

July 21, 2014

Standard Occupational Classification Policy Committee Chair
U.S. Bureau of Labor Statistics, Suite 2135
2 Massachusetts Avenue NE
Washington, DC 20212

Submitted via email to soc@bls.gov (subject line 2018 SOC)
Re: Request/Recommendation for New Health Informatics Practitioner Standard Occupational Classification (SOC)

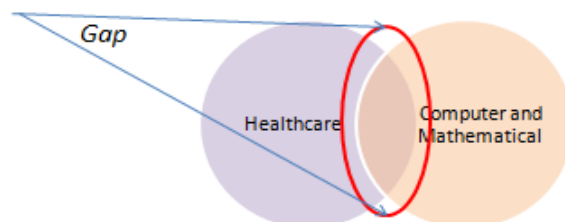
To the Standard Occupational Classification Policy Committee Chair:

This proposal was developed as a collaborative effort initiated by the FACA Health IT Policy Committee, Certification and Adoption Workgroup, Workforce Sub-group. The following groups employing, representing, and/or educating the workforce in the health informatics occupation respectfully request a new Standard Occupational Classification for **Health Informatics Practitioner**:

- Alliance of Nursing Informatics ([ANI](#))
- American Health Information Management Association ([AHIMA](#))
- American Medical Informatics Association ([AMIA](#))
- Cuyahoga Community College ([TRI-C](#))
- Center for Disease Control and Prevention ([CDC](#))
- College of Healthcare Information Management Executives ([CHIME](#))
- Commission on Accreditation for Health Informatics and Information Management Education ([CAHIIM](#))
- Commission on Certification for Health Informatics and Information Management ([CCHIIM](#))
- Health Information Management Systems Society ([HIMSS](#))
- Minnesota Department of Health ([MDH](#))
- Minnesota e-Health Initiative (a Public-Private Collaborative) ([MDH](#))
- Oregon Health and Science University ([OHSU](#))
- University of Colorado Denver Anschutz Medical Campus ([CU](#))
- University of Minnesota, Institute for Health Informatics ([U of M](#))
- University of Pittsburgh Department of Health Information Management School of Health and Rehabilitation Sciences ([Pitt](#))
- University of Texas School of Biomedical Informatics at Houston ([UTH](#))
- Department of Veterans Administration, Health Informatics Department ([VHA](#))

Request for New SOC Proposal for Health Informatics Occupation

The Standard Occupational Classifications (SOCs) for healthcare and related industries currently lacks codes associated with the **health informatics occupation**. Health Informatics workers apply science to ensure the effective use of data, information, and knowledge that supports the safe and effective delivery of healthcare and improve health and wellness. Workers apply



interdisciplinary knowledge, skills, and tools; enabling information to be collected, managed, used, and shared safely to support the delivery of healthcare and to promote health. Using a broad spectrum of methods, its practitioners work with a variety of data extending from molecules to people to populations. In some contexts, terms such as “biomedical informatics” or “clinical informatics” are used to describe this occupation, however these all refer to the same general occupation explored here under the heading **Health Informatics**. (See Appendix A for additional definitions)

Recommended Placement in SOC:

Most individuals in the Health Informatics occupation are healthcare and public health workers; many health informatics jobs may require healthcare licensure, specific knowledge of healthcare and public health operations, direct care or clinical processes. These jobs also have a strong technical component, Therefore we strongly recommend recommended that the new Health Informatics occupation reside under the major group: 29-0000 Healthcare Practitioners and Technical Occupations, specifically:

Preferred Option:

New Broad Category: 29-9020 Health Informatics Practitioner
under the Minor Group [29-9000 Other Healthcare Practitioners and Technical Occupations](#)

It should be noted that the [O*NET](#) classification system follows a similar structure to the SOC and has categorized one of the health informatics role (Nurse Informatics Specialist) in the [15-0000 Computer and Mathematical Occupations](#) major group. Although not the first choice for placement for the reasons specified above, the proposed Health Informatics code could alternatively be included in the SOC as:

Alternate Option:

New Detailed Occupation: 15-1123 Health Informatics Practitioner
Under the Broad Category [15-1120 Computer and Information Analysts](#)

Rationale:

The current SOC system does not have an existing classification for the Health Informatics practitioner occupation. Employers are seeking workers in this occupation with specific education and skills to perform work that is distinct from other occupations in the SOC. The lack of an SOC has created numerous challenges including:

