Report IV
Contemporary Issues in Medicine: Basic Science and Clinical Research

Medical School Objectives Project
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During the past decade, a remarkable transformation has occurred in the education of medical students in the United States. Many medical schools have made major changes in the organization, content, and management of the curriculum; adopted new pedagogical approaches for facilitating students’ learning; and established a wider range of venues for providing clinical education experiences.

The majority of the changes that have been implemented in recent years have affected primarily the first two years of the curriculum. Clinical experiences, generally in the form of community-based preceptorships, have been introduced into those years. Concurrently, individual basic science courses have been replaced by courses that integrate both basic science and clinical content, using small group or independent learning exercises as the primary instructional format. In combination, these changes have decreased the amount of time devoted to the basic sciences of medicine in the first two years of the curriculum, and diminished the role of individual basic science departments in the design and conduct of the coursework.

Throughout the decade, basic science educators have warned that the changes being implemented may have a negative impact on the quality of medical students’ education. They have pointed out, quite rightly, that new physicians must possess adequate knowledge of the basic sciences relevant to medicine if medical practice is to continue to evolve as a scientifically based endeavor. They have expressed concern, therefore, that the reduced emphasis on basic science education in medical school, and the attendant diminished role of basic science departments in the education of medical students, may eventually impact adversely on the quality of medical practice.
The concerns expressed by basic science educators deserve serious consideration. Knowledge and understanding of the scientific principles that govern human biology provide doctors with the rationale for the contemporary practice of medicine and, equally important, provide the rationale for incorporating new knowledge into their practices over the course of their professional careers. For the latter to occur, doctors must have an appreciation of the ways that new basic science knowledge is generated and how, through translational research, that knowledge is applied in clinical medicine.

In this regard, clinical investigators have expressed concerns that medical schools are not providing opportunities for students to acquire the knowledge, skills, and attitudes they need to appreciate the importance of clinical research to the future practice of medicine, or to appreciate the rewards of conducting clinical research. In a recent report, the AAMC Task Force on Clinical Research urged medical educators to transmit the excitement of clinical research to a new generation of medical students by exposing them to the concepts underlying evidence-based medicine, and to mentors and role models active in clinical research. By emphasizing in the medical school curriculum the importance of clinical research to the practice of medicine, medical schools would also be helping to develop the next generation of clinical researchers.

Medical school deans and faculties have an obligation to ensure that their students have the opportunity to acquire the knowledge, skills, and attitudes required to practice scientifically based medicine throughout their professional careers. Thus, they must pay particular attention to how their students are being educated in the basic sciences, and how they are learning about the importance of clinical research to the future practice of medicine. To provide guidance on these important issues, the AAMC convened, under the auspices of the AAMC’s Medical School Objectives Project (MSOP), two expert panels – one composed of basic science educators and the other composed of clinical investigators. This report – MSOP Report IV – presents the results of the panels’ deliberations.
Basic Science in Medical Education Panel

Introduction

During the 1980s and early 1990s, a number of blue ribbon panels were established both to examine the state of medical students’ education in the United States, and to make recommendations for changes that would improve the quality of the educational experience. Since the recommendations set forth by the various panels were quite similar, the panels’ reports provided a framework for a great deal of the curriculum reform activity that began to occur in the early 1990s.

The educational reforms that have been, and continue to be, implemented in schools across the country in response to those reports are generally viewed as having a positive impact on medical students’ education. There is concern, however, that the changes are adversely affecting the education of medical students in the basic biomedical sciences. This concern derives from the fact that the amount of time devoted to the basic sciences in the curriculum is decreasing, and the role of basic science departments in the design and conduct of courses is being diminished. This concern is heightened by the fact that these changes are occurring at a time when new knowledge in the biological sciences has been increasing at an unprecedented rate, new scientific domains that promise paradigm shifts in clinical thinking have been opening, and the population sciences are receiving greater emphasis.

Given these concerns, the conceptual framework that governs the ways that medical students learn basic science needs to be examined. There are four major questions that should be addressed:

- What basic science knowledge should matriculating medical students possess so that they are prepared for the basic science coursework included in the medical school curriculum?
- What fundamental principles should guide the education of medical students in the basic sciences?
- What knowledge, skills, and attitudes related to the basic sciences should medical students possess at that time of graduation?
- What educational strategies should be employed to ensure that medical students have opportunities to acquire the knowledge and understanding that they are expected to possess at graduation?
The deans and faculties of medical schools, who are responsible for the design and conduct of their schools' educational programs, should address these questions with some degree of specificity. In this report, the panel provides a general perspective on each of these questions, hoping that its views will help to guide those deliberations.

