ASSOCIATION OF AMERICAN MEDICAL COLLEGES

Report II

# Contemporary Issues in Medicine: Medical Informatics and Population Health

Medical School Objectives Project

June 1998

Copyright 1998 by the Association of American Medical Colleges. All rights reserved.

To request additional copies of this publication, please contact:

Brownell Anderson
Association of American Medical Colleges
2450 N Street, NW
Washington, DC 20037-1134
Phone: 202-828-0412 • Fax: 202-828-0972
E-mail: mbanderson@aamc.org

# Introduction

In February 1998 the Association of American Medical Colleges (AAMC) issued Report I of the Medical School Objectives Project (MSOP). The purposes of the MSOP were to set forth program level learning objectives that medical school deans and faculties could use as a guide in reviewing their medical student education programs (initial phase), and to suggest strategies that they might employ in implementing agreed upon changes in those programs (implementation phase). Issuing MSOP Report I concluded the initial phase of the project. That report set forth 30 program level learning objectives that represented a consensus within the medical education community on the knowledge, skills, and attitudes that students should possess prior to graduation from medical school.

Report I set forth three learning objectives that reflected a growing awareness that in the future physicians will be expected to be more effective than is now the case in acquiring, managing, and utilizing information for clinical decision-making (medical informatics), and to be committed to using systematic approaches for promoting and maintaining the health of both individuals and the populations of which those individuals are members (population health perspective). These objectives are restated below:

For its part, the medical school must ensure that before graduation a student will have demonstrated, to the satisfaction of the faculty:

- the ability to retrieve (from electronic databases and other resources), manage, and utilize biomedical information for solving problems and making decisions that are relevant to the care of individuals and populations
- knowledge of the epidemiology of common maladies within a defined population, and the systematic approaches useful in reducing the incidence and prevalence of those maladies
- an understanding of, and respect for, the roles of other health care professionals, and of the need to collaborate with others in caring for individual patients and in promoting the health of defined populations

At the outset of the MSOP, AAMC staff recognized that there were certain contemporary issues in medicine that would present special challenges to medical school deans and faculties committed to aligning the design and content of their educational programs "with evolving societal needs, practice patterns, and scientific developments." Medical informatics and population health were two of those issues. Thus, to assist deans and faculties in their efforts to design and implement educational experiences that would allow students to acquire the knowledge, skills, and attitudes required to achieve the above objectives, the AAMC established two expert panels - one on medical informatics and one on population health - and charged each to develop more detailed learning objectives for the topic under consideration by the panel, and to suggest learning experiences and implementation strategies that deans and faculties might adopt to enable students to achieve those objectives.

Medical informatics and population health are interrelated topics. Physicians will have to possess the knowledge, skills, and attitudes required to be competent in medical informatics if they wish to incorporate into their practices systematic approaches for promoting and maintaining the health of defined populations. For this reason, the reports of the two expert panels are presented together in this document - MSOP Report II.

Each of the panel reports included in this document was reviewed by others with experience and expertise in medical informatics and population health. The report of the Medical Informatics Advisory Panel was reviewed by the Education Committee of the American Medical Informatics Association (AMIA), and discussed in detail by the general membership at the 1997 AMIA national meeting. The report of the Population Health Perspective Panel was reviewed by a select group of physician executives who work for major managed care organizations, and then reviewed and endorsed by the Committee on Quality Health Care of the American Association of Health Plans (AAHP).

This report - MSOP II - is the second of a series of reports that will be issued by the AAMC during the course of the project. Each of the subsequent reports will address a particularly challenging contemporary issue that medical school deans and faculties must confront in order to align the content of their medical student education programs "with evolving societal needs, practice patterns, and scientific developments."

# Medical Informatics Advisory Panel

## I. Introduction

The Medical Informatics Advisory Panel was charged to provide guidance on learning objectives related to medical informatics. To this end, the panel has developed recommendations to help ensure that medical school graduates have a foundation in medical informatics that will support them, as physicians in the 21st century, to efficiently utilize increasingly complex information for problem solving and decision making. The recommendations consist of a set of learning objectives expressing the competencies medical schools should help their students attain, as well as a set of implementation strategies outlining ways schools can develop educational programs that address these learning objectives.

### A. Definition and Scope of Medical Informatics

*Medical informatics is the rapidly developing scientific field that deals with resources, devices and formalized methods for optimizing the storage, retrieval and management of biomedical information for problem solving and decision making.*[1,2]

The emergence of medical informatics as a discipline is due in large part to advances in computing and communications technology, to an increasing awareness that biomedical knowledge and clinical information about patients are essentially unmanageable by traditional paper-based methods, and to a growing conviction that the processes of knowledge retrieval and expert decision making are as important to modern biomedicine as the fact base on which clinical decisions or research plans are made.