- Lack of accurate employment data (current and future projections) on the health informatics occupation and workforce expansion, which is particularly important given the U.S. government’s investment in developing a skilled health IT workforce including computer science/information technology, health informatics, and health information management occupations.
 - Without a SOC for health informatics practitioners, government, employers and academic institutions are unable to accurately measure the effect of the workforce development efforts and/or project workforce growth.
- Inability by employers to recruit, retain, and appropriately compensate workers with the needed skill set. For example:
 - Federal and state agencies that use with employment structures aligned with the SOC system, struggle to recruit, retain, and compensate health informatics practitioners competitively because of the lack of an appropriate and accurate SOC.
 - Currently some health informatics practitioners are incorrectly classified, resulting in salary caps and/or limited career progression (e.g., nurse informaticists are often incorrectly categorized as nurses because there is not a class that reflects the unique work performed and expertise needed).

- Colleges and universities find it difficult to develop new academic programs to meet employer demands for health informatics because of the lack of a SOC and related occupation data and projections.ⁱ
- Students in health informatics academic programs are unable to apply for federal student aid under Title 4 funding.ⁱⁱ
- Registered apprenticeship programs for health informatics practitioners cannot be developed due to the lack of an SOC.ⁱⁱⁱ
- Health informatics practitioners will not find their occupational data for correct reporting on the U.S. Census.

Background

With the passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act and Title VIII of the American Recovery and Reinvestment Act of 2009 (ARRA), over \$20 billion^{iv} in health information technology (health IT) incentive payments was made available starting in 2010 to assist healthcare providers in improve the quality, safety, and coordination of care while also achieving efficiency gains to help control costs through the adoption and meaningful use of electronic health records (EHRs).^v The Medicare and Medicaid EHR Incentive Program has had a significant impact on the healthcare workforce, particularly for healthcare providers eligible for the financial incentives by accelerating the use of EHR technology by eligible hospitals and professionals and increasing the requirements to achieve interoperability and exchange.^{vi} ONC reported that EHR incentives increased adoption o f a basic EHR^{vii} by office-based providers and hospitals by approximately 15 percent during the first year of the program (2010-2011). By 2012, 56 percent of hospitals and 42 percent of physicians had implemented basic EHRs.^{viii} Today, 94 percent of hospitals^{ix} have adopted EHRs, as have 78 percent of physicians.^x

The importance of the workforce in advancing the implementation and on-going management of health IT was considered important enough for funding to be allocated for expansion in the HITECH Act, the portion of the ARRA that provided incentives for adoption of health IT. Of the \$20 billion allocated, \$118 million was designated for workforce development, resulting in the launch or expansion of programs in community colleges and universities, production of curricular materials, and development of competency certifications. Part of the motivation for including workforce development in HITECH was research showing a need for over 40,000 informatics and technology professionals as the U.S. rapidly increased its use of IT in healthcare.^{xi}

In a 2013 workforce report, the HHS Office of the National Coordinator for Health Information Technology reported that the most common positions for which employers are recruiting in the health IT space include those related to information management, clinical informatics, and information technology support (e.g., equipment, development/programming, and software support).^{xii} The 2013 HIMSS Leadership Survey listed Clinical Application Support, Clinical Informatics, and Network and Architecture Support as the top three Health IT staffing needs since 2010.^{xiii xiv}

The health informatics occupation demands knowledge and skills in both health professions (e.g., medicine, nursing, allied health, etc.) and IT (computer science, information science, informatics). The effective use of IT is recognized by many healthcare provider organizations, payers, and public health departments as an essential component of a “learning health system.”^{xv}

Nature of the Work Performed by Health Informatics Practitioners

Health informatics practitioners promote the effective use of data, information, and knowledge to support the safe and effective delivery of healthcare and improve health and wellness. Practitioners apply a unique set of disciplinary knowledge of healthcare, technical skills and IT tools, enabling health information to be collected, managed, used, and shared safely to support the effective delivery of care and improve health outcomes. For these reasons, health informatics practitioners perform work that is unique from other occupations in the SOC system.

Below, the duties and work performed are categorized as **required** (common to all jobs in this occupation) or as **may be frequently performed**, but not by all workers.

