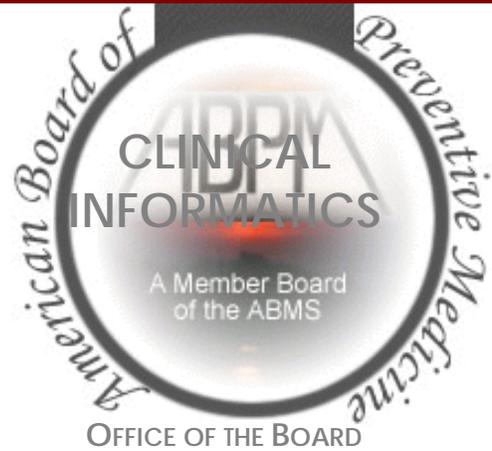


**STUDY GUIDE MATERIALS
EXAMINATION CONTENT OUTLINE**



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Introduction to The Guide

This Guide has been prepared for physicians who seek to become certified in the subspecialty of Clinical Informatics. The Guide describes the scope and content of the subspecialty, so that physicians may know what is expected of them as they prepare for examination by the American Board of Preventive Medicine (ABPM).

The Guide includes an outline of Clinical Informatics content; approximate percentage distributions of test items; lists of books, journals, and other materials found to be useful to practitioners; and general information about Board examinations. The outlines and lists are not claimed to be all-inclusive or definitive. Although the Guide will be revised from time to time, the Board makes no claim that cited texts are best or most current and cannot assure that persons who read any or all listed texts will achieve competence or perform at some predictable level on the examination. Further, it is well recognized that personal backgrounds and preferences are important determinants of the suitability of any particular text or educational medium.

Examinations conducted by the ABPM are intended to confirm the determination the candidate is qualified by training and experience to claim competence. Applicants who judge their training and experience to lack elements regarded by the Board as important will find it helpful to prepare for comprehensive practice, and examination, by guided study. This Guide outlines the scope of practice and provides a list of useful texts and periodicals. There is no certainty the answer to every examination question will be found in the cited materials, as many questions require an exercise of discernment and judgment rather than a specific textbook answer.

Candidates commonly inquire if review books, courses, or similar exam preparation offerings are of value. First, it is important to know that Board and exam committee members do not participate as faculty in such activities and vice versa. Many examinees feel brief courses enhance recall of previously acquired knowledge and improve one's approach to multiple-choice examinations in general. But it is unlikely that anyone will learn in a review course or from a review CD or other media all that one needs to know to pass the exam. Some review questions may be similar to examination questions; however it is not correct to infer that there is a transfer of content as a small change in a question or in a response may change what is the correct answer.

There are no trick questions, and it would be unusual for a question to reflect very recent events or issues (i.e., new "hot" topics) because of the lead time necessary to develop the full examination. The general purpose is to ascertain whether there is a sound base of specialty-relevant knowledge and skills and the ability to exercise discernment and judgment.

There are 200 questions on the Clinical Informatics

examination. All questions are weighted equally. Candidates will find advantage in answering all questions, as there is no penalty for an incorrect answer, i.e., a wrong answer is not subtracted from right answers and there is no advantage in leaving a question unanswered. Thus, the candidate who has no idea as to the correct answer and responds at random will have a 25% chance of selecting it since there are four choices for each question. In most cases, even when the correct answer is not known with confidence, the candidate will have sufficient knowledge to exclude 2 or 3 of the choices as improbable. Guessing on the remaining possibilities offers better odds than 25% and reflects the fact that the candidate should earn partial advantage from knowing what is not right.

Board examination questions are all multiple choice, best single answer with four possible responses. The question may contain a clinical vignette, an experimental or statistical observation, a definition or classification, an administrative problem, an application of a principle or regulation, or any situation potentially faced in practice.

STUDY OUTLINE

The Clinical Informatics outline is intended to describe the core content of the field; the content of the respective examination is essentially congruent. However the statement of scope does not reflect the appropriate weighting of any given item as determined by importance or frequency in practice. Thus, items of fundamental importance and those with less frequent application or more peripheral concern appear in the outline to be equivalent.