Medical informatics is an interdisciplinary field based on computer science, information science, the cognitive and decision sciences, epidemiology, telecommunications, and other fields. Researchers in medical informatics discover new methods and techniques to enhance health care, biomedical research, and education through information technology. These advances are applicable to all basic and clinical domains of biomedicine.

1 Greenes RA, Shortliffe EH. Medical Informatics: An emerging academic discipline and institutional priority. JAMA 1990; 263:1114-1120

2 Shortliffe EH, Perreault LE, Wiederhold G, Fagan LM, eds. Medical Informatics: Computer applications in health care. Reading, MA: Addison-Wesley, 1990. (See Chapter 1. page 20)

## B. Educational Premise

The argument that medical informatics should be a central feature of the medical curriculum rests on the following premise:

*To support health care, life-long learning, education, research and management, medical students should be able, at the time of graduation, to utilize biomedical information for: formulating problems; arriving at strategies for solutions; collecting, critiquing and analyzing information; taking action based on findings; and communicating and documenting these processes and the results.*

## C. Organization of the Objectives

*The Medical Informatics Advisory Panel identified five major roles played by physicians—Life-long Learner, Clinician, Educator/Communicator, Researcher, and Manager—as those in which medical informatics plays a vital part.*

The learning objectives are framed within the context of these five roles. The panel recognizes that these roles are intertwined in daily practice. For instance, a physician addressing a challenging case is primarily in his/her clinician role but may also be: a learner, discovering what the biomedical literature has to say about a potential treatment plan; a researcher, comparing this particular patient's circumstances with others previously treated at the institution; an educator, helping the patient understand the treatment options; and a manager, making arrangements to ensure that the treatment plan can actually be implemented. The categorization of objectives according to roles is therefore somewhat artificial, and, as a result, occasional overlaps will be seen in the objectives that follow. Nonetheless, this categorization may help schools develop their educational programs and track their progress along the way.

By organizing these objectives according to physician roles, the panel also sought to emphasize connections with other elements of the curriculum. Schools may find that they currently address some of these objectives through offerings in related fields such as clinical epidemiology, evidence-based medicine, or medical decision making. Medical school curricula operate at the limit of what can be achieved in four years. Adding entirely new components, no matter how important they are, is a daunting task. Because medical informatics draws from and affects so much of what is already taught, the panel believes that the most practical and sustainable approach to achieve these objectives is one of infiltration: enhancement of existing curricular elements as opposed to creation of entirely new ones. The Implementation Strategies address these considerations explicitly.

## D. Scope and Specificity of the Objectives

The methods, tools and resources developed through medical informatics often help physicians accomplish tasks that they were already doing, enabling them do so more efficiently or in entirely new ways. Other applications of information technology allow physicians to accomplish tasks that were not previously possible. Each objective is included below only if, by its attainment, a physician's ability to fulfill the specified role has been significantly informed, transformed, or enabled by medical informatics.

The panel elected to express these objectives in terms of *what students should be able to do with information technology and what knowledge and attitudes about information technology they require for these purposes*—in service of the five physician roles. The panel did not specify "how", in terms of hardware and software implementation, each of these tasks should be carried out. Addressing the latter would have made this document rapidly obsolete as the technology itself is changing so rapidly. In this and many other ways, these objectives are intended as a guide. Individual institutions will necessarily add detail to these objectives, modifying them to suit local emphases, priorities, and available resources.

The panel also distinguished these objectives from those traditionally seen as "computer literacy". While basic literacy is essential for appropriate use of information technology and resources, the panel assumed that increasing numbers of students are bringing these competencies to medical school. Examples of what the panel sees as computer literacy competencies as listed at the end of this report. All medical schools should identify, at a very early stage of the curriculum, medical students who have not mastered these literacy objectives and should provide appropriate experiences to assist them.

The panel acknowledges that the objectives listed below are ambitious. The panel members deliberately elected to articulate a high standard, to suggest and make explicit what may be possible with time, rather than limiting their scope to more immediately attainable goals. As specified in the Implementation Strategies, the panel advocates a graduated approach to developing educational programs that address these objectives. The objectives are offered without explicit or implicit priorities. It is necessary for each school to set local priorities as directed by its own values and resources. These priorities in turn direct which objectives are addressed sooner and/or in greater depth.