Required duties to be performed:

- Apply health-related, discipline-specific knowledge (e.g., clinical care, public health, healthcare operations) to health information technology systems; and serve as a liaison between healthcare workers and the information technology systems engineers/analysts/designers to translate and align health workers' unique workflows, processes, and policies, while meeting industry, healthcare, and federal standards.
- Design, develop, select, test, implement, support, maintain, and/or evaluate new or modified health information systems to support patients, public health, and health care professionals.
- Incorporate current research on human-technology interactions to improve the design of health information technology.
- Manage, analyze, and interpret health-related data for discipline-specific practice, healthcare delivery, healthcare improvement, healthcare oversight, population health, and/or public health.
- Facilitate communication and organizational learning resulting from data analysis.
- Apply knowledge of informatics science and computer science to the analysis, design, implementation, maintenance, and/or evaluation of health IT.
- Assure that accepted policies or practices are applied as related to information technology and discipline-specific practices.
- Keep abreast of developments in health informatics and discipline-specific knowledge/practices.

May be frequently performed:

- Advise on health information systems' use and configuration to promote efficient, effective, and safe integration of the technology into healthcare and public health workflow and processes.
- Incorporate knowledge of decision and cognitive sciences to design, select, test, implement, support, maintain, and/or evaluate new or modified **health-related decision-support** tools to support patients, healthcare professionals, and public health.
- Assist in the development of new policies or practices related to information technology and discipline-specific practices as needed.
- Contribute to and/or apply national and international information and technical standards to informatics practices.

Some health informatics practitioners who are in supervisory roles may also perform the following work:

- Use evidence-based knowledge of socio-organizational science, as well as discipline-specific and informatics science to introduce and deploy strategies, policies or procedures related to the design, evaluation, support, or modification of health information technology for clinical practice, administration, education, research, or public health.
- Assess training and development needs in relation to implementation of software and discipline-specific practices.

- Apply data analytics methods to improve the quality and safety while reducing cost of health-related practice, administration, education, or research.
- Support health informatics research.

How the work performed by Health Informatics Practitioners is distinct from other detailed occupations in the SOC

The health informatics occupation lies fundamentally within the health professions, it is not simply an extension of a worker’s health-related field (i.e., a physician, nurse, public health professional, or allied health professional with information technology savvy). Neither are those who work in the health informatics practitioner occupation simply IT professionals or managers who apply IT skills to health or healthcare settings. Specifically, the health informatics practitioner occupation differs from:

- Computer occupations related to health information technology that include workers who install, maintain, and optimize the hardware and software, network and communication infrastructure. By contrast, health informatics professionals work more closely with the information than the technology, focusing on the use of data and information in a specific setting or by a discipline/domain.^{xvi}
- Medical record and health Information technicians, roles that are part of the health information management occupations, but are quite specialized. Because medical records and other types of health information are increasingly in electronic formats, workers in this occupation apply their knowledge and skills especially in areas of information governance, documentation analysis, coding, abstracting, reporting, and legal and compliance issues.^{xvii}

Health Informatics Job Titles

The following list summarizes common Health Informatics job titles found in the workforce today. An analysis of the Direct Match Title file showed that the SOC currently does not have a classification for this occupation. In the lists below. The potential mapping of a number of Health Informatics job titles to existing SOC titles is outlined.

The following Health Informatics Practitioner Job Titles are related to the proposed new SOC. There are not any matches in the Direct Match Title File. It is requested that these job titles be added in connection to a Health Informatics Practitioner occupation.

Health Informatics Job Titles Unique to the Occupation	In Direct Match Title File	Needs to be Added to Direct Match Title File
Bioinformatics Specialist/Analyst	No	Yes
Clinical Informatics Specialist/Analyst	No	Yes
Clinical Applications Specialist/Coordinator	No	Yes
Health Data Analyst/Specialist	No	Yes
Health Informatics Specialist	No	Yes
Informatics Analyst/Specialist/Coordinator	No	Yes
Terminology Specialist	No	Yes
Nursing Informaticist/Informatician	No	Yes
Physician Informaticist/Informatician	No	Yes
Pharmacy Informatics Specialist	No	Yes
Laboratory Informatics Specialist	No	Yes

Imaging Informatics Specialist	No	Yes
Public Health Informatics Specialist	No	Yes

The following Health Informatics Job Titles perform work which would require that they are mapped to existing SOC. This table provides the common job title and the most applicable SOC. It is recommended that the Job Titles be added to the Direct Match Title File.

