

Emergency Medicine at the Mount Sinai School of Medicine

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Abstract

Emergency medicine became the twenty-third specialty by the American Board of Medical Examiners in 1979. Emergency physicians are specialists in the stabilization and resuscitation of medical and surgical emergencies in patients of all ages; they are experts in triage and in prioritization of resources. Emergency physicians provide the “safety net” for the American health care system, and they are the facilitators between the community and health care systems, and between primary care physicians and specialists. The emergency department is an ideal environment in which to teach the assessment and management of patients presenting with undifferentiated processes. Emergency physicians possess a unique set of clinical and research skills that have made them valuable members of the medical school academic community. Presented is a historical perspective on the specialty of emergency medicine and its evolving role at the Mount Sinai School of Medicine. Included are discussions on innovations in teaching developed by the emergency medicine faculty, including applications of computer-assisted instruction and the Internet. **Key Words:** Emergency medicine, undergraduate medical education, curricula, informatics, computer-assisted instruction.

Introduction

OVER THE PAST 25 YEARS, emergency medicine (EM) has emerged as a recognized specialty by the American Board of Medical Specialties and as an important component of the medical school academic community (1, 2). EM has clinical, research, and administrative roles in the health care system that are unique to the specialty (3). It organizes and monitors emergency care delivery by coordinating emergency medical services (EMS) and hospital resources. At a societal level, EM is the safety net ensuring essential medical care 24 hours a day to all individuals regardless of their resources (4).

In 1994, the Josiah Macy Foundation sponsored a multi-disciplinary conference entitled “The Role of Emergency Medicine in the Future of American Medical Care” (5). The panel concluded that:

- 1) The federal government should establish as a goal “access to high-quality emergency medical care . . . for all persons who need such care.”
- 2) Emergency departments (EDs) be classified according to the level of care available and that EDs advise patients of the qualifications and credentials of the attending physicians; the panelists were strongly critical of those EDs that were staffed by moonlighting, non-EM trained physicians.
- 3) The financing for EM postgraduate training be maintained in an effort to protect EM from the proposed funding cuts aimed at the non-primary care specialties.
- 4) “State medical licensing boards, the National Board of Medical Examiners, the Liaison

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Committee on Medical Education (LCME), and medical school deans and faculties must ensure that every medical student has acquired the appropriate knowledge and skills to care for emergency patients. This education must be provided through educational experience supervised by appropriately qualified emergency physicians.”

- 5) “The deans and faculty of all LCME accredited medical schools . . . should establish in their schools appropriately staffed and supported academic departments of emergency medicine.”
- 6) The American College of Emergency Physicians (ACEP) and the Society for Academic Emergency Medicine (SAEM) should convene a conference designed to establish the research agenda for the specialty and develop strategies to implement that agenda. That research conference was held in 1995 and the proceedings were published in 1998 (6).

Much progress has been made toward meeting these goals. This presentation will describe the evolution of Emergency Medicine, the discipline and its graduate training programs, and our institution’s comprehensive undergraduate educational program designed to meet the above challenges.

The Field of Emergency Medicine

Emergency physicians are specialists in evaluating patients of all ages with undifferentiated medical conditions. Foremost, they are specialists in the stabilization and resuscitation of patients with both medical and surgical emergencies. They are experts in triage and in prioritization of resources, and are facilitators between primary care physicians and specialists.

The emergency department is an ideal setting to teach rapid patient assessment, stabilization, and differential diagnosis. It provides a provocative interface between the community and the health care system, routinely confronting students and care providers with difficult societal issues. Advanced directives, patient autonomy, child and elderly abuse, abandonment and suicide are only a few of the many issues that must be addressed, often simultaneously, on a regular basis in the ED. Consequently, in order to be effective, the emergency physician must be a patient advocate with strong clinical, communication, and administrative skills. The ED is a source of many patients with varying types and severities of illness for clinical research, and it offers a window

on the community for epidemiologic and outcomes research. All of the above makes EM unique in its scope of practice and has earned it a critical role in medical education and research.

Historical Perspective

The first EM training program was established in 1969 at the University of Cincinnati (7). Until that time, there were no trained teachers of emergency medicine, nor was there a certifying board or specialty society. EDs were staffed by an assortment of clinicians from various backgrounds, who were frequently moonlighting and rarely had a commitment to providing comprehensive emergency care. In academic centers, the ED was usually staffed by house officers with limited faculty supervision, leaving the sickest patients to be seen by the least experienced physicians.