Basic Science Education: Premedical Preparation

To prepare students for the course work included in the medical school curriculum, medical schools presently expect matriculating students to have a thorough understanding of modern concepts in biology, chemistry, and physics. To meet these expectations, schools generally require students to have taken undergraduate courses that equate to one year of biology, two years of chemistry (to include organic chemistry), and one year of physics. All schools also value mathematical competence. Although most schools do not set forth specific course requirements in mathematics, approximately one fifth do require calculus.

In considering recommendations for premedical preparation in the basic sciences, it is useful to recognize how graduating medical students view their undergraduate experiences. When asked how important certain courses were in preparing them for medical school, medical school graduates in the class of 2000 expressed views that are somewhat in conflict with the admissions requirements noted above. The graduating students considered courses in physiology, biology, biochemistry, genetics, and comparative anatomy as clearly "important;" courses in organic chemistry and physics as only "slightly important;" and calculus courses as "unimportant."

It is also useful to recognize the scope of course work completed by most matriculating medical students. According to recent data, approximately three-fourths of the students who matriculated in 1997 had taken courses in biochemistry and genetics, and 90% had taken social science courses. Furthermore, the majority of matriculating students had taken courses in advanced biology, physiology, calculus, and psychology. About half of the students who had taken these courses had done so to fulfill requirements for completing their undergraduate course of study. The other half had done so primarily to improve their readiness for their medical studies. Thus, expanding medical school entrance requirements to conform with the opinions expressed by graduating medical students would not dramatically alter the undergraduate course of studies pursued by most matriculating medical students.

The panel believes that all of the undergraduate course work taken by
prospective medical students should be rigorous, but the required courses need not be those that are designated as appropriate for majors in a given scientific discipline. Since courses available for aspiring medical students should focus on content needed for the study of medicine, those courses should be designed, whenever possible, by collaboration with medical school faculty. Given the nature of the course work in most medical schools, the panel believes that in addition to the usual requirements noted above, matriculating students should be expected to have completed course work in genetics and biochemistry.

Basic Science Education: Principles Governing Medical Students’ Education

Medical practice should be based on a sound understanding of the scientific basis of contemporary approaches to the diagnosis and management of disease. Therefore, knowledge and understanding of the scientific principles that govern human biology provide doctors not only with a rationale for the contemporary practice of medicine, but also with a framework for incorporating new knowledge into their practices in the future.

It is imperative, therefore, that medical students acquire knowledge and an understanding of the principles of the biomedical sciences that are relevant to medicine. In addition to knowledge and an understanding of these principles, they should understand and gain an appreciation for how new basic science knowledge is developed, and be capable of thinking critically about how new scientific knowledge applies to clinical medicine.

Delivery of optimal medical care will require future physicians to know and utilize concepts and facts subsumed by “content areas” identified by the learning objectives set forth below, and also to be capable of integrating this information for clinical diagnosis, treatment, and counseling of patients, their families, and other care-givers. Moreover, the rapid and continuing expansion of knowledge, coupled with a commitment to life-long learning, requires that medical school graduates possess the appropriate skills to understand, critically assess, and incorporate into their clinical practice basic science concepts and facts that are as-yet unknown.

Medical school deans and faculties must ensure that students receive adequate exposure to the entire spectrum of sciences relevant to medicine, ranging from molecular and cellular biology to epidemiology and biostatistics. They must continuously evaluate the content of their curricula to ensure that important new knowledge...
derived from the emerging disciplines of genomics, proteomics, and bioinformatics is incorporated in a timely fashion.

The panel acknowledges that while each of the basic science disciplines is not explicitly listed in the MSOP reports, the fundamental principles underlying the learning objectives as laid out in Report I and further elaborated upon in this report most certainly encompass all of the basic sciences. The joint learning objectives have been written to serve this purpose. The panel further acknowledges the very important work done by the basic science disciplines in developing learning objectives and core curricula specific to those disciplines. Therefore, the panel recommends that curriculum committees developing a scientifically based curriculum utilize that literature.

