedural Terminology (codes)	EKG	Electrocardiograph
ARRA	American Recovery and Reinvestment Act	CRP	Central Research Project	EMR	Electronic Medical Record
ASTM	[an international standards organization]	CRT	Cathode Ray Tube	ER	Emergency Room
BHIE	Bidirectional Health Information Exchange	CT	Computed Tomography	ESMD	Electronic Submission of Medical Documentation
CCD	Continuity of Care Document	CVX	Vaccines Administered (HL7 Standard Code Set)	FACA	Federal Advisory Committee Act
CCR	Continuity of Care Record	DDI	Drug-Drug Interaction	FHIE	Federal Health Information Exchange
CDA	Clinical Data Architecture	DoD	Department of Defense	FIPS	Federal Information Processing Standard
CDC	Centers for Disease Control and Prevention	DSP	Digital Signal Processing	GAO	Government Accountability Office
CDR	Clinical Data Repository	DURSA	Data Use and Reciprocal Support Agreement	GDP	Gross Domestic Product
				GE	General Electric

Acronyms (continued)

GPO	Government Printing Office	ICD9-CM	International Classification of Diseases, 9th Edition, Clinical Modification	NAMCS	National Ambulatory Medical Care Survey
HCPCS	Healthcare Common Procedure Coding System	IDA	Institute for Defense Analyses	NCHS	National Center for Health Statistics
HCN	Healthcare Collaborative Network	IT	Information Technology	NCPDP	National Council for the Prescription Drug Program
HDR	Health Data Repository	ITSD	Information Technology and Systems Division	NEJM	New England Journal of Medicine
HHS	Department of Health and Human Services	JAL	James A. Lovell Federal Health Care Center	NHIN	Nationwide Health Information Network
HIE	Health Information Exchange	FHCC	James A. Lovell Federal Health Care Center	NIH	National Institutes of Health
HIPAA	Health Insurance Portability and Accountability Act	LOINC	Logical Observation Identifiers Names and Codes	NIST	National Institute of Standards and Technology
HIT	Health IT	MDPnP	Medical Device Plug-and-Play	NSF	National Science Foundation
HITECH	Health Information Technology for Economic and Clinical Health Act	MEG	Magnetoencephalograph	NTC	NHIN Technical Committee
HL7	Health Level 7	MHS	Military Health System		
		MPI	Master Patient Index		
		MRI	Magnetic resonance imaging		

Acronyms (continued)

OECD	Organisation for Economic Co-operation and Development	SaaS	Software as a Service	VistA	Veterans Health Information System and Technology Architecture
ONC	Office of the National Coordinator for Health IT	SHA	Secure Hash Algorithm	VLER	Virtual Lifetime Electronic Record
PACS	Picture Archiving and Communication system	SHARP	Strategic Health IT Advanced Research Project	XDR	Cross-Enterprise Document Reliable Interchange
PCAST	President's Advisory Council on Science and Technology	SMArt	Substitutable Medical Apps Reusable Technologies	XDS	Cross-Enterprise Clinical Data Sharing
PCHR	Personally Controlled Health Record	SNOMED	Systematized Nomenclature of Medicine Clinical Terms		
PET	Positron emission tomography	SOAP	Simple Object Access Protocol		
PIX/PDQ	Patient Identifier Cross-referencing/Patient Demographics Query	TBD	To be determined		
PQRI	Physician Quality Reporting Initiative	USD PPP	U.S. Dollars adjusted for Purchasing Power Parity		
REST	Representational State Transfer	VA	Department of Veterans Affairs		
RHIO	Regional Health Information Organization	VHA	Veterans Health Administration		

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