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Recommended Curriculum Guidelines for Family Medicine Residents

# Medical Informatics

*This document was endorsed by the American Academy of Family Physicians (AAFP).*

## Introduction

This Curriculum Guideline defines a recommended training strategy for family medicine residents. Attitudes, behaviors, knowledge, and skills that are critical to family medicine should be attained through longitudinal experience that promotes educational competencies defined by the Accreditation Council for Graduate Medical Education (ACGME), [www.acgme.org](http://www.acgme.org). The family medicine curriculum must include structured experience in several specified areas. Much of the resident's knowledge will be gained by caring for ambulatory patients who visit the family medicine center, although additional experience gained in various other settings (e.g., an inpatient setting, a patient's home, a long-term care facility, the emergency department, the community) is critical for well-rounded residency training. The residents should be able to develop a skillset and apply their skills appropriately to all patient care settings.

Structured didactic lectures, conferences, journal clubs, and workshops must be included in the curriculum to supplement experiential learning, with an emphasis on outcomes-oriented, evidence-based studies that delineate common diseases affecting patients of all ages. Patient-centered care, and targeted techniques of health promotion and disease prevention are hallmarks of family medicine and should be integrated in all settings. Appropriate referral patterns, transitions of care, and the provision of cost-effective care should also be part of the curriculum.

Program requirements specific to family medicine residencies may be found on the ACGME website. Current AAFP Curriculum Guidelines may be found online at [www.aafp.org/cg](http://www.aafp.org/cg). These guidelines are periodically updated and endorsed by the AAFP and, in many instances, other specialty societies, as indicated on each guideline.

Please note that the term “manage” occurs frequently in AAFP Curriculum Guidelines. “Manage” is used in a broad sense to indicate that the family physician takes responsibility for ensuring that optimal, complete care is provided to the patient. This does not necessarily mean that all aspects of care need to be directly delivered personally by the family physician. Management may include appropriate referral to other health care providers, including other specialists, for evaluation and treatment.

Each residency program is responsible for its own curriculum. **This guideline provides a useful strategy to help residency programs form their curricula for educating family physicians.**

## Preamble

Medical informatics is the interdisciplinary study of the design, development, adoption, and application of information technology-based innovations in health care service delivery, management, planning, and patient care. It is also referred to as applied clinical informatics and operation informatics. Clinical informatics includes a wide range of topics ranging from clinical decision support to visual images (e.g., radiological, pathological, dermatological, ophthalmological). It also includes clinical documentation, provider order entry systems, system design, system implementation, and adoption issues.<sup>1</sup>

The ultimate concern of the physician is patient welfare, yet the medical knowledge required of physicians is beyond the brain's physical capability. Therefore, physicians must leverage information technology to help ensure safe, high quality care. The acquisition, input, retrieval, analysis, and sharing of clinical and administrative data are crucial components of physician proficiency in this expanding field. As leaders of their respective health care teams, physicians must also track tasks, and communicate with team members and patients.

Electronic health record (EHR) systems are one tool being developed to assist physicians in performing their myriad of tasks. Physicians must also be able to filter and use patient education resources to equip patients to be active participants in their treatment plans. Lastly, physicians must be exposed to and be comfortable with new technologies (e.g., mobile technologies, tablets, simulation and gaming centers, teleconferencing and telemedicine) that may be used to improve efficiency, effectiveness, and productivity.

This Curriculum Guideline provides an outline of the competencies, attitudes, knowledge, and skills regarding medical informatics that should be among the objectives of training programs in family medicine. This knowledge will lead to optimal patient care through the appropriate evaluation and application of biomedical information and health information technologies at the point-of-care by future family physicians.

## Competencies

At the completion of residency training, a family medicine resident should be able to:

- Efficiently use appropriate information resources and tools available to support clinical decision making at the point-of-care and to promote lifelong professional learning and enrichment (Patient Care, Medical Knowledge)
- Exhibit understanding of the ways in which medical informatics and information technology can be applied to the continuum of care delivery in order to improve efficiency, cost-effectiveness, quality, and safety (Practice-based Learning and Improvement, Patient Care, Systems-based Practice)
- Access specific, relevant clinical information by performing and appropriately refining database searches through use of necessarily focused medical terminology and concepts (Medical Knowledge)
- Access, enter, and retrieve data related to patient care, and efficiently and accurately document clinical encounters, plans of care, and medical decision making via available clinical information systems and registries (Systems-based Practice, Practice-based Learning and Improvement)
- Describe the role of data across the health care system, the laws governing use of data, and technical approaches to ensuring quality, privacy, and security of data (Medical Knowledge, Systems-based Practice)
- Identify the range of clinical decision support tools; explain how to determine which application is appropriate for specific situations; describe how to develop and implement clinical decision support tools (Medical Knowledge, Systems-based Practice)
- Describe the processes of developing or selecting a clinical information system, preparing and supporting clinicians for system implementation, and evaluating system effectiveness (Systems-based Practice)
- Identify the key types of health information systems and describe how to achieve system interoperability (Systems-based Practice)
- Identify the non-technical factors that influence the adoption of clinical information systems by clinicians and describe strategies for promoting effective use of clinical information systems (Systems-based Practice, Practice-based Learning and Improvement)