# II. Objectives

## A. Role of Life-long Learner

*Medical education is a life- (or at least career-) long process beginning with medical school, extending into residency, and continuing through years of medical practice. Support of life-long learning with information technology requires more than computer literacy. Other requirements include cognizance of the broad range of medical information resources available and their relative value for particular needs, the know-how to use them, and the motivation to use them routinely. To provide a foundation for life-long learning, the successful medical school graduate should be able to do the following:*

1. Demonstrate knowledge of the information resources and tools available to support life-long learning. Knowledge includes awareness of these resources, their content, and the information needs they can address. Relevant resources include MEDLINE and other relevant bibliographic databases, textbooks and reference sources, diagnostic expert systems, and medical Internet resources.

2. Retrieve information, demonstrating the ability to:
   a. Perform database searches using logical (Boolean) operators, in a manner that reflects understanding of medical language, terminology and the relationships among medical terms and concepts.
   b. Refine search strategies to improve relevance and completeness of retrieved items.
   c. Use a standard bibliographic application to download citations from a search and organize them into a personal database.
   d. Identify and acquire full-text electronic documents available from the World Wide Web or a local “virtual” library.

3. Filter, evaluate, and reconcile information, demonstrating the following:
   a. Knowledge of the factors that influence the accuracy and validity of information in general.
   b. The ability to discriminate between types of information sources in terms of their currency, format (for example a review vs. an original article), authority, relevance, and availability.
   c. The ability to weigh conflicting information from several sources and reconcile the differences.

d. The ability to critically review a published research report.

e. Knowledge of copyright and intellectual property issues, especially with regard to materials that are retrieved electronically.

4. Exhibit good "information habits." These reflect attitudes that support the effective use of information technology, and include:

   a. Using multiple information sources for problem solving.

   b. Maintaining a healthy skepticism about the quality and validity of all information. (This includes recognition that technology which provides new capabilities also has the potential to introduce new sources of error.)

   c. Making decisions based on evidence, when such is available, rather than opinion.

   d. An awareness of the many ways information becomes lost or corrupted and the need to take appropriate preventative action (for example, routinely employing backup procedures for personal and institutional data).

   e. Effectively using security procedures (for example, choosing "good" pass words, not sharing them, and changing them often).

   f. Protecting confidentiality of private information obtained from patients, coll leagues, and others.

## B. Role of Clinician

*The clinician must acquire information about the patient, make clinical decisions based on available information, and document and relay findings. To lay the foundation for supporting the full range of clinical activities with information technology, the successful medical school graduate should be able to do the following:*

1. Retrieve patient-specific information from a clinical information system, demonstrating the ability to display selected subsets of the information available about a given patient.

2. Interpret laboratory tests, demonstrating the following:

   a. Knowledge of the limitations of standard laboratory measurements.

   b. The ability to integrate clinical and laboratory findings

3. Incorporate uncertainty explicitly into clinical decision making, demonstrating the ability to:

a. Quantify and communicate the degree of certainty associated with specific items of scientific and clinical information.

b. Identify and locate, when possible, the crucial pieces of missing clinical information, and determine when it is appropriate to act on incomplete information.

c. Integrate verbal and statistical sources of medical knowledge with the facts of a specific clinical case.

4. Make critical use of decision support, demonstrating knowledge of the available sources of decision support which range from textbooks to diagnostic expert systems to advisories issued from a computer-based patient record.

5. Formulate a treatment plan, demonstrating the ability to do the following:

   a. Express the relative certainties of a differential diagnosis.

   b. Express the relative risks and benefits of outcomes and treatment options.

   c. Take action by balancing them.

6. Document and share patient-specific information, demonstrating the ability to record in information systems specific findings about a patient and orders directing the further care of the patient.

7. Respect patient (and physician) confidentiality, demonstrating the following:

   a. Knowledge of the legal, ethical, and medical issues surrounding patient documentation, including confidentiality and data security.

   b. The ability to use security-directed features of an information system.

## C. Role of Educator/Communicator

*Physicians play significant roles as teachers in various contexts: with peers and students, with their patients, and with the public at large. In all contexts they must also communicate effectively. To provide a foundation through which information technology can effectively support the physician as educator, the successful medical school graduate should be able to do the following:*

1. Select and utilize information resources for professional and patient education, demonstrating:

   a. Practical knowledge of instructional technologies and resources available via the Internet, CD-ROM, video teleconferencing, and other media.

b. The ability to effectively utilize various computer-based instructional tools, including electronic tutorials and patient simulations.

c. The ability to effectively utilize a variety of computer-based self assessment tools.