The distribution of examination questions is weighted in favor of relevance to actual practice; however, candidates who are preparing to represent themselves as competent must recognize they are responsible for knowledge and skills across the breadth of their chosen subspecialty, not just in the preponderant content of their personal day-to-day practice. Examinations do not stress esoteric facts, and they do require examinees to demonstrate sound understanding. A primary purpose of this outline is to describe the extent of the subspecialty.

REFERENCE MATERIALS

BOOKS

Carter JH. 2008. Electronic Health Records: A Guide for Clinicians and Administrators, Second Edition. Philadelphia PA: ACP Press-American College of Physicians.

DeGoulet P, Fieschi M. 1997. Introduction to Clinical Informatics. New York: Springer-Verlag.

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Kotter JP. 1996. Leading Change. Boston MA: Harvard Business School Press.

O'Carroll PW, Yasnoff WA, Ward ME, Ripp LH, Martin EL. 2003. Public Health Informatics and Information Systems. New York: Springer-Verlag.

Payne TH. 2008. Practical Guide to Clinical Computing Systems: Design, Operations, and Infrastructure. San Diego, CA: Academic Press.

Pantanowitz L, Tuthill JM, Balis UGJ. 2012. Pathology Informatics, Theory & Practice. Chicago, IL: American Society for Clinical Pathology (ASCP).

Shortliffe EH, Cimino JJ. 2006. Biomedical Informatics: Computer Applications in Health Care and Biomedicine. New York: Springer Science+Business Media, LLC.

Van Bemmel J, Musen MA. 1997. Handbook of Medical Informatics. Houten, the Netherland: Bohn Stafleu.

Wager KA, Lee FW, Glaser JP. 2009. Health Care Information Systems: A Practical Approach for Health Care Management, Second Edition. San Francisco CA: Jossey-Bass.

JOURNALS

AI Medicine (AIM)

Applied Clinical Informatics Journal (ACI)

Computer Methods and Programs in Biomedicine (CMPBM)

Computers in Biology and Medicine (CBM)

International Journal of Medical Informatics (IJMI)

Journal of Biomedical Informatics (JBI)

Journal of Medical Internet Research (JMIR)

Journal of Pathology Informatics (JPI)

Journal of the American Medical Informatics Association (JAMIA)

Medical Decision Making (MDM)

PERCENTAGE DISTRIBUTION OF TEST ITEMS

1. Fundamentals 10%
2. Clinical Decision Making and Care Process Improvement 30%
3. Health Information Systems 40%
4. Leading and Managing Change 20%

CONTENT OUTLINE

1. Fundamentals: The basic knowledge that provides clinical informaticians with a common vocabulary and understanding of the environment in which they function.
 - 1.1 Clinical Informatics
 - 1.1.1 The discipline of informatics
 - 1.1.2 Key informatics concepts, models, and theories
 - 1.1.3 Clinical informatics literature
 - 1.1.4 International clinical informatics practices
 - 1.1.5 Ethics and professionalism
 - 1.1.6 Legal and regulatory issues
 - 1.2 The Health System
 - 1.2.1 Determinants of individual and population health
 - 1.2.2 Primary domains, organizational structures, cultures, and processes
 - 1.2.3 The flow of data, information, and knowledge within the health system
 - 1.2.4 Policy & regulatory framework
 - 1.2.5 Health economics and financing
 - 1.2.6 Forces shaping health care delivery
 - 1.2.7 Institute of Medicine quality components
2. Clinical Decision Making and Care Process Improvement: The knowledge and skills that enable a clinical informatician to implement effective clinical decision making systems and participate in the development of clinical processes that support effective, efficient, safe, timely, equitable, and patient-centered care.
 - 2.1 Clinical Decision Support
 - 2.1.1 The nature and cognitive aspects of human decision making
 - 2.1.2 Decision science
 - 2.1.3 Application of clinical decision support
 - 2.1.4 Transformation of knowledge into clinical decision support tools
 - 2.1.5 Legal, ethical, and regulatory issues
 - 2.1.6 Quality and safety issues
 - 2.1.7 Supporting decisions for populations of patients
 - 2.2 Evidence-based Patient Care
 - 2.2.1 Evidence sources
 - 2.2.2 Evidence grading
 - 2.2.3 Clinical guidelines
 - 2.2.4 Implementation of guidelines as clinical algorithms
 - 2.2.5 Information retrieval and analysis