To properly emphasize the important relevance of the basic sciences to the practice of medicine, the scientific basis of medicine should be integrated into coursework offered throughout the four years of the undergraduate medical education curriculum.

Basic Science Education: Medical School Objectives

To ensure that the curriculum provides opportunities for medical students to acquire knowledge and understanding of the scientific principles relevant to clinical medicine, deans and faculties must set forth learning objectives for the basic sciences, which can be used to guide the design and content of the curriculum.

Much of the basic science knowledge that medical students should possess at the time of graduation, was set forth in MSOP Report I: Learning Objectives for Medical Students Education: Guidelines for Medical Schools. The relevant learning objectives included in MSOP Report I are:

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

- Knowledge of the normal structure and function of the body (as an intact organism) and of each of its major organ systems
- Knowledge of the molecular, biochemical, and cellular mechanisms that are important in maintaining the body's homeostasis
- Knowledge of the various causes (genetic, developmental, metabolic, toxic, microbiologic, autoimmune, neoplastic, degenerative, and traumatic) of maladies and the ways in which they operate on the body (pathogenesis)
- Knowledge of the altered structure and function (pathology and pathophysiology) of the body and its major organs systems that are seen in various diseases and conditions

- 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

- The ability to reason deductively in solving (clinical) problems

- 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

- An understanding of the need to engage in life-long learning to stay abreast of relevant scientific advances, especially in the disciplines of genetic and molecular biology

- An understanding of the power of the scientific method in establishing causation of disease and efficacy of traditional and non-traditional therapies

- The capacity to recognize and accept limitations in one's knowledge and clinical skills, and a commitment to continuously improve one's knowledge and ability

The panel agrees that these learning objectives are clearly important. However, the panel believes that additional learning objectives, by better delineating certain scientific principles, also should be considered as deans and faculties develop learning objectives for their own medical student education programs. The panel recommends that the following objectives be added to those included in MSOP Report I.

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

- Knowledge of the principles of pharmacology, therapeutics, and therapeutic decision making

- Knowledge of the principles, and application of these principles, in the emerging disciplines of genomics, proteomics, and bioinformatics

- Knowledge of the scientific principles underlying laboratory diagnosis, and the ability to critically evaluate the limitations of diagnostic methodologies
- The ability to critically analyze and evaluate the source and validity of new basic science information that applies to human biology and the practice of medicine
- Knowledge of behavioral biology and the role of behavior in health maintenance, as well as in the diagnosis, treatment and prognosis of clinical disorders

These objectives each apply to a key domain of knowledge, some of it new and evolving, that currently, or in the future will, underlie the practice of medicine. The panel acknowledges that it has set forth a challenging agenda by recommending that learning objectives be developed in the disciplines of genomics, proteomics, and bioinformatics, since an understanding of the application of knowledge in these disciplines is only beginning to emerge. Nonetheless, the panel believes that because these disciplines will have fundamental importance for medical practice in the future, medical school deans and faculties must begin now to focus attention on how they should be addressed in the medical school curriculum.

Basic Science Education: Strategies for Medical Students’ Education

As noted previously, the remarkable changes that have occurred during the past decade in the organization, content and management of the medical school curriculum have had their greatest impact on the traditional approach to the teaching of basic sciences during the first two years of the curriculum. These changes can be traced in large part to a set of recommendations issued in 1992 by the Commission on Medical Education: The Sciences of Medical Practice established by The Robert Wood Johnson Foundation. The commission, composed of senior physicians and scientists, had been charged to determine how faculty and students can use most effectively the science base that is relevant to the practice of medicine.

When the commission’s report was issued, the National Caucus of Basic Biomedical Science Chairs expressed the opinion that implementing the commission’s recommendations would deleteriously affect the education of future physicians. None-the-less, many medical schools have taken steps to implement those recommendations. Based on the experience to date, it appears that the recommendations that were set forth do provide, in general, a useful framework for considering how basic science information and principles can be represented best in the medical student education program.
However, the panel wishes to emphasize in the strongest possible terms its conviction that there has been insufficient attention paid to the integration of basic science content into the third and fourth years of the curriculum. Given the rapid pace with which new basic science knowledge is being applied in clinical medicine, and the emergence of the new disciplines of genomics, proteomics, and bioinformatics, it is imperative that this deficiency be remedied. The panel recognizes that medical schools are now paying more attention to the organization and content of the third and fourth years of the curriculum. The panel strongly recommends that deans and faculties involved in designing and implementing changes in those years pay particular attention to the need to integrate relevant basic science content into those years by enlisting the participation of basic science faculty in those efforts.