## Attitudes and Behaviors

The resident should demonstrate attitudes and behaviors that encompass:

- Encouragement of other members of the care team to develop comfort with and competency in the use of clinically-relevant technologies
- Recognition of the importance of health care professional involvement in the planning, selection, design, and implementation of information systems, and participation in systems- change processes and utility analysis at the point-of-care.
- Awareness of the impact of implementing technology to facilitate medical practice and participating in policy and procedural development related to medical informatics
- Recognition of the relevance of aggregation and analysis of clinical data for improving care quality, patient outcomes, and population health
- Recognition of computer hardware and software system limitations and the need for continual learning in informatics skills, applications, and knowledge as technology continues to advance rapidly
- Understanding of the impact of information systems on clinical workflow and communication within multidisciplinary teams
- Understanding of the appropriate and ethical utilization of social media as it relates to data security, confidentiality, patient's right to privacy and professionalism
- Upholding of legal and ethical standards related to data security, confidentiality, and patients' right to privacy
- Recognition of the importance of accuracy, integrity, and completeness of the medical record, and commitment to playing a critical role in maintaining patient information
- Understanding the continuous System Development Process including planning, analysis, design, implementation, support and security of medical informatics
- Recognition of the role of the family physician as a leader in change management during the implementation and sustainment of informatics system within a clinical environment

## **Knowledge**

In the appropriate setting, the resident should demonstrate the ability to apply knowledge of the following:

1. Information resources and support tools available to aid in clinical decision making and to promote patient education and lifelong learning for clinicians
2. Basic components of computer systems and networks, and the nature of computer-human interfaces as they impact patient care and population health
3. Fundamentals of data modeling and database systems

4. Policies and procedures to ensure the security and confidentiality of patient information and the integrity of computer systems and networks
5. Policies and procedures to ensure the appropriate utilization of social media as it relates to patient information, as well as professionalism
6. Aggregation and analysis of clinical data for improving care quality, population management, and patient and public health outcomes
7. New technologies as they become relevant to clinical practice and patient safety (e.g., changes in informatics system memory, storage and connectivity, user interfaces, metadata, telemedicine, virtual monitoring, personalized health care, wearable systems, and cloud computing)
8. Technology tools to actively engage and involve the patient before, during, and after the visit (e.g., patient portals, post-discharge virtual clinics/telehealth, artificial organs/systems)
9. Technology being utilized within various parts of the health care continuum (e.g., inpatient disinfection robots, 3-D printers, middleware clinical alarms)
10. Health care software trends (e.g., patient-centered devices [diabetes chip], humanoid robots to interact with human patients, mobile health, virtual personal assistants [scribes], digital health, drones for medication delivery)
11. Simulation and gaming technologies to aid in clinician training, enhance patient safety, and engage the public in improving health outcomes
12. System development process, including planning, analysis, design, implementation, support, and security of medical informatics
13. Impact of information system changes on practice patterns, and on physician-patient relations and physician work-life balance

## **Skills**

In the appropriate setting, the resident should demonstrate the ability to independently perform or appropriately refer the following:

1. Participate in projects designed to use technology to promote patient care that is safe, efficient, effective, timely, patient centered, and equitable
2. Incorporate informatics principles across the dimensions of health care including, health promotion, disease prevention, diagnosis, and treatment of individuals and their families across the lifespan and promotion of population health
3. Retrieve information by performing and appropriately refining database searches

4. Access, evaluate, and synthesize data, information, and knowledge from multiple sources and apply to clinical practice, patient education, and professional development
5. Evaluate various clinical information sources for quality, accountability, reliability, and validity and utilizing appropriate evidence for clinical decision making at the point-of-care and for professional learning and enrichment
6. Direct patients to credible online medical information and services, and use information management systems for patient education
7. Direct patients to utilize patient portals that will allow them access to personal health information and maintain appropriate communication with health care providers
8. Effectively utilize health care informatics tools without compromising the physician patient relationship
9. Access, enter, and retrieve data related to patient care, and efficiently and accurately document clinical encounters, plans of care, and medical decision making via available clinical information systems
10. Collaborate with other clinicians and support staff via networks across multiple sites within health care information systems using secure forms of communication (e.g., email, discussion lists, videoconferencing, teleconferencing, text messaging, and related technologies)
11. Effectively use health care informatics as supports business operations while providing security for registration, scheduling, billing, and electronic health record management
12. Effectively use health care informatics as it relates to patient care and communication: telemedicine, diagnostic and imaging tools, social media, digital quality metric tools, point-of-care devices and portals, as well as various interfaces (laboratory, radiology, pharmacy, e-Prescribing)
13. Evaluate and incorporate new applicable technologies for clinical practice and training with an understanding of “implementation fatigue” and burnout
14. Participate in design of data collection tools for practice decision making, record keeping, and participation in quality management/improvement initiatives related to clinical data in practice
15. Evaluate security effectiveness and parameters of systems for protecting patient information and ensuring confidentiality (e.g., authentication, firewalls, encryption)
16. Effectively and securely use social media to effectively and securely manage one’s online reputation, support practices, and help patients deal with their acute and chronic conditions