2. Effectively employ written, electronic and oral communication, demonstrating the following:

a. The ability to use software to create visual materials that effectively support oral presentations.

b. The ability to create a handout that includes simple graphics and tables for use in teaching or patient education.

c. The ability to collaborate across multiple sites using electronic mail, discussion lists, news groups, teleconferencing, and related communication technologies.

d. Knowledge of institutional electronic communications policies.

## D. Role of Researcher

*"Research" includes traditional biomedical research performed primarily in the laboratory as well as clinical research exploring outcomes of medical interventions. These activities are performed by a relatively small proportion of physicians. However, the use of research tools and techniques is not restricted to formal studies. In addition, the relative ease of access to aggregate data in electronic form means that many clinical questions of the physician who is not a full-time researcher may be easily addressed through "ad hoc" research. Therefore, as we extend the tasks of a physician to include the examination of primary data across patients or other units, we see proper use of appropriate research tools as central to every physician's work. Examples include determination of a practice's case mix, determination of the incidences of diagnoses in a practice, testing the efficacy of a new treatment, and assuring quality of care.*

*Physician-researchers must understand sources for data and employ methods of decision theory to help formulate testable hypotheses; and they must collect, organize, analyze and interpret the data. They should also have an appreciation for the roles that medical informatics and computational biology have played in the conduct of modern biomedical research. To establish the foundation for information technology to support physicians in the roles as researchers, the successful medical school graduate should be able to do the following:*

1. Determine what data exist relative to a clinical question or formal hypothesis, demonstrating the following:

a. The ability to use information technology to locate existing data sources.

b. Knowledge of data sources (including medical records, claims and reimbursement information and online data) at one's own institution by identifying how these might be used to address a specific clinical question posed as research.

c. The ability to identify and locate existing data sets not maintained at one's own institution (e.g., national registry data) that might be used to address a specific clinical question posed as research.

2. Execute a plan for data collection and organize data for analysis, demonstrating the ability to:

   a. Select an appropriate computer database tool for collecting and organizing data.

   b. Properly represent data from a study in a form that is useful and supports computer-based analysis.

3. Analyze, interpret and report findings, demonstrating the ability to:

   a. Select the appropriate computer software tool for analysis of data.

   b. Use software to perform simple statistical analysis and portray the results graphically.

   c. Interpret the reports of statistical software analysis.

4. Appreciate information technology's impact on basic biomedical research, demonstrating an understanding of ways in which information technology supports:

   a. Gene sequencing and genetic data banks.

   b. Automation of laboratory experiments.

   c. Bibliographic retrieval and management of the biomedical literature

## E. Role of Manager

*Physicians must understand and manage costs, manage and work effectively in groups, and effectively manage themselves. They also must understand their roles within the context of the overall health care system. To establish a foundation for information technology to support physicians in their managerial roles, the successful medical school graduate should be able to do the following:*

1. Appreciate the role of information technology in relation to managing the cost of medical care and its impact on individuals and society, demonstrating knowledge of the following:

a. On-line sources of health care financing information.

b. Continuous quality improvement and process management.

c. How information technology can be used to develop, implement, and monitor compliance with clinical pathways and other forms of patient care protocols.

d. How clinical information in the aggregate is used to determine health care service planning for populations.

2. Formulate and make decisions for individuals and groups, demonstrating the following:

a. Knowledge of cost/benefit issues in health care.

b. The ability to use a decision-analysis package.

c. The ability to use software assessing patient utilities.

d. The ability to incorporate economic and cost perspectives.

3. Work effectively as an individual, in interprofessional groups, and as a member of a complex health care system, demonstrating the following:

a. The ability to use electronic personal and clinical scheduling systems.

b. The ability to archive and organize digital information of personal and clinical import.

c. Knowledge of online resources for legislation, political advocacy, and local health care policy setting.

## III. Implementation Strategies

The panel identified ways in which schools might implement educational programs addressing the learning objectives listed above. These strategies, as a group, envision the ultimate embedding of experiences relating to informatics as opposed to exclusive reliance on a categorical informatics course to achieve some or all of the above objectives.