**Conclusion**

During the past decade, a remarkable transformation has occurred in the education of medical students. The major principles that have governed the curriculum changes of the past decade, and those that are ongoing, are based on the belief that students’ learning would be enhanced by integrating basic science and clinical content throughout the four years of the curriculum, by utilizing clinical case studies to illustrate the clinical relevance of basic science content, and by employing active rather than passive learning formats.

As medical schools continue to respond to the compelling reasons for curriculum reform, it is essential that they reaffirm the importance of the basic sciences by integrating basic science content throughout the educational program. Perhaps the greatest challenge medical educators face in achieving this objective is to incorporate the ever increasing body of relevant knowledge, particularly in the evolving disciplines of genomics, proteomics, and bioinformatics. For this reason it is imperative that basic science educators continue to play an active leadership role in the evaluation and management of the curriculum.

The perspective provided by this report should inform deans and faculties as they strive to improve the quality of the education of their medical students. The deans and faculties of medical schools would serve their students well if they would reaffirm the importance of basic science in the education of medical students, clearly delineate the general fund of knowledge that they expect students to acquire before entering their schools, set forth specific learning objectives for basic science education in their schools, and design and implement learning experiences that will allow
their students to meet those objectives. They must ensure that the teaching of the sciences fundamental to medicine include not only facts and principles that apply to human biology, but also the facts and principles relevant to the behavioral and social aspects of health and disease. In this regard, the panel wants to emphasize that content related to the behavioral, social, probabilistic, and information sciences must receive greater emphasis in the medical school curriculum.
Basic Science Medical Education Advisory Panel

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Clinical Research in Medical Education Panel

Clinical research is a component of medical and health research intended to produce knowledge valuable for understanding human disease, preventing and treating illness, and promoting health. Clinical research embraces a continuum of studies involving interaction with patients, diagnostic clinical materials or data, or populations, in any of these categories: disease mechanisms; translational research; clinical knowledge, detection, diagnosis, and natural history of disease; therapeutic interventions including clinical trials, prevention and health promotion; behavioral research; health services research; epidemiology; and community-based and managed care based research.

AAMC Task Force on Clinical Research (2000)

Introduction

Both the study of medicine and the delivery of health care have been revolutionized by the dramatic achievements of contemporary science. Profound advances in molecular and cellular biology, epidemiology, physiology, and health-services research have generated unprecedented opportunities for medical progress. At the same time, intensive economic pressures on the health care system have created an increasingly frenetic clinical environment that not only challenges patients and the doctors caring for them, but also makes it difficult to cultivate innovative and imaginative physicians who will use these scientific advances to question accepted doctrine, seek out new knowledge, and establish a higher standard of care for the next generation of patients.

The most significant educational casualty of the modern clinical training experience is the disappearance of time available to think, in an expansive and considered fashion, about an individual patient and his or her disease. Traditionally, such reflective thinking has been a hallmark of the care provided in teaching hospitals; it was why doctors came to train, and why patients came for treatment. Today, sadly, even the most insightful and compassionate physicians feel increasingly compelled to evaluate and treat patients with reflexive speed, leaving little time for contemplation, originality, or fundamental innovation.

This pattern of behavior matters because medicine is more than simply the compassionate (and now, efficient) application of received wisdom; it is also the
challenging of old customs, and the development of new insights. A clinician has the opportunity to be both a care provider and a medical scientist. As a provider, the goal is to assimilate what is known about the management of specific clinical problems to the care of individual patients. As a medical scientist, the goal is to routinely question traditional dogma, and actively explore opportunities to gain additional knowledge and further improve patient care. Clinical research, which flows from the inquisitive practice of clinical medicine, is an intimate learning process that is carried out in full partnership with the patient.