Health Informatics Job Titles	In Direct Match Title File	Request to be Added to Direct Match Title File and Applicable SOC
Bioinformatics Advisor	No	11-9111 Medical and Health Services Managers*
Chief Medical Information Officer	No	11-9111 Medical and Health Services Managers*
Chief Public Health Informatics Officer	No	11-9111 Medical and Health Services Managers*
Chief Nursing Information Officer	No	11-9111 Medical and Health Services Managers*
Chief Health Information Officer	No	11-9111 Medical and Health Services Managers*
Clinical Informatics Director	No	11-9111 Medical and Health Services Managers*
Clinical Information Systems Director	No	11-3021 Computer and Information Systems Managers*
Director Clinical Information Services	No	11-9111 Medical and Health Services Managers*
Health Informatics Researchers/ Scientists	No	19-1042 Medical Scientists, Except Epidemiologists
Professor Health/Clinical Informatics	No	25-1071 Health Specialties Teachers, Postsecondary

* The Healthcare Information and Management Systems Society (HIMSS) has submitted a proposal for a new management SOC minor class (11-4000) for health information technology, health informatics and health information management occupations that could apply to these positions if it were to be accepted.

In addition to the Health Informatics Practitioner job titles listed above, it should be noted that there are additional informatics titles related to other disciplines (e.g., dental, social work, nutrition) not listed, but they are currently in the healthcare workforce.

Indication of the number of jobs or workers in the occupation

Even though the health informatics occupation is increasingly valued in healthcare and public health organizations, there is little data about the field because it has not previously been included in federal labor statistics. However, this does not mean that there is no data to support the case for a SOC. In 2013, for example, the Office of the National Coordinator for Health IT analyzed a comprehensive database of 84 million online job postings to find a total of health IT-related 434,282 job postings between 2007-2011, with 226,356 health IT core jobs and 207,926 health IT-related clinical user jobs.^{xviii, xix} The former would contain many who work in the occupation of health informatics.

Additional evidence for the uniqueness of this occupation comes from the disciplines of medicine and nursing. Each of these disciplines has certifications of specialization in informatics, with medicine using the term “clinical informatics” and nursing using “nursing informatics.” Last year,

about 450 physicians successfully passed the first board examination for the new subspecialty of clinical informatics.^{xx} ^{xxi} This subspecialty is the first to have been designated as a subspecialty of all medical specialties (e.g., internal medicine, surgery, radiology, etc.), further showing it not being limited to one kind of physician (or any other health occupation).

Likewise, the nursing profession has had a specialization in nursing informatics for over a decade and appears to be the largest health informatics job role. The O*NET On-Line system,^{xxii} which provides summary data for the informatics nurse specialist job, reported that 521,000 specialists were employed in 2012 and projected 209,600 job openings between 2012 and 2022.^{xxiii}

Collecting reliable and valid data for the health informatics occupation can be completed through the multiple discipline-specific professional associations and societies, but would be significantly improved with a SOC. The only data from the Bureau of Labor Statistics reflect standard information technology jobs within the healthcare industry. The estimate of 50,000 added positions nationally was calculated using research data tracking the level of HIT implementation at all U.S. hospitals.^{xxiv} This and other estimates fail to include health informaticists focused on tasks such as clinical data analytics or designing clinical decision support. The only other candidate SOC code lists entry-level education as postsecondary certificate and may have an associate degree.^{xxv} Thus, there is a lack of appropriate career representation, both from work performed and a required education perspective.

Types of Employers

Health informatics practitioners work for various employers in the healthcare industry including:

- ▶ Health systems that integrate multiple care settings, including inpatient hospitals, outpatient centers, physician practices, psychiatric units, and long-term and post-acute settings.
- ▶ Hospitals, including acute inpatient and academic medical centers.
- ▶ Public health agencies, including local and state health departments, federal public health agencies and public health non-profit organizations.
- ▶ Healthcare payers and insurance companies and benefits management companies.
- ▶ Federal government, including the Veteran's Administration and Department of Defense, and other policy-makers and researchers.
- ▶ Health Industry employers, including healthcare technology vendors, pharmaceutical companies, health research organizations, and healthcare consulting companies.
- ▶ Colleges and universities.

As adoption of electronic health records and other health information technologies continues to increase, it is anticipated that health informatics practitioners will emerge in other health-related settings not listed including physician practices, long-term and post-acute care settings, and behavioral healthcare settings.