The strategies are expressed in two tables. Table 1 addresses a set of curricular issues and suggests:

- what might be an “initial strategy” pursed by a school at an early stage of addressing medical informatics in the curriculum,

**Table 1. Curricular Issues**

| Issue | Initial Strategy | Ideal State | Strategic Advice |
|---|---|---|---|
| When to teach | Once in years basic science | Throughout all four years | Include informatics as a theme in the school's next curriculum revision |
| Structure | Categorical course in medical informatics | Informatics embedded in all courses | Work with and focus on strengths already at the institution |
| Who teaches | Informatics specialists | All faculty | Create formal opportunities for "rank and file" faculty to learn to participate in teaching this material<br><br>Informatics specialists should seek opportunities to integrate their material into the overall curriculum |
| Breadth of coverage | All students; selected objectives | All students; all objectives | Customize the objectives to your institution |
| Assessments | Tests are specific to objectives | Assessment is built into overall evaluation schema | Build questions addressing informatics objectives into course examinations<br><br>Develop "open computer" (analogous to "open book") examinations |
| Sequence | None; everything is taught together sophistication of tasks | Cumulative, with increasing between student | Use information technology to enable collaborative projects |

- an "ideal state" which expresses the panel's view of the best curricular approach to addressing medical informatics,
- some "strategic advice" provided as illustrative steps schools can take to move from an initial strategy to the ideal state.

Table 2 has a similar organization but addresses instructional issues and approaches. The panel recognizes that each institution will ultimately invent its own ideal state and that attainment of the ideal state will require a process extending over several years. Additional implementation strategies emerge from the widespread investment in information technology, primarily to support health care and its management, that is occurring in virtually all academic medical centers. These investments are creating

**Table 2: Instructional Issues**

| Issue | Initial Strategy | | Ideal State | Strategic Advice |
|---|---|---|---|---|
| Where | Central Computer Lab | Multiple Satellite Labs | Point of Service | The health sciences library is a major resource<br><br>Information technology supplied for students can also bring important resources to preceptors/community doctors |
| Pacing | Lockstep: All students are exposed to a given topic at the same time | | Self-paced: Students learn on an as-needed basis with appropriate support | The clinical years of the curriculum provide a natural setting for self-paced learning, as do problem-based learning settings |
| Approach | Reception learning; didactic sessions with closed-ended tasks | | Discovery learning; open-ended tasks | Use students (especially those with advanced computer skills) in a teaching role<br><br>Faculty will require recognition for the contributions to developing new educational materials |

a technology infrastructure, in the form of desktop computers that are placed throughout the environment, other computing devices, and networks to interconnect them. It is important for applications of information technology that originate within the medical curriculum to take advantage of this infrastructure, to utilize these networks and computers, and adopt whatever standards the institution as a whole is adopting. There should not be, within academic medical centers, a separate information technology architecture to support the educational mission of the institution. Systems to support all aspects of the institutional mission should be as integrated as possible.

To realize this integration, representatives of the educational mission should participate in the processes determining information technology strategy for the institution as a whole. Deans and other institutional leaders should take steps to ensure that representatives of the educational mission are “at the table” when strategic decisions regarding the deployment of information technology are made. This approach is in full accord with the Integrated Advanced Information Management Systems (IAIMS) program of the National Library of Medicine. (See “http://www.nlm.nih.gov/pubs/factsheets/iaims.html” for more information on IAIMS)

Another key component of an overall implementation strategy is to involve students. Because many students are technologically sophisticated, they can be important and influential forces for change. The more experienced students can be opinion leaders among their colleagues, to shape and legitimate the curricular approach that is followed. Students can contribute to development of software that may be needed to address informatics objectives, and other applications of technology to education, through summer jobs and internship experiences. Students can also play an important role as teachers of their peers in formal curricular experiences that address the informatics objectives.

The AAMC can contribute to this effort in important ways, helping member institutions address these objectives. The AAMC Curriculum Management & Information Tool (CurrMIT) can track the more specific objectives established by individual schools, opening these to inspection and sharing across institutions. Workshops, programs at meetings, and other AAMC-sponsored activities can assist curriculum leaders and faculty members develop strategies to effect change. Initiatives of the AAMC that support information resources in general can and should, as part of their overall mission, embrace these objectives and support the efforts of individual institutions to attain them.

## Computer Literacy Issues

Students must have certain basic skills before they can develop higher level informatics competencies. Many students will acquire them during their premedical education. The skills should be assessed at the start of medical school and deficiencies should be addressed early in the first year. Upon entry into medical school, students should be able to demonstrate basic computer literacy, including the following abilities:

a. To launch a computer application.

b. To save work to a computer file.

c. To print a file.

d. To copy a file for use on another computer.

e. To use a standard word processing program to create and edit a formatted document using tables and graphics.

f. To use electronic mail effectively, including proper etiquette.

g. To access and use the World Wide Web.

