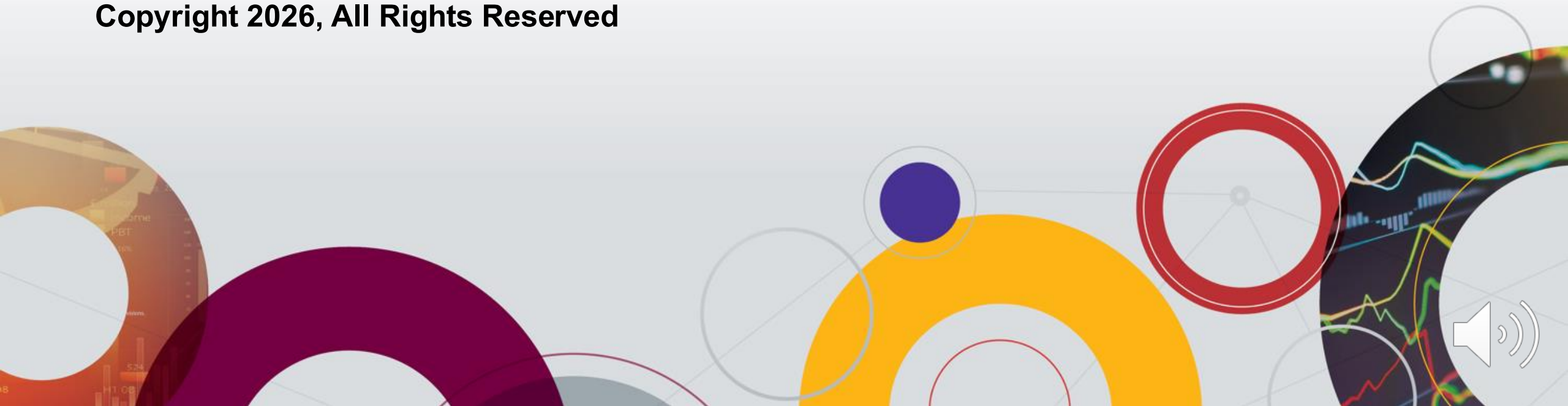


1.4b Who Does Biomedical Informatics and AI?

10x10 – Introduction to Biomedical Informatics & Artificial Intelligence
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Who does biomedical informatics and AI?

Practitioners

Healthcare IT workforce

Users

Leaders

Certification

Informatics and AI users

Physicians and medical students – first addressed by AAMC Medical School Objectives Project (1998), more on next slide

Clinical and translational scientists (Valenta, 2016)

Next-generation research scientists (Moore, 2019)

Nurses (Forman, 2020)

Patients – Americans use at least once a week or ever to seek health information and advice (Presiado, 2024)

- Internet search – 63%, 93%
- Social media – 56%, 78%
- AI chatbots – 13%, 37%

Informatics and health professions education

“Informatics training for clinicians is more important than hardware and software” (Safran, 2009)

Health informatics a “required skill for 21st century clinicians” (Fridsma, 2018)

Competencies (Hersh, 2014; Hersh, 2023)

Some recent competency frameworks focused on artificial intelligence (AI)

- Healthcare professionals (Russell, 2023)
- Primary care practitioners (Liaw, 2023)
- Medical educators (Pylman, 2025)

1. Find, search, and apply knowledge-based information to patient care and other clinical tasks
2. Effectively read from, and write to, the electronic health record (EHR) for patient care and other clinical activities
3. Use and guide implementation of clinical decision support (CDS)
4. Provide care using population health management approaches
5. Protect patient privacy and security
6. Use information technology to improve patient safety
7. Engage in quality measurement selection and improvement
8. Use health information exchange (HIE) to identify and access patient information across clinical settings
9. Engage patients to improve their health and care delivery through personal health records and patient portals
10. Maintain professionalism in use of information technology tools, including social media
11. Provide clinical care via telemedicine and refer patients as indicated
12. Apply personalized/precision medicine
13. Participate in practice-based clinical and translational research
14. Use and critique artificial intelligence (AI) applications in clinical care



Digital health competencies in medical education (Car, 2025)