As modern medicine sits poised to reap the benefits of dramatic scientific advances, there is an apparent need for more “clinical champions” - passionate physicians who have the expertise, imagination, and perseverance necessary to ensure that this progress finds expression in the care and treatment of patients. It is both the responsibility and the privilege of medical schools and teaching hospitals to develop these clinical champions by cultivating curiosity in students, and by valuing reflection about the care of patients. In pursuit of their clinical missions, these institutions must not only apply current treatment standards as effectively as possible, but they must be committed to improving patient care by encouraging and supporting the efforts of the next generation of doctors to establish more rigorous standards. Clinicians in training must be encouraged to ask fresh, penetrating questions, to wonder about underlying biological mechanisms, and to consider alternative therapeutic approaches. It is essential that the academic medicine community celebrate the inquisitive physician.

Educating Physicians to be Inquisitive

How can physicians be educated so that they become inquisitive clinicians, physicians who ask “why?” as well as “what?” The panel believes that from their first day of medical school, students should begin hearing about clinical research, and should be exposed to active clinical investigators. They should be exposed throughout the curriculum to the breadth and the achievements of clinical research, the contemporary challenges in clinical medicine, and the important questions that demand resolution. It is critical for students to appreciate both how much is not known, and what remains to be discovered. Importantly, an introduction to the ethical issues associated with clinical research must be a vital and deeply embedded component of any clinical research instruction.

The panel believes that in general, most of the knowledge base required of
such a clinical-investigator is already taught in medical school, and much of what is not present can be provided through a modest program of additional classes, case-studies, and mentored research experiences. The greater challenge is to reconsider the ways that medical students are taught to utilize the vast quantity of knowledge that is presented to them so that they will have learned an interrogative, intellectual approach that can be applied to daily clinical practice. Thus, in some sense, the learning objectives that are set forth below are less challenging for schools than are the educational strategies that follow.

Learning Objectives

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

- An understanding of the ethics involved in subscribing to the principles of good clinical practice in research with human participants
- An understanding of the power of the scientific method in establishing the causation of disease and efficacy of traditional and non-traditional therapies
- Knowledge of contemporary challenges in clinical medicine
- Possession of a working knowledge of seminal clinical research findings and their patient care applications
- Understanding of the interdisciplinary nature of clinical research
- Basic knowledge of information systems, biostatistics, epidemiology, and the "logic of inference"

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

- The ability to assess and critique, at a fundamental level, research as it is reported in major medical journals, based on an understanding of how data are derived
- The ability to communicate effectively with a clinical researcher, either in a clinical or consult context
The ability to translate current clinical research into lay language for patients

The ability to assess on-line medical information and to assist patients and their families with these tools

The ability to highlight important clinical research questions, stemming from a presented case or patient interaction

The ability to reason deductively in solving clinical problems

**Attitudes**

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

- Ethical sensitivity and awareness of issues related to potential conflicts of interest
- A proclivity toward skepticism, curiosity, and humility in the face of the unknown
- An appreciation of the role and importance of clinical research and investigation in the care of patients
- An understanding of the need to engage in lifelong learning to stay abreast of relevant scientific advances, especially in the disciplines of genetics and molecular biology
- An appreciation for the vast reserve of clinical information that remains unknown
- A willingness to intellectually extend a patient care interaction in order to explore the scope of questions that would improve patient care for similar cases
- An appreciation of how the body of medical knowledge is built and advanced

**Educational Strategies**

**Modification of Existing Pedagogy**

During the clinical years, the questions asked on ward rounds must proceed beyond the usual recollection of known facts (i.e., “What are seven causes of atrial fibrillation?” “What are the Ranson Criteria?”), and should ideally incorporate questions of mechanism and of investigative approach (i.e., “Why might infection have led to atrial fibrillation in this patient, and how would you study this?” or “Why should this patient with pancreatitis exhibit hyperglycemia, and how could
this theory be tested?”). While it may be more comfortable to stick with questions of fact, for which there are arguably pre-existing sets of “correct” answers, such an approach ultimately does a great disservice to both student and patient.

**Exposure to Clinical Research**

In order for students to develop an appreciation of the strengths and limitations of different approaches in areas such as molecular biology, physiology, epidemiology, and health-services research, they must gain a general understanding of the different research methodologies employed in each of those areas. Students also must have the opportunity to develop an understanding of the different intellectual strategies employed across medical specialties in the study of contemporary medical problems, and appreciate the importance of an interdisciplinary approach in researching complex medical questions. Students must have the opportunity to explore the ethical issues associated with clinical investigation that include, but are not limited to, the basics of informed consent, patient safety, and institutional review boards.