Education and Training

Most health informatics practitioners graduate from colleges and universities with a baccalaureate or higher degree. A scan of current job postings confirms that employers are seeking candidates who hold a minimum of a bachelor's degree, with a master's or doctoral degree in health informatics preferred. Employers frequently desire workers with informatics certification. The preference for a four-year or greater secondary education level is best illustrated in the O*NET On-Line system where summary data on the informatics nurse specialist job found that 60 percent of respondents required a bachelor's degree, 25 percent required a master's degree, and 5 percent an associate's

degree.^{xxvi}

The findings from a 2010 study of informatics programs in the U.S. provides information consistent with employer requirements for education level and health-related discipline expertise. The study identified 177 informatics programs across seven health-related disciplines at the baccalaureate or higher academic level.^{xxvii} (Exhibit 1) There are also academic accreditation bodies for informatics programs. The [Commission on Accreditation for Health Informatics and Information Management Education](#) (CAHIIM) is accrediting master's degree programs in health informatics.^{xxviii} The Accreditation Commission for Graduate Medical Education (ACGME) is accrediting clinical informatics fellowships for the new physician subspecialty.^{xxix} The International Medical Informatics Association (IMIA) is currently undertaking the final stages of a pilot project on the accreditation of health/medical informatics programs.^{xxx}

Exhibit 1: JMLA Survey of Biomedical and Health Informatics Programs in the U.S. ^{xxxi, xxxii, xxxiii}

Degree levels in each program	Informatics program category						
	Health*	Medical†	Nursing‡	Bioinformatics§	Cheminformatics**	Dental**	Pharmacy**
Bachelor's	3			12	1		
Bachelor's and master's	2	1		5			
Bachelor's, master's, and PhD				7			
Graduate certificate	6	1	2	3			
Graduate certificate and master's			6	5			
Graduate certificate, master's, and PhD		4		3			
Master's	14	6	11	16			
Master's and PhD	7	5	1	21	2	1	
PhD		3		19			
Residency or fellowship						1	9
Totals	32	20	20	91	3	2	9

* Programs titled as and/or offering degrees or specialization in health or public health informatics.
† Programs titled as and/or offering degrees in medical or biomedical informatics.
‡ Programs offering advanced nursing degrees with an informatics component, are affiliated with a nursing school or department, and are accepting students with nursing experience.
§ Programs described as "bioinformatics" or "computational biology" and offering degrees in these or related fields with relevant focus or specialization.
** Programs titled as and/or offering a degree or specialization in cheminformatics, dental, or pharmacy informatics, respectively.

As noted, employers are also seeking certifications for health informatics workers. A number of organizations are currently certifying or developing certifications for health informatics practitioners including:

- The American Nursing Credentialing Center (ANCC) Informatics Nurses offers an informatics nursing certification.^{xxxiv}
- The American Medical Informatics Association (AMIA) has created a task force to develop an Advanced Interprofessional Informatics Certification that will apply to advanced healthcare degrees in informatics or disciplines related to informatics.
- The American Board of Preventive Medicine (ABPM) administers the physician clinical informatics subspecialty certification.^{xxxv}
- The Commission on Certification for Health Informatics and Information Management (CCHIIM) is undergoing an analysis and development of a health informatics certification.

As the health informatics occupation continues to mature, the workforce may see pathways in the future for new entry-level jobs for workers with 2-year associate degrees. Today, however, entry-level education continues to be at the 4-year degree level or higher.

Licensing

Professional licenses are not required for all health informatics practitioners, but may be required for jobs with a specific clinical focus such as nurse and physician informaticists.

Tools and Technologies

Tools

- ▶ Desktop and/or laptop computers
- ▶ Electronic health record systems
- ▶ Computerized Provider Order Entry (CPOE), e-prescribing applications, and clinical decision support
- ▶ Quality improvement and reporting software applications
- ▶ Personal health records and patient portals
- ▶ Public health surveillance systems, registries and other related data collection systems
- ▶ Quality measure reporting applications
- ▶ Laboratory information systems
- ▶ Data mining, analysis and visualization, and similar tools for managing complex data
- ▶ High throughput, high performance distributed computational systems for big data (molecules to people to populations)
- ▶ Medical picture archiving computer systems (PACS)
- ▶ Mobile devices such as smart phones and tablets