By 1975, there were 10 residency programs in the United States. In 1979, the American Board of Medical Specialists (ABMS) created the American Board of Emergency Medicine (ABEM), making it the twenty-third recognized medical specialty (2). In that same year, the Federal government allocated funding for graduate EM residency training and in 1980, the Residency Review Committee (RRC) for Emergency Medicine was established through the Accreditation Council for Graduate Medical Education (ACGME).

The intent of ABMS certification is to ensure that a practicing physician has completed an accredited educational program and has demonstrated competency in providing quality patient care. Learning from other specialties, ABEM created a practice tract that accommodated those physicians working in EDs prior to the creation of a sufficient number of residency training programs. The first ABEM examination was given in 1980. The last year non-EM residency trained applicants could apply to the board was 1990. The ABEM exam has a one-day written component and a one-day oral component, and certification is valid for 10 years. In 1998, there were 15,898 physicians certified by ABEM, with an estimated 25,000 full-time equivalent positions available in the specialty (8).

Emergency Medicine Residency Training

In 1997, there were 3,239 residents-in-training in the 119 RRC-accredited EM residencies; 72% of these trainees were male and 27% female (7). ABEM requires a minimum of 36 months of training in an ACGME-accredited EM program,

although many educators believe that 4 years is the minimum time required to effectively teach all of the competencies needed in the specialty of EM.

The curriculum core content for EM training covers medical and surgical disorders in patients irrespective of age (9). In addition to issues in medical and traumatic resuscitation, the curriculum emphasizes administrative topics such as accreditation, reimbursement, personnel management, wellness, and interdepartmental relations. EMS and disaster medicine are strongly represented in the curriculum since pre-hospital care has a prominent interface with the ED care.

Emergency Medicine in Undergraduate Medical Education

One of the goals in medical education is teaching students how to assess the cardiopulmonary status of a patient (the “ABCs”), and to provide life-saving interventions when indicated. The thought of a student finishing medical school without knowing the fundamentals of resuscitation and of basic first aid seems incomprehensible and contrary to the precepts of medical education as defined by the LCME (10). A survey performed in 1994 showed that approximately 70% of medical schools did not require basic first aid in their curriculum, approximately 60% did not require advanced cardiac life support skills, and 20% did not require basic cardiac life support skills (1). Approximately 90% of schools surveyed did not require Advanced Trauma Life Support (ATLS) skills. The same survey revealed that only 20% of medical schools had a required clerkship in EM.

Clearly, there are many opportunities throughout the clinical years for medical students to be exposed to acutely ill or injured patients. The creation of a formal curriculum designed to ensure a minimum exposure to EM concepts is desirable, and has become more easily attainable with the growing presence of EM academicians. In 1996, there were 124 LCME-accredited medical schools, of which 41% had recognized academic departments of EM, a 23% increase over the number in 1991 (11).

Several publications have dealt with curriculum design for emergency medicine in undergraduate education (12, 13). In 1990, the SAEM Education Committee published a 4-year curriculum that was modified in 1998. The curriculum presents goals and objectives, and links them to teaching methods. It focuses on 3 core content areas: acquisition of basic life support skills, including the diagnosis and treatment of shock; the differentiation and treatment of common acute

problems; and the assessment of the undifferentiated patient (14).

The Department of Emergency Medicine at the Mount Sinai School of Medicine has worked from the models developed by ACEP and SAEM, and has developed a comprehensive EM experience for the medical students. The following sections in this paper present the mandatory first and fourth year EM experiences, the various elective opportunities that are available, and some of the innovations that have been implemented to facilitate didactic and bedside learning.

The First-Year Curriculum

From the first day of medical school, students sense the need to have a working knowledge of fundamental health care concepts. While it is acceptable for a student to plead ignorance on a complicated medical question, it is far more difficult to justify ignorance in the case of basic first aid and emergency care.

The EM experience for first-year students at the Mount Sinai School of Medicine is taught during the first three weeks of the academic year and is designed to provide the basic principles of patient assessment and stabilization. The course uses case studies, small group teaching, and problem-based learning (PBL) techniques to teach the knowledge, skills, and attitudes needed to assess victims of illnesses or accidents, and provides the students with skills to function as a first responder (Tables 1 and 2). It also includes 8 hours of Basic Life Support (BLS) taught by third- and fourth-year medical student American Heart certified instructors.