For those students who have a particular interest in clinical research, medical schools should provide opportunities for them to take specifically designed electives that nurture and foster that interest. These electives can be brief, as in a one-month rotation, or more intense, such as working on a clinical trial over a period of time. Selected students should have the opportunity to pursue combined degrees, such as an MPH, MSci, or Ph.D. related to clinical research.

**Case Studies**

Consideration of existing educational strategies suggests that, while ultimately an experiential approach is best, an effective way to familiarize students with the power and range of clinical research is through case studies.

A broad and diverse range of case-studies must be developed, highlighting a range of approaches (from DNA analysis through population-based studies), a range of medical disciplines, a range of research quality (from exemplary to deeply-flawed), and should ideally include both historical and contemporary examples, from industry as well as academia. Cases should focus on research that resulted in:

1. **the development of a new diagnostic or therapeutic approach**
   
   New diagnostic approaches might include the use of CT imaging to diagnose pulmonary embolus, and the use of MRI in stroke. New therapeutic approaches might include GnRH for premature puberty, and thrombolytic therapy for strokes.
2. **a change in practice**
   Examples include how the approach to myocardial infarctions has evolved over the last several decades, from bed rest for 6 months to diagnostic tests then home with rehab in a day. Another example includes the use of routine screening colonoscopy as part of good primary care/preventive medicine.

3. **an ethical dilemma**
   Examples can include the implications associated with most genetic testing, e.g., testing healthy people for Huntington’s or hemochromatosis.

4. **the introduction of a new experimental approach or study design**
   The use of gene chips and the application of knowledge about population genetics.

5. **the introduction of a new technological innovation**
   Examples include cardiac catheterization, laproscopic surgery, and artificial skin for burn victims.

6. **the development of a new outcome measure or surrogate marker**
   An example is looking at troponin to assess myocardial infarctions.

The case studies are expected to introduce students to the “process” of developing questions, as well as to illustrate the range of questions possible for a given clinical conundrum. The case studies will enable students to develop and hone their critical appraisal skills, and learn how to formulate and frame ethical, scientifically useful questions. Case studies will also emphasize the role of the patient as partner in discovery, and will highlight the role of communication as an essential aspect of both medical practice and clinical research.

**Inter-active WEB-based Courses**

Interactive web-based courses can complement the above approaches, and reinforce an understanding of the application of critical analysis. This approach would offer yet more opportunities to consider ethical dilemmas in clinical research, experimental or study design issues, and patient concerns more deeply.
Faculty Resources

A variety of skills are needed to support an educational program in clinical research. Thus, individuals with diverse areas of expertise can participate in different portions of the program, making it an inclusive one. Research role models should include physician-scientists, as well as basic scientists who are engaged in research that is strongly translational. Clinicians who participate in clinical trials can offer a valuable perspective, and outstanding diagnosticians may help the student to appreciate the complexity of the disease process that is essential before one is able to formulate testable hypotheses. Involving faculty who have different roles at the medical center will enable students to appreciate the degree to which the delivery of medical care depends upon research. It also will weave the research process into the everyday fabric of their lives, to hopefully make it a natural part of their careers.

Faculty development in teaching the skills associated with a general appreciation of clinical research and a rudimentary understanding of clinical research needs to occur at all institutions, regardless of the relative strength of that institution’s own clinical research enterprise.

Conclusion

Clinical research, like every other type of scientific investigation, is ultimately learned by example. Medical students must receive exposure to a range of clinical investigators during the pre-clinical as well as the clinical years, and should have the opportunity to participate in clinical research experiences. The panel recognizes that the number of clinical investigators differs from school to school, and that expertise might not exist in every research area. None-the-less, the panel believes that in every school there is often a greater reservoir of talent than may be initially presumed, especially considering the rather broad nature of clinical investigation. Medical schools should identify their clinical researchers, and cultivate the development of a clinical research community that would engage medical students and expose them to the excitement of clinical research throughout the curriculum. This is an essential factor in ensuring that the next generation of physicians will be composed of truly inquisitive physicians.
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