# Medical Informatics Advisory Panel

Chair: Charles P. Friedman, Ph.D.
Director, Center for Biomedical Informatics, Professor of Medicine
University of Pittsburg

Milton Corn, M.D.
Acting Associate Director
National Library of Medicine Extra Mural Programs

Mark Frisse, M.D.
Chief Information Officer
Washington University School of Medicine

Joseph W. Hales, Ph.D.
Assistant Research Professor, Division of Medical Informatics
Duke University Medical Center

Helene Hoffman, Ph.D.
Assistant Dean for Curriculum and Educational Computing
University of California - San Deigo School of Medicine

Harold Lehmann, M.D., Ph.D.
Assistant Professor of Medicine, Director of Medical Informatics Education
The Johns Hopkins University

Richard Rathe, M.D.
Associate Professor & Director of Medicial Infomatics
Univesity of Florida College of Medicine

Albert A. Salas, M.A.
AAMC Staff

# Population Health Perspective Panel

## Introduction

The Population Health Perspective Panel was convened to support the efforts of the AAMC's Medical School Objectives Project. The panel was asked to provide guidance to the MSOP on educational objectives related to population health, and on how schools might design and implement educational strategies to achieve the panel's recommended objectives.

In order to meet its charge, the panel first developed a consensus definition of what is meant by a population health perspective. The panel concluded that *a population health perspective encompasses the ability to assess the health needs of a specific population; implement and evaluate interventions to improve the health of that population; and provide care for individual patients in the context of the culture, health status, and health needs of the populations of which that patient is a member.*

In considering how this definition might be applied in the design and implementation of educational activities and in medical practice, the panel recognized that a single person might be a member of several different populations, each of which presents different aspects or perspectives on health and health care to the observer. These perspectives may differ depending on the seniority and work of the clinician. For example, a primary care doctor practicing in a neighborhood health center would be concerned especially with the geographic community, while a medical director of a health plan might learn more by understanding the population of employees and family members of its largest corporate customers.

Of the many possible populations that could be studied, the panel emphasized four that they thought would generate the most powerful insights and richest learning for today's medical students preparing for their future challenges.

- The geographic community: the prototypical public health perspective
- The patient panel: the population for whom a doctor's team or a doctor has health care responsibility

- The disease state or clinical condition: the common conditions that consume a large part of our health care dollar or lead to significant disability
- By demographic characteristic: groupings by age, gender, economic, cultural, and educational status.

While accepting that the educational principles are the same in analyzing these and other populations, the panel urged that these four receive special emphasis in the schools' educational programs.

## Pressures For and Against Change

Before articulating the educational objectives and strategies, the panel wished to note that medical educators and public health experts have been calling for medical schools to improve their teaching of population health for many years. The panel concluded that several structural and perceptual features have created obstacles to change in the past and that these must be addressed if the panel's recommendations are to be embraced. The panel emphasized three important barriers: the "ownership" of population health in the medical school organization; the absence of dedicated funding to support population health curriculum development and teaching; and the view within the academic community that population health is simply a response to concerns expressed by the managed care industry.

*Ownership of Population Health in the Medical School Environment*:
A substantial obstacle lies in the cross disciplinary nature of population health instruction as it occurs at most medical schools; namely, the competencies are not "owned" by any one department, particularly a department that has much leverage in curriculum control. If responsibility and oversight for the teaching of these competencies resided in an accountable organizational entity, with a clear delineation of the expected outcomes of this training, instruction time could better be negotiated and the importance of measuring these outcomes might be better advocated. If population health had a clear place and legitimization within the curriculum, students could expect that these objectives would be reinforced in the clinical years by residents and clinical faculty.

*Lack of Dedicated Funding to Support New Initiatives in Teaching Population Health:*
Because budgets are constructed around departmental organization, there is no

explicit funding for faculty to develop and implement teaching initiatives aimed at population health objectives.

*Misconceptions about Impetus Behind Integrating Population Health Perspective:*
The fundamental principles supporting efforts in population health training exist independently of the managed care delivery system, and yet the education mission and managed care mission are conflated in the minds of some. This misconception impedes education efforts to expand such training because faculty fear they are responding to a managed care imperative rather than preparing future practitioners for the medicine of the next century.

Despite these three obstacles, the panel believes that positive new influences within and beyond the medical education community are emerging to support change. These forces provide a rationale and impetus to change the traditional educational focus to encompass a perspective that includes population health models.