Students are taught how to recognize emergencies and to prioritize care. The emphasis is on the use of everyday materials in stabilization and treatment. Students are taught the importance of identifying clues in the environment that may be helpful in managing the patient with an undifferentiated problem. Cardiopulmonary resuscitation and managing an obstructed airway for both adult and pediatric patients are considered an integral part of the curriculum. This not only prepares the student for clinical rotations, but gives the student a potentially lifesaving skill.

The course also introduces students to history taking and physical exam skills. Behavioral and human interest issues are stressed, such as the various presentations of substance abuse, as well as elder and child abuse. Ethics issues, which frame how we deal with the complexities of medicine, societal issues and our own personal beliefs, are woven throughout the discussions.

TABLE 1
First-Year Curriculum

Introductory Lecture and Approach to the Patient in the Field	2 hours
Medical Emergencies	
Shortness of Breath, Chest Pain, Allergic Reactions	2 hours
Change of Mental Status, Hypo/Hyperglycemia, Poisoning and Overdose, Seizures	2 hours
Environmental, Travel and Behavioral Emergencies	2 hours
Trauma	
Central Nervous System Trauma, Immobilization, Musculoskeletal Trauma	2 hours
Truncal Trauma, Burns and Cold Injuries	2 hours
Pediatric and Obstetrical Emergencies and Out-of-Hospital-Childbirth	2 hours

TABLE 2
Skills Taught in the Small Group Sessions in the First-Year Course

BLS ⁽¹⁾ ; CPR ⁽²⁾ and obstructed airway Airway and breathing assessments Pulse evaluations
• Location
• Presence
• Strength
• Rate
• Rhythm
Controlling hemorrhage and epistaxis Cervical spine immobilization Extrication Logrolling ⁽³⁾ , extrication and transport Bandaging and splinting Automatic external defibrillator use

⁽¹⁾ BLS = basic life support

⁽²⁾ CPR = cardiopulmonary resuscitation

⁽³⁾ Logrolling = turning the patient while maintaining spinal immobilization

Psychomotor skills such as applying and maintaining cervical spine immobilization, assessing the patient's airway, breathing, and circulation are emphasized. Slides and videotapes are augmented by demonstrative materials such as epinephrine autoinjector pens, rudimentary splinting materials, nitroglycerin bottles, and automatic external defibrillators. Attendance is mandatory and active participation is encouraged.

Successful completion of the course requires passing the written BLS exam, the practical BLS exam, and a PBL practicum which consists of a case scenario that requires an integration of the primary concepts taught in the course. The case con-

sists of an accident involving patients with a variety of medical and surgical problems. Students must identify the problems, prioritize care, render stabilization, and make disposition decisions. Groups of 5 students have 5 days to work together to formulate a response. A composite essay written by the group is handed in for evaluation; students have the option of meeting with course faculty to review their performance in depth.

Evaluations of the course have been quite positive. Of the 90 students who have completed the clerkship, 90% submitted an evaluation. Approximately 82% responded that the course strongly stressed problem solving; on the quality of the course, 80% rated it either "Excellent" or "Very Good."

The Shadow Program

The shadow program, or pre-clinical Emergency Medicine, is designed to offer exposure of first- and second-year students to human pathology and socioeconomic problems concurrent with didactic education. The program began in 1996 as a single student's request for a four-hour period of observing clinical practice, and has evolved into weekly sessions which include not only observing, but also assisting attending physicians and nurses with limited patient care activities. Student responsibilities include identifying new words or concepts relevant to the day's patients, and reporting back the following week on what was discovered regarding the word or concept, thus incorporating problem-based learning into the program. During the 1998 academic semester, there were 20 requests for the 8 available positions. Driven by demand, the shadow program has been expanded to 12 students.