Technologies

- ▶ Specialized health information software applications and systems(e.g., electronic health records, computer-based documentation systems for point-of-care, personal health records, health information exchange networks, laboratory information systems, quality measurement systems, billing and reimbursement)
- ▶ Telehealth and patient monitoring devices
- ▶ Mainstream software applications (e.g., spreadsheets, databases, email, Web 2.0, mobile applications, word processing, social network applications, presentations, etc.)
- ▶ Database and query-reporting software, computer-based training software (e.g., Learning management system (LMS) software)

Professional or Trade Associations and Unions

Health Informatics Practitioners are frequently members of one or more of the following professional organizations

- American Medical Informatics Association (AMIA) and their multiple sub-specialty interest groups (e.g., nursing, public health, etc.)
- American Nursing Informatics Association (ANIA)
- Alliance for Nursing Informatics (ANI)
- American Health Information Management Association (AHIMA)
- Health Information and Management Systems Society (HIMSS)
- College of Healthcare Information Management Executives (CHIME)
- Professional Societies with health informatics special interest group (e.g., Association of Women's Health, Obstetric and Neonatal Nurses Informatics specialty group, American

College of Physicians, American Academy of Family Physicians, American Academy of Pediatrics)

- International Associations
 - International Medical Informatics Association (IMIA) and Special Interest Groups
 - International Society of Computational Biology
- Association for Computing Machinery (ACM), Institute of Electrical and Electronics Engineers (IEEE), and Human Factors and Ergonomics Society (HFES) (health/healthcare informatics related specialty groups)

How suggested changes will better reflect current occupational structure in the US

Currently federal labor statistics on occupational data for the health informatics occupation do not accurately reflect the work performed in this occupation because it has not been included as a SOC. If health informatics practitioners can be included as a SOC, it will be much easier to track the growth of the profession, and will facilitate recruitment, hiring and retention of the professionals with this unique set of job skills. It also will allow for funding of students and programs that can help build the profession, as well as research to ensure that the health IT developed by these professionals is well tested.

Appendix A: Healthcare Industry Definitions of Health Informatics

There are a number of definitions of health informatics and related terms, but all of them converge on the notion of using *information*, embedded in *technology*, to improve health and healthcare delivery. Here are some definitions of the field from leading professional and other stakeholder organizations:

- **Accreditation Council for Graduate Medical Education (ACGME, referring to the medical subspecialty)** – “Clinical informatics is the subspecialty of all medical specialties that transforms health care by analyzing, designing, implementing, and evaluating information and communication systems to improve patient care, enhance access to care, advance individual and population health outcomes, and strengthen the clinician-patient relationship.”^{xxxvi}
- **American Health Information Management Association (AHIMA)** – “Health Informatics (HI) is a science that defines how health information is technically captured, transmitted and utilized. Health informatics focuses on information systems, informatics principles, and information technology as it is applied to the continuum of healthcare delivery. It is an integrated discipline with specialty domains that include management science, management engineering principles, healthcare delivery and public health, patient safety, information science and computer technology.”^{xxxvii}
- **American Medical Informatics Association (AMIA)** – Biomedical informatics (BMI) is the interdisciplinary field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving, and decision making, motivated by efforts to improve human health. The informatics community typically uses the term health informatics to refer to applied research and practice of informatics across the clinical and public health domains described more extensively at <http://www.amia.org/about-amia/science-informatics>.^{xxxviii}
- **Biomedical and health informatics** – “the field that is concerned with the optimal use of information, often aided by the use of technology, to improve individual health, health care, public health, and biomedical research.”^{xxxix}
- **Department of Veterans Affairs Definition:** Health Informatics (HI) is a discipline at the intersection of information science, computer science, and health care that designs and

delivers information to improve clinical care, individual and public health and biomedical research. HI optimizes health-related information acquisition, processing, and use with tools that include people and processes; hardware and software; algorithms and data; and information and knowledge.