17. Participate within the system development process, including planning, analysis, design, implementation, support, and security of medical informatics

## Implementation

Implementation of this curriculum should include both focused and longitudinal experiences throughout the residency program. Didactic lectures and journal clubs should be augmented with instruction regarding principles of the physician-patient-computer relationship in daily practice. The model of care should shift from a reactive, individual model to a proactive, population-based model through technology application. Communication should be emphasized as integral to the effective use of information. Ready access to computer and information resources in the clinical care, administrative, and teaching environments should be provided. An efficient and responsive technical support infrastructure should be in place, in addition to a faculty “champion” to direct medical informatics training within the program. A baseline needs assessment at matriculation should lead to appropriate practical training in computer skills literacy through tutorials, and group and/or one-on-one instruction. Avoid applying technology for its own sake and intimidating those who are anxious about technology. Departments should also measure and report educational outcomes to promote evidence-based approaches to high-quality medical informatics training for family medicine residents across the nation.

## Resources

American College of Graduate Medical Education (ACGME). ACGME program requirements for graduate medical education in clinical informatics.

[http://www.acgme.org/portals/0/pfassets/programrequirements/381\\_clinical\\_informatics\\_2016.pdf](http://www.acgme.org/portals/0/pfassets/programrequirements/381_clinical_informatics_2016.pdf). Accessed May 8, 2017.

Bloomrosen M, Detmer D. Advancing the framework: use of health data—a report of a working conference of the American Medical Informatics Association. *J Am Med Inform Assoc*. 2008;15(6):715-722.

Burnette MH, De Groot SL, Dorsch JL. Medical informatics in the curriculum: development and delivery of an online elective. *J Med Libr Assoc*. 2012;100(1):61-63.

Hanauer DA, Branford GL, Greenberg G, et al. Two-year longitudinal assessment of physicians' perceptions after replacement of a longstanding homegrown electronic health record: does a J-curve of satisfaction really exist? *J Am Med Inform Assoc*. 2017;24(e1):e157-e165.

Hersh W, Williamson J. Educating 10,000 informaticians by 2010: the AMIA 10x10 program. *Int J Med Inform*. 2007;76(5-6):377-382.

Mantas J, Ammenwerth E, Demiris G, et al. Recommendations of the International Medical Informatics Association (IMIA) on education in biomedical and health informatics. *Methods Inf Med*. 2010;49(2):105-120.

Metler T, Raptis DA. What constitutes the field of health information systems. *Health Informatics J*. 2012;18(2):147-56.

Shah M. Three technology trends transforming health care. *Forbes*. April 13, 2015. <http://www.forbes.com/sites/athenahealth/2015/04/13/3-technology-trends-transforming-health-care/#25e83ef82601>. Accessed May 8, 2017.

Snow S. The future of healthcare: key software trends for 2015. *Forrester*, March 12, 2015. <https://www.forrester.com/The+Future+Of+Healthcare+Key+Software+Trends+For+2015/-/E-WEB18623>.

Zelnick CJ, Nelson DA. A medical informatics curriculum for 21<sup>st</sup>-century family practice residencies. *Fam Med*. 2002;34(9):685-691.

## Website Resources

Agency for Healthcare Research and Quality. Health Information Technology. <http://healthit.ahrq.gov>

American Academy of Family Physicians. EHR Product Select & Implement. [www.aafp.org/practice-management/health-it/product.html](http://www.aafp.org/practice-management/health-it/product.html)

American Medical Informatics Association (AMIA). <https://www.amia.org/>

International Medical Informatics Association (IMIA). [www.imia.org](http://www.imia.org)

Nursing Informatics Competencies: Self-Assessment. [www.nursing-informatics.com/niassess/index.html](http://www.nursing-informatics.com/niassess/index.html)

U.S. National Library of Medicine. Fact Sheet: Medical Informatics. [www.nlm.nih.gov/pubs/factsheets/trainedu.html](http://www.nlm.nih.gov/pubs/factsheets/trainedu.html)

## Reference

1. American Medical Informatics Association. Clinical informatics. <https://www.amia.org/applications-informatics/clinical-informatics>. Accessed May 8, 2017.



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Cove Hospital