- 2.3 Clinical Workflow Analysis, Process Redesign, and Quality Improvement
 - 2.3.1 Methods of workflow analysis
 - 2.3.2 Principles of workflow re-engineering
 - 2.3.3 Quality improvement principles and Practices
- 3. Health Information Systems: The knowledge and skills that enable a clinical informatician to participate in the development or selection of an information system for clinicians; prepare clinicians prior to implementation and support them during implementation and ongoing operation of a clinical information system; and evaluate the effectiveness of a system in meeting clinical needs.
 - 3.1 Information Technology Systems
 - 3.1.1 Computer Systems
 - 3.1.2 Architecture
 - 3.1.3 Networks
 - 3.1.4 Security
 - 3.1.5 Data
 - 3.1.6 Technical approaches that enable sharing data
 - 3.2 Human Factors Engineering
 - 3.2.1 Models, theories, and practices of human-computer (machine) interaction
 - 3.2.2 HCI Evaluation, usability testing, study design and methods
 - 3.2.3 Interface design standards and design principles
 - 3.2.4 Usability engineering
 - 3.3 Health Information Systems and Applications
 - 3.3.1 Types of functions offered by systems
 - 3.3.2 Types of settings where systems are used
 - 3.3.3 Electronic health/medical records systems as the foundational tool
 - 3.3.4 Telemedicine
 - 3.4 Clinical Data Standards
 - 3.4.1 Standards development history and current process
 - 3.4.2 Data standards and data sharing
 - 3.4.3 Transaction standards
 - 3.4.4 Messaging standards
 - 3.4.5 Nomenclatures, vocabularies, and terminologies
 - 3.4.6 Ontologies and taxonomies
 - 3.4.7 Interoperability standards
 - 3.5 Information System Lifecycle
 - 3.5.1 Institutional governance of clinical information systems
 - 3.5.2 Clinical information needs analysis and system selection
 - 3.5.3 Clinical information system implementation
 - 3.5.4 Clinical information system testing before, during and after implementation
 - 3.5.5 Clinical information system maintenance
 - 3.5.6 Clinical information system evaluation

- 4 Leading and Managing Change: The knowledge and skills that enable clinical informaticians to lead and manage changes associated with implementing clinical information systems and promoting adoption by health professionals.
 - 4.1 Leadership Models, Processes, and Practices
 - 4.1.1 Dimensions of effective leadership
 - 4.1.2 Governance (e.g., processes; responsibility versus authority)
 - 4.1.3 Negotiation
 - 4.1.4 Conflict management
 - 4.1.5 Collaboration
 - 4.1.6 Motivation
 - 4.1.7 Decision making
 - 4.2 Effective Interdisciplinary Teams
 - 4.2.1 Human resources management (e.g., hiring, performance reviews and feedback, professional development, termination)
 - 4.2.2 Team productivity and effectiveness (e.g., articulating team goals, defining rules of operation, clarifying individual roles)
 - 4.2.3 Group management processes (e.g., nominal group, consensus mapping, Delphi method)
 - 4.2.4 Managing meetings
 - 4.2.5 Managing group deliberations
 - 4.3 Effective Communications
 - 4.3.1 Effective presentations to groups
 - 4.3.2 Effective one-on-one communication
 - 4.3.3 Writing effectively for various audiences and goals
 - 4.3.4 Developing effective communications program to support system implementation
 - 4.4 Project Management
 - 4.4.1 Basic principles
 - 4.4.2 Identifying resources
 - 4.4.3 Resource allocation
 - 4.4.4 Project management tools (non-software specific)
 - 4.4.5 Informatics project challenges
 - 4.5 Strategic and Financial Planning for Clinical Information Systems
 - 4.5.1 Establishing mission and objectives
 - 4.5.2 Environmental scanning
 - 4.5.3 Strategy formulation
 - 4.5.4 Action planning and strategy implementation
 - 4.5.5 Capital and operating budgeting
 - 4.5.6 Principles of managerial accounting
 - 4.5.7 Evaluation of planning process
 - 4.6 Change Management
 - 4.6.1 Assessment of organizational culture and behavior
 - 4.6.2 Change theories (e.g., precede-proceed, social influence theories, complex adaptive systems)
- 4.6.3 Change management strategies
- 4.6.4 Strategies for promoting adoption and effective use of clinical information systems