- **National Center for Educational Statistics:** Medical Informatics is a program that focuses on the application of computer science and software engineering to medical research and clinical information technology support, and the development of advanced imaging, database, and decision systems. Includes instruction in computer science, health information systems architecture, medical knowledge structures, medical language and image processing, quantitative medical decision modeling, imaging techniques, electronic medical records, medical research systems, clinical decision support, and informatics aspects of specific research and practice problems.^{xi}
- **American Nurses Association - Nursing informatics (NI)** is a specialty that integrates nursing science, computer science, and information science to manage and communicate data, information, knowledge, and wisdom in nursing practice. NI supports consumers, patients, nurses, and other providers in their decision-making in all roles and settings. This support is accomplished through the use of information structures, information processes, and information technology.^{xii}
- **Minnesota Department of Health** – Health Informatics is the use of the principles and practices of computer science in addressing the problems of health care. An interdisciplinary field of scholarship that applies computer, information, management and cognitive sciences to promote the effective and efficient use and analysis of information to improve the health of individuals, the community and society.
- **UK Council for Health Informatics Professions (UKCHIP)** – Health Informatics is “the knowledge, skills and tools which enable information to be collected, managed, used and shared safely to support the delivery of healthcare and promote health.”^{xiii}

ⁱ Integrated Post-Secondary Education Data System, U.S. Department’s National Center for Education Statistics (NCES). <http://nces.ed.gov/ipeds/datacenter/>

ⁱⁱ Information for Financial Aid Professionals. (<http://ifap.ed.gov/ifap/>) and Gainful Employment Disclosure requirements for linkages to a SOC or U.S. Department of Labor’s O*NET website. Web form and requirements available at: <http://webcache.googleusercontent.com/search?q=cache:W4pqf6Ff0ZIJ:ifap.ed.gov/ForeignSchoolInfo/attachments/FSCosumerInfoActivity9.doc+&cd=1&hl=en&ct=clnk&gl=us>

ⁱⁱⁱ Registered Apprenticeship Program. United States Department of Labor. http://www.doleta.gov/oa/apprentices_new.cfm#findApply. [The CDC Public Health Informatics Fellowship Program became a DOL Registered Apprenticeship in 2012, at the same time the occupation title of “Public Health Informatician” was entered in the O*Net database under code 15-1121.00 \(Computer Systems Analyst\).](#)

^{iv} HITECH authorized the EHR Meaningful Use incentives. It was estimated incentive payments would cost \$20 billion over 10 years. Total cost is dependent on the number of providers in the program. CBO estimates \$20B as the net after penalties were factored. The estimate for incentive payments that would/could be paid out is approximately \$30B. (Congressional Budget Office. “[Letter to the Honorable Charles B. Rangel re: Analysis of the Effect on Federal Direct Spending and Revenues of the Health Information Technology for Economic and Clinical Health \(HITECH\) Act](#)”, January 21, 2009.)

^v Dougherty M, Williams M, Millenson M, et al. EHR payment incentives for providers ineligible for payment incentives and other funding study. Washington, D.C.: Prepared for Office of Disability, Aging and Long-Term Care Policy, Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services; June, 2013. Available at <http://aspe.hhs.gov/daltcp/reports/2013/EHRPI.pdf>

^{vi} ONC Federal Health Information Technology Strategic Plan (2011 – 2015). http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_0_4318_1211_15583_43/http%3B/wci-pubcontent/publish/onc/public_communities/f_i/onc_website_home/fed_health_strategic_plan/fed_health_it_strategic_plan_home_portlet/files/final_federal_health_it_strategic_plan_0911.pdf

^{vii} A base EHR is defined by ONC as including: patient demographics, patient problem lists, patient medication histories (EH)/medications taken by the patient (EP), clinical notes, , electronic orders for prescriptions, laboratory results viewing, and imaging results viewing. <http://dashboard.healthit.gov/HITAdoption/>

^{viii} Office of the National Coordinator for Health IT, Health IT Dashboard. <http://dashboard.healthit.gov/hitadoption/>

^{ix} Adoption of Electronic Health Record Systems among U.S. Non-federal Acute Care Hospitals: 2008-2013. ONC Data Brief, No. 16, May 2014. <http://www.healthit.gov/sites/default/files/oncdatabrief16.pdf>