*Public Sector Pressure:*
With increased focus on the health care delivery system and rising consumerism, the public's expectation is that the educational enterprise should produce physicians (and other health professionals) to meet the needs of the public. In this context, increasing pressure will be brought to bear on medical schools to produce graduates with the knowledge, skills, and attitudes needed to address the health problems faced by society.

*Students' Expectations:*
Students expect to be prepared to practice effectively in the current and future environment of health care in the United States, including managed care and public health arenas. As reflected by responses on the 1996 AAMC Graduation Questionnaire, medical school graduates are critical of their education in public health and community medicine, health promotion and disease prevention, and the role of community health, social service, and other non-physician providers.

*Managed Care/HMO Requirements:*
Hospitals, integrated delivery systems, group practices, and HMOs need doctors who are better at "managing" care and managing the health of the populations for which they are accountable. Medical schools will be expected to produce physicians better prepared to function effectively in the health care financing and delivery environment of the 21st century.

# The Educational Elements

*The educational disciplines:*

The educational domains encompassing training in a population health perspective include Epidemiology; Biostatistics; Disease Prevention/Health Promotion; Health Care Organization, Management, and Financing; Environmental and Public Health.

*Educational Objectives:*

Prior to graduation, a medical student should have demonstrated to the satisfaction of his/her faculty the following:

- The ability to define and describe a population, its demography, cultural and socioeconomic constitution, circumstances of living, and health status; and to understand how to gather health information about this population. Defining the population includes the use of rates, incidence, prevalence, and demographic descriptors to characterize its health, disease (with awareness of the community from which the patient comes), and social and behavioral risk factors.
- The ability to read critically clinical studies and apply findings to health care decisions involving real patients and panels of patients.
- An understanding of the implications of local systems of health care (organization, financing, and management) on delivering patient care to specific patients. The student will use this understanding as s/he develops general clinical skills.
- The ability to incorporate principles of disease prevention and behavior change appropriate for specific populations of patients within a community. The student is not only knowledgeable about specific health risks but can also integrate this knowledge in routine patient care responsibilities.
- The ability to function effectively as part of a health care team and not the sole deliverer of health care. The student values the unique contribution of different members of a health care team and can solve problems of a patient panel or individual patient as a member of an effective team.
- Respect for cultural and socioeconomic diversity, willingness to work through systems, willingness to work in collaboration with other members of the health care team, and willingness to accept at least partial responsibility for the health of populations.

The panel identified three educational principles that it felt schools should meet as they design educational activities. These principles reflect the panel's opinion that population health is best taught through examples and experiences, not courses. These principles are: first, teaching students the practical fundamentals of the core disciplines that underpin the effective application of population health; second, giving students experiences in studying real populations; and, third, integrating the teaching and learning into all parts of medical curriculum rather than relying solely on a stand-alone population health course. By addressing basic principles of population health early in the curriculum, schools will support applied field and clinical experiences that reinforce the acquisition and retention of practical population health knowledge and skills. The panel agreed on several uniform criteria that must be satisfied in designing educational experiences. The knowledge, skills, and attitudes taught in the population health curriculum should:

- Add value to served communities;
- Have high face validity to the learners;
- Be learned in the settings of integrated, accountable delivery systems;
- Reinforce competencies that are attractive to managed care partners that share the teaching responsibility.

Given this approach, the panel recommended the following:

- Develop a didactic curriculum spanning four years that begins with a critical evaluation of study designs; progresses through a study of the rules of evidence by which a clinical test, therapeutic maneuver, or preventive service is judged; and finishes with a clinically relevant review using the US Preventive Services Task Force publication " A Guide to Clinical Preventive Services" as a manual. This could be expanded to include doing an actual case history once per clinical rotation with an eye toward the population health implications and discussion of appropriate preventive measures for this and similar patients.
- Compare a highly socialized health system (such as Sweden) with the mixed (public/private) system in the U.S. in relation to key indicators such as cost, satisfaction, access, and indicators of health.
- Examine closely, through a formal field experience, a town or state population that is of personal interest to the student. In this population, review the impact (incidence rates, cost, morbidity) and system of care for a variety of populations

that are chronically ill, such as the frail elderly, the physically disabled, the mentally ill, and the developmentally impaired.