The Fourth-Year Curriculum

Beginning in the 1997–1998 academic year, EM became a required fourth-year clerkship at the Mount Sinai School of Medicine. The three-week rotation provides a mixture of didactic and hands-on patient care. It is designed to give students an opportunity to approach undifferentiated clinical conditions, and to interface with pre-hospital care providers, hospital administrators, and in-house consultant services. In essence, students function as "subinterns" at one of three clinical sites. Students are expected to complete 10 twelve-hour shifts during which they see between 4 and 8 patients, depending on the numbers of patients and the severity of their illnesses. Students see patients according to their triage category and they

are thus introduced to the concept of prioritizing care. Once patients have been examined, students are expected to generate a differential diagnosis and a management plan. Cases are presented directly to an ED attending physician who then helps guide the student through the patient care plan. Attending physicians are assigned only one student per day, thus allowing time for an intimate interaction including bedside teaching.

Complimentary to the clinical experience, students are provided with 9 hours of standardized, case-based lectures, a one-hour ethics conference, a four-hour suture and splinting laboratory, and a volume of core reading material from the peer-reviewed literature. The lectures are given in 3 three-hour blocks, and cover the approach to altered mental status, poisoning and drug overdose, weakness and dizziness, headache, asthma, abdominal pain, chest pain, arrhythmias, and trauma. The case-based scenarios emphasize triage, prioritization, stabilization, and recognition of life-threatening process. These same cases, as well as additional material, are presented on the Internet in the form of computer-assisted instruction, therefore allowing students 24-hour access to course materials (see CyberSchool section below).

The suture lab includes a didactic presentation on wound preparation and aftercare; it is followed by a hands-on demonstration and practicum using pigs' feet or chicken thighs. Splinting skills are practiced on each other with the assistance of faculty and EM residents. An optional live swine laboratory is also offered where students are taught central line placement, tube thoracostomy, venous cut down, cricothyrotomy and peritoneal lavage techniques.

In addition, students are exposed to the business foundations of medical practice and the organization, structure, and functions of the public and private health care funding organizations. It is intended that our students learn basic information that will ultimately be needed to negotiate with these agencies to further the care of their own patients while legitimately supporting their future clinical practices.

Students' grades are based on shift evaluations, a 50-question multiple choice written exam followed by an oral discussion of the answers, participation in a conference, and a review of the log books. The shift evaluation forms review and evaluate the student, based on number of patients seen, supervision of procedures, history-taking and physical exam skills, ability to formulate differential diagnosis and formulate management plan, ability to interpret laboratory tests, technical ability, ability to interact with patients, oral presentations and comments. The evaluations are

given back to the student at the end of each shift, providing them with timely, ongoing feedback on their performance and facilitating the teacher/student relationship. Student log books capture the name, unit number, telephone number, presenting complaint, discharge diagnosis, important clinical and laboratory findings, procedures and, most important of all, follow-up of the patient after discharge from the ED. The purpose of the log book is to help the student track their clinical experience, and to ensure that depth is given to experience by obtaining outcome information on their patients. Log books are reviewed for their completeness, and during the last lecture day, students are asked to present an interesting case that they followed up on.

Computer-Assisted Instruction: The CyberSchool

The use of computer-assisted instruction (CAI) in medical education has emerged as a valuable tool to educate "on demand." This is especially useful in sites such as the ED where patient flow is 24 hours a day and unpredictable. Its use has rapidly increased over the past 20 years and has been the topic of numerous publications and journals including the *Journal of Education Computing Research* and the *Journal of Computer-Based Instruction* (15, 16). There is some evidence, including a recent meta-analysis of 120 studies (15), that suggests CAI is superior to traditional forms of teaching. CAI has also been shown to reduce the amount of time it takes to learn an objective, and to improve post-test scores from the 50th to the 60th percentile (16, 17). In 1992, a panel convened by the Association of American Medical Colleges (AAMC) recommended that medical schools should lead in the application of information science and computer technology and promote their effective use (18, 19). The AAMC directory now shows that virtually all medical schools employ computers in some aspect of medical education. Medical students desire greater use of computers in their education (20), and leading medical educators believe that ". . . a strong grounding in the use of computer technology to manage information, support patient care decisions, select treatments, and develop their abilities as lifelong learners. . ." is essential for medical students (21). Recent literature in *Academic Medicine* debated the value of requiring all medical students to own their own computers as well as the need for enhancing faculties' competencies in programming and using computer-aided tools (22, 23).

As emergency medicine becomes an accepted part of undergraduate medical education, it is important to explore how best to teach students without taking time away from patient care. Toward this end, the Department of EM at the Mount Sinai School of Medicine developed its CyberSchool (<http://mssm.edu/emergmed>), an interactive CAI program designed