Domain 1: Professionalism in Digital Health

- Professionalism, ethical, legal, and regulatory considerations in digital health
- Digital identity, safety, and security

Domain 2: Patient and Population Digital Health

- Digital health literacy
- Personal health records
- Telehealth
- Digital diagnostics
- Sensors, wearables, and internet of medical things
- Health apps and digital therapeutics
- Internet-based health interventions
- Digital determinants of health

Domain 3: Health Information Systems

- Data governance and data management
- Foundation and principles of health information systems
- Electronic health records
- Health information exchange
- Human-centered design in digital health

Domain 4: Health Data Science

- Public health informatics
- Artificial intelligence in health care
- Computational thinking in medicine
- Precision medicine

Informatics curricula for medical students and physicians

Curricula

- Teaching EHR skills (Rajaram, 2020)
- Throughout medical education (Hare, 2022)
- In residency training (Baker, 2022; You, 2023; Rohan, 2024; Mrosak, 2025; Rowland, 2025)

Challenges

- Access to EHRs and other systems (Welcher, 2018)
- Implementation and evaluation (Zainal, 2022)

What we know about informatics leaders

Who are the leaders in IT and informatics?

- Chief Information Officer (CIO)
- Chief Clinical Informatics Officers (CCIOs) – most common include (Kannry, 2016)
 - Chief Medical Information/Informatics Officer (CMIO)
 - Chief Nursing Informatics Officer (CNIO)
 - Others (e.g., Dental, Pharmacy) less common but all need critical skill sets and training (Kannry, 2016)
- Chief Technology Officer (CTO)
- Many other titles, no standards

Hospitals and healthcare organizations increasingly creating operational “clinical informatics” departments

- Often separate from IT (and CIO)
- Usually with clinical leadership, often CMIO
- Increasingly incorporate HIM



Chief Information Officer (CIO)

Usual title of IT leader in an organization

WittKeifer survey (Ross, 2024)

- 84% serve on organizational executive leadership team
- Half make salaries >\$500K
- Most satisfied with job
- Most see talent development critical and aim to expand internal workforce
- Current top priorities include developing strategic foundation for AI/ML development while maintaining financial prudence

Chief Medical Information / Informatics Officer (CMIO)

Position now an important part of healthcare organizations, serving as (Kilbridge, 2012)

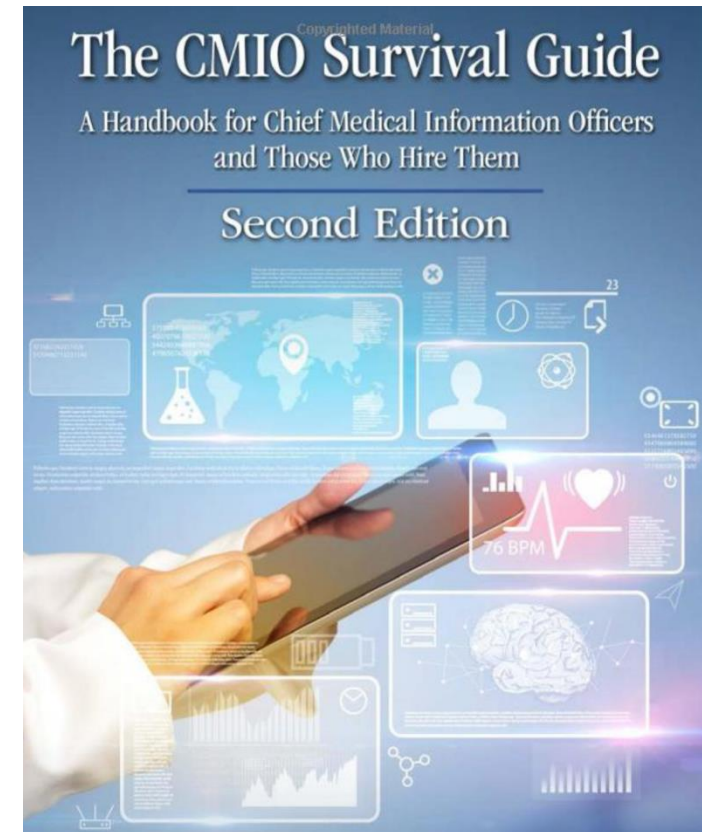
- Liaison between clinicians and IT
- Executive informatician