- Develop specific curriculum material that underscores the role of poverty as a major determinant of ill health in America.
- Develop a modular approach that enables students to identify the basic demographic characteristics of a panel of patients in a practice setting. Using these data, the students should evaluate the delivery of one preventive maneuver such as influenza immunization for persons above 65 years or mammography for women about age 50 years. This module should be designed to prepare students for an equally important exercise during postgraduate training when a resident assumes responsibility for the care of a panel of patients.
- Through the use of real and paper-based case histories, understand how lifestyle choices and cultural factors influence compliance of individual patients with recommended approaches to disease prevention and behavior modification. Through these exercises, learn to use strategies shown to be effective in modifying unhealthy behaviors.

## Recommendations for Action

The following are suggestions designed to facilitate the development of curriculum to teach population health:

*School Objectives:*

Each school should develop an explicit list of mechanisms by which population health objectives are to be met. Subsequent evaluation should be conducted by schools to track their success. Providing funded time to develop a population health curriculum and the needed faculty time to institute new curriculum changes should be part of the school's population health training strategy.

*Teaching Faculty:*

Identify faculty to serve as teachers and mentors and support their development, including enhancing awareness of the elements of managed care so that the students are taught by informed and positive teachers who can help respond to their fears about practice in the future.

*Form liaison with others who can help:*

The American Board of Preventive Medicine and Teachers of Preventive Medicine may have resource materials and expertise that can be shared.

### *LCME Requirements:*

LCME should require that schools show evidence that they have developed objectives, designed and delivered a curriculum, and test students for these competencies.

### *National Boards:*

Population health competencies should be tested on parts 1-3 of the National Boards.

Certain steps can be taken by the AAMC to facilitate and reinforce movement toward more effective population health teaching:

#### *Leadership accountability:*

Clearly articulate to medical school leadership and constituency the priority of ensuring instruction in and supporting a population health curriculum.

### *Academic Health Center Infrastructure:*

Provide a clearing house of curriculum materials and experts who can help schools develop their curriculum. Encourage the development of an in-school infrastructure that links functions of the schools of medicine and public health, as well as those of nursing, pharmacy, and health services administration in a way that creates interests and opportunities for teaching, research, and learning in population health.

### *Curriculum database:*

Include specific curricular elements, objectives, processes, and outcomes for population health on the annual AAMC curriculum survey, and list the schools that have developed a population health curriculum in the AAMC Curriculum directory.

### *Graduate Training:*

Develop an explicit list of expectations of how the teaching and learning at the undergraduate level should fit with post-graduate education programs.

### *Funding:*

AAMC should encourage public and private funding agencies (NIH, private foundations) to balance biomedical research funding with that provided for health services and public health research.

# Appendix 1

## Population Health Curriculum: Knowledge, Skills, Attitudes

### Knowledge:

- Evidence-based medicine.
- Social and behavioral determinants of health, at an individual and population level.
- Ethics
  - Distribution of resources
  - Barriers to access
  - Distributive justice
  - Use of scarce resources for individuals vs. populations
- Organization and financing of US health care.
- The principles, practice, and financing of preventive care.
- Cost-analytic approaches and information in prioritizing the use of resources.
- Describe population demographics.

### Skills:

- Mechanisms to gather information from diverse sources.
- Use of non-quantitative descriptors.
- Measuring performance in populations.
  - Patient satisfaction
  - Functional status
  - Costs and cost-effectiveness
  - Clinical outcome measurement
  - Performance scorecards
  - Severity adjustment approaches
- Skills to effect change (leadership skills, advocacy, change strategies, communication)
- Use of test characteristics in routine decisions of day-to-day practice.
- Application of quality improvement methods to improve the systems and individual care.

### Attitudes:

- Cultural responsiveness.
- Constructive attitudes and ability to work with other disciplines.
- Influence of doctors on systems of health care.
- Field experience with economically disadvantaged populations.
- Identification and collaboration with external organizations

# Population Health Perspective Members

Chair: Gordon Moore, M.D., MPH
Director, Teaching Programs
Harvard Community Health Plan

Jeffery Harris, M.D., MPH
Acting Associate Director for Policy, Planning and Evaluation
Centers for Disease Control

Rebecca Henry, Ph.D.
Professor of Medical Education
Michigan State University College of Human Medicine

David Leach, M.D.
Director of Medical Education
Henry Ford Health Systems

F. Marc LaForce, M.D.
Chief of Medicine
The Genesee Hospital

Nicole Lurie, M.D., M.S.P.H.
Professor of Medicine
University of Minnesota Medical School

Allan Rosenfield, M.D.
DeLamar Professor and Dean
Columbia University School of Public Health

Simeon Rubenstein, M.D.
Medical Director of Corporate Health
Group Health Cooperative of Puget Sound

Alexis Ruffin, M.S.
AAMC Staff