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- ^x Hsiao, CJ and Hing, E (2014). Use and Characteristics of Electronic Health Record Systems Among Office-based Physician Practices: United States, 2001–2013. Hyattsville, MD, National Center for Health Statistics. <http://www.cdc.gov/nchs/data/databriefs/db143.htm>.
- ^{xi} Hersh WR and Wright A. What workforce is needed to implement the health information technology agenda? An analysis from the HIMSS Analytics™ Database. AMIA Annual Symposium Proceedings. 2008. Washington, DC: American Medical Informatics Association. 303-307.
- ^{xii} Hersh W. The Health Information Technology Workforce: Estimations of Demands and a Framework for Requirements. *Applied Clinical Informatics*. 2010;1(2):197-212.
- ^{xiii} 2013 HIMSS Leadership Survey. *Healthcare Information and Management Systems Society (HIMSS)* http://himss.files.cms-plus.com/HIMSSorg/Content/files/leadership_FINAL_REPORT_022813.pdf. March 4, 2013.
- ^{xiv} Readyng the Health IT Workforce for Patient-Centered Team Based Care: Understanding Training Needs: *Department of Health and Human Services: The Office of the National Coordinator for Health Information Technology* http://www.healthit.gov/sites/default/files/summer_workforce_meeting_paper_508.pdf
- ^{xv} Smith M, Saunders R, Stuckhardt L, and McGinnis JM, *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America*. 2012, Washington, DC: National Academies Press.
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- ^{xxviii} A directory of CAHIIM accredited health informatics programs is available at: <http://www.cahiim.org/accredpgms.asp>
- ^{xxix} Clinical Informatics Fellowship Program. All physicians who have successfully completed any ACGME-accredited residency or a Royal College of Physicians and Surgeons of Canada (RCPSC)- or College of Family Physicians of Canada (CFPC)-accredited residency program located in Canada are eligible to enroll in any clinical informatics fellowship program. Admission into a specific clinical informatics fellowship is not restricted to only those who completed the core residency in the same specialty with which the fellowship is associated. Admission is also not restricted to only those residents who completed accredited programs in one of the sponsoring disciplines. https://www.acgme.org/acgmeweb/Portals/0/PDFs/FAQ/381_clinical_informatics_FAQs.pdf
- ^{xxx} This project was approved by the IMIA General Assembly (GA) at its meeting in Oslo, Norway in August 2011. This followed the expression of interest by programmes in health and biomedical informatics in accreditation at the international level. The development of proposals by the IMIA Vice President for Special Affairs, Prof. Arie Hasman, and their discussion with the IMIA Board and GA, occurred during 2010 and 2011. A final report on the future direction and feasibility of expanding this beyond the project phase will be presented to the IMIA General Assembly for their consideration. <http://www.imia-medinfo.org/new2/node/449>
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- ^{xxxii} The American Medical Informatics Association provides a directory of some of the formal academic and training programs in biomedical, health, and nursing informatics available at: http://www.amia.org/education/programs-and-courses?page=2&field_state_value_many_to_one=All&tid=Al
- ^{xxxiii} "As of 2013, there are now 42 accredited master's degree programs and six doctoral programs with majors in nursing informaticsman for the American Association of Colleges of Nursing. Enrollment in these post-graduate programs, now at 2,741 students, is up 19% over a year ago." *Modern Healthcare* March 22, 2013: <http://www.modernhealthcare.com/article/20130322/MAGAZINE/303239968#>
- ^{xxxiv} <http://www.nursecredentialing.org/Certification/ExamResources/Eligibility/ECategory/InformaticsNurseEligibility.html>
- ^{xxxv} Physicians who are *Diplomates* of the American Board of Medical Specialties (ABMS) can seek Clinical Informatics Subspecialty Certification through the American Board of Preventive Medicine or the American Board of Pathology (ABP).

Clinical informatics is the first and only subspecialty certification open to all “boarded” physicians regardless of their primary medical specialty. Physicians who practice Clinical Informatics collaborate with other health care and information technology professionals to analyze, design, implement and evaluate information and communication systems that enhance individual and population health outcomes, improve patient care, and strengthen the clinician-patient relationship. Clinical Informaticians use their knowledge of patient care combined with their understanding of informatics concepts, methods, and tools to: assess information and knowledge needs of health care professionals and patients; characterize, evaluate, and refine clinical processes; develop, implement, and refine clinical decision support systems; and lead or participate in the procurement, customization, development, implementation, management, evaluation, and continuous improvement of clinical information systems. Information on requirements for certification in Clinical Informatics:

https://www.theabpm.org/application/ci_requirements.pdf

^{xxxvi} http://www.acgme.org/acgmeweb/Portals/0/PDFs/Clinical_Informatics_PRs_RC.pdf

^{xxxvii} <http://www.ahima.org/careers/healthinfo>

^{xxxviii} <http://www.amia.org/presentation/definition-biomedical-informatics>

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http://www.nursingworld.org/HomepageCategory/NursingInsider/Archive_1/2008NI/Jan08NI/RevisedNursingInformaticsPracticeScopeandStandardsOfPractice.aspx

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