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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 AAFP 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. 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. 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 indicating that the family physician takes responsibility that optimal and complete care is provided to the patient. To manage does not necessarily mean that all aspects of care need to be directly delivered personally by

the family physician and 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 services delivery, management, planning, and patient care. It is also referred to as applied clinical informatics and operation informatics. Clinical informatics encompasses a wide range of topics, including clinical decision support, visual imagery (e.g., radiological, pathological, dermatological, ophthalmological), clinical documentation, provider order entry systems, system design, and system implementation and adoption.[1]

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 are compelled to leverage information technology in the health care industry. The physician must learn to be proficient in collecting and analyzing data, and applying these directly to care decisions to improve patient outcomes. 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 devices, tablets, simulation centers, teleconferencing, and telemedicine) that may be used to improve efficiency, effectiveness, and productivity.

This AAFP 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 utilize appropriate information resources and tools available to support clinical decision making and to promote an attitude of lifelong learning and enrichment (Patient Care, Medical Knowledge)
- Demonstrate 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 refining database searches through use of focused medical terminology and concepts (Medical Knowledge)
- Access, enter, and retrieve data related to patient care, 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 it, its use and technical approaches to ensure privacy and security (Medical Knowledge, Systems-based Practice)
- Identify various clinical decision support tools, their appropriate application to specific situations, and how it is developed
- Understand the process of selecting, developing, and implementing clinical information systems, as well as evaluating its effectiveness
- 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)
- Understand the role of medical informatics in enhancing the accuracy and efficiency of our reimbursement mechanisms, while improving quality of care
- Understand the role of medical informatics in enhancing patient population decisions in patient safety, prevention, and improved quality (Systems-based Practice)

Attitudes and Behaviors

The resident should demonstrate attitudes and behaviors that encompass:

- Promoting a culture of competency in the utilization of clinically relevant technology within the team
- Recognizing the importance of health care professional involvement in selection, design, planning, and implementation of information systems, as well as their participation in process of system improvement and evaluation
- Awareness of the impact of implementing technology in facilitating medical practice, including the development of policies and procedures
- Recognition of the relevance of aggregation and analysis of clinical data for improving care quality, patient outcomes, and population health
- Recognizing the limitations of computer hardware and software system and the need to stay abreast in informatics skills, applications, and knowledge as technology continues to evolve
- Understanding of the role and impact of information systems on clinical workflow and interdisciplinary team communication
- Understanding and applying the legal and ethical standards in the use of social media and its relation to professional, data security, confidentiality and patient’s right to privacy

- Recognition of the importance of accuracy, integrity, and completeness of the medical record, and health provider's 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:

1. Information resources and support tools available to aid in clinical decision making to promote patient education and facilitate 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. Policies and procedures to ensure the security and confidentiality of patient information and the integrity of computer systems and networks
4. Policies and procedures to ensure the appropriate utilization of social media as it relates to patient information, as well as professionalism
5. Application of aggregation and analysis of clinical data for improving care quality, population management, and individual and public health outcomes
6. 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)
7. Importance of technology tools to actively engage and involve the patient before, during, and after the visit (e.g., patient portals, post-discharge virtual clinics, telemedicine, and websites health education)
8. Current health care technology devices, software, data processing utilized within various parts of the health care continuum (e.g., inpatient disinfection robots, 3-D printers, middleware clinical alarms)
9. Current 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)
10. Simulation technologies to aid in clinician training and to enhance patient safety to improve health outcomes
11. System development process, including planning, analysis, design, implementation, support, and security of medical informatics.

12. Impact information system changes have on practice patterns, physician-patient relations, and physician work-life balance

13. Team-based practice approach as part of the data gathering and entry process through the health care continuum, recognizing the physician as a crucial player to ensure accuracy and protection of the data

14. Quantity, complexity, and quality of care can all be captured by expanding the role of the EMR to monitor provider practice and patient responsiveness. This will also enhance the accuracy and efficiency of our reimbursement mechanisms, while improving quality of care.

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, their families, and populations 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 utilize 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 portal to 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 it 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. Effective and secure use of social media to manage and maintain 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

Curriculum implementation should include both focused and longitudinal experiences throughout the residency program. Didactic lectures and journal clubs should include instruction regarding principles of the physician-patient-computer relationship in daily practice. The model of care should shift from an individual model to 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. 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

Accreditation Council for Graduate Medical Education (ACGME). Program requirements for graduate medical education in clinical informatics. www.acgme.org/Portals/0/PFAssets/ProgramRequirements/381_clinical_informatics_2017-07-01.pdf. Accessed February 27, 2019.

American Academy of Family Physicians (AAFP). Family physicians gauge meaningful use benefit, burden. www.aafp.org/news/practice-professional-issues/20180205musurvey.html. Accessed February 27, 2019.

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.

Britton JR. Healthcare reimbursement and quality improvement: integration using the electronic medical record. *Int J Health Policy Manag*. 2015;4(8):549-551.

Burnette MH, De Groote 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*. 2016;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. 3 technology trends transforming health care. April 13, 2015. www.forbes.com/sites/athenahealth/2015/04/13/3-technology-trends-transforming-health-care/#25e83ef82601. Accessed February 27, 2019.

Snow S. The future of healthcare: key software trends for 2015 (webinar). March 12, 2015. www.forrester.com/The+Future+Of+Healthcare+Key+Software+Trends+For+2015/-/E-WEB18623. Accessed February 27, 2019.

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

Website Resources

Agency for Healthcare Research and Quality (AHRQ). Health Information Technology. http://healthit.ahrq.gov

American Academy of Family Physicians (AAFP). EHR Product Select & Implement. 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

Nursing Informatics Competencies: Self-Assessment. 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

Reference

1. American Medical Informatics Association. Clinical informatics. www.amia.org/applications-informatics/clinical-informatics. Accessed February 26, 2019.

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