Increasingly called Chief Health Information Officer (CHIO)

Role evolving from implementation to optimization of EHR plus strategic leadership in AI, population health, and patient engagement (Raths, 2022)

Information and insights come from “survival guide” (Rydell, 2018) and periodic surveys

Newer trend: Chief Health AI Officer (Beecy, 2024)



WittKieffer-AMDIS periodic physician surveys (Ross, 2023)

Latest survey from over 215 CMIOs and other physician informatics leaders

Three-fourths male

Job titles

- CMIO 48%
- CHIO 8%
- Associate CMIO/CHIO 15%
- Other titles include Director, Medical Informatics (10%); Vice President, Medical/Clinical Informatics (5%); and assorted others

Large majority part of multi-hospital system, integrated delivery network, or academic medical center

Three-fourths over 8 years experience

About 70% still in clinical practice; proportion of time of those in clinical practice

- <25% 68%
- 25-50% 24%
- >50% 8%

WittKieffer-AMDIS annual physician survey (cont.)

CMIOs report to

- CMO 34%
- CIO 32%
- CEO 7%
- Other 27%

Three-fourths have direct reports, i.e., lead teams

Almost three-fourths board-certified in clinical informatics and increasing over time

Only 32% with formal informatics training

Median salary for CMIOs about \$350K, more than clinical specialty

HIMSS nursing informatics workforce survey (Carroll, 2023)

1

Workplace

- 62% work for a hospital or multi-facility health system.
- 5% were international respondents.
- Reporting structures are shifting with Information Systems/Technology (34%), Informatics (33%) and Nursing (30%) being the most common. On average, Nurse informaticists are reporting into two departments.

2

Title, Education, Training

- CNIO/Senior Nursing Informatics Officer title continues to advance with 54% reporting that their organization had the formal role.
- Overall advanced degrees shifting slightly with 68% having a Masters or PhD.
- The impact of a certification has decreased slightly in 2022 with 79% feeling it's impactful compared to 86% in 2020.

3

Salary and Satisfaction

- 60% stated they earn a base annual salary of \$100,000 or more.
- Over time, respondents have remained satisfied with their choice of career in informatics (76% highly satisfied), although a quarter feel the Nursing Informatics role is not at all valued by their organization.

CNIO evolving from “tactician to strategist” (Jackson, 2019)

Should we have certification of HIT/informatics professionals?

Present in nursing and HIM for decades

Nursing (ANCC) – bachelor's degree with practice experience

HIM has many; first three require formal education

- Registered Health Information Administrator (RHIA)
- Registered Health Information Technician (RHIT)
- Certified Coding Specialist/Associate (CCS, CCA, CCS-P)
- Certified Health Data Analyst (CHDA)
- Certified in Healthcare Privacy and Security (CHPS)
- Clinical Documentation Improvement Professional (CDIP)

Certification of physicians: clinical informatics subspecialty

Subspecialty of all medical specialties

- Requires primary medical specialty

Approved by American Board of Medical Specialties in 2011 (Detmer, 2014), based on core curriculum (Gardner, 2009) and training requirements (Safran, 2009)

“Grandfathering” of training requirements initially through 2017 and extended through 2025

Certification has been offered annually since 2013 – over 3000 certified (including me)

Administered by [American Board of Preventive Medicine \(ABPM\)](#) and [American Board of Pathology \(ABP\)](#)



History of the clinical informatics subspecialty

2014

- ACGME fellowship accreditation rules released
- First 4 programs accredited (including OHSU) and one launched

2015

- More fellowship programs accredited (15 total) and launched (4, including OHSU) (Longhurst, 2016)

2019

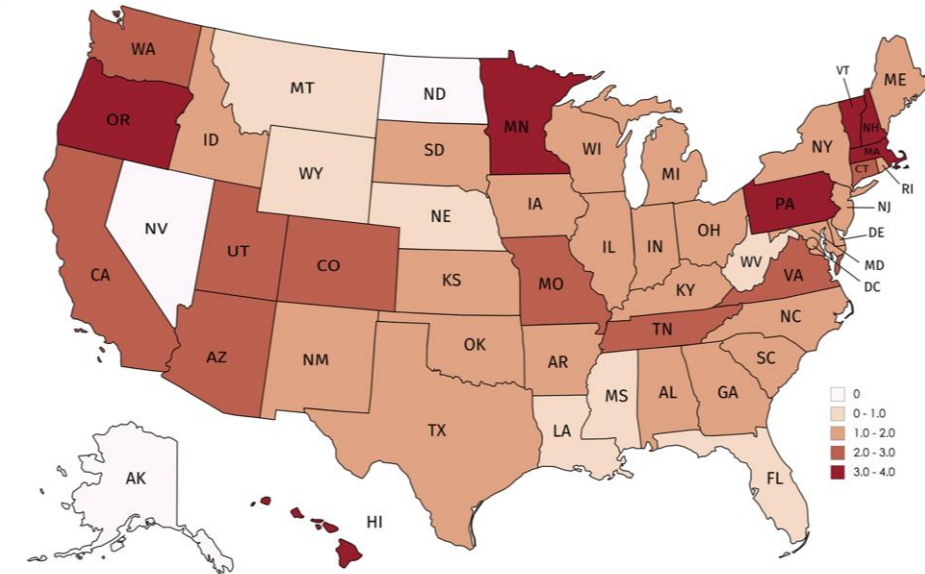
- Over 2000 board-certified (Desai, 2020)

2020

- Fellowships made important contributions in COVID-19 response (Subash, 2020)
- Innovations pursued, such as combined fellowships (Palma, 2020)

2024

- Over 60 accredited fellowship programs



Future of clinical informatics subspecialty

2025

- Last year of Practice Pathway

2026

- Must complete ACGME-accredited fellowship to become board-certified

Should in-person fellowship be required for board certification?

- Fellowship program directors concern about enrollment (Turer, 2022)
- Others argue more flexibility needed to make subspecialty more acceptable (Hersh, 2022)

Fellowships have evolved and positively impacted sponsoring organizations (Lingham, 2023)

Graduates of fellowships report robust training, even for those without prior experience, although diversity has not been optimal (Kim, 2023)

AMIA Health Informatics Certification (AHIC)

[AMIA certification](#) for rest of informatics workforce

Open to all with degrees in informatics or health professions

In addition to passing exam, requires work experience, varying by degree and time spent working in field

Exam content based on health informatics workforce analysis (Gadd, 2020)

Over 125 certified by 2024

Track	Academic Degree	% Work Time in Health Informatics	Qualifying Health Informatics Experience
1	Master's or doctoral degree in health informatics or a degree with a focus in informatics from an accredited program, college, or university <i>Examples of qualifying degrees include (but are not limited to) those associated with: Clinical informatics, consumer health informatics, public health informatics, clinical research informatics, or translational bioinformatics</i>	50%-100%	4 years within the past 6 years
		20%-49%	6 years within the past 8 years
2	Master's or doctoral degree in a health informatics related field from an accredited program, college, or university <i>Examples of qualifying degrees include (but are not limited to): Dentistry, Nursing, Medicine, Pharmacy, Public Health, Computer Science, and other health professions</i>	50%-100%	6 years within the past 8 years
		20%-49%	8 years within the past 10 years
3	Baccalaureate degree in health informatics or a Baccalaureate degree in a health informatics related field from an accredited program, college, or university <i>Examples of qualifying degrees include (but are not limited to): Dentistry, Nursing, Medicine, Nutrition, Computer and Information Science, Pharmacy, Public Health, Biomedical and Software Engineering, and other health professions</i>	50%-100%	8 years within the past 10 years
		20%-49%	10 years within the past 12 years



Other HIT certifications

[Healthcare Information Management Systems Society \(HIMSS\)](#)

- CPHIMS – Certified Professional in Healthcare Information & Management Systems
- CAHIMS – Certified Associate in Healthcare Information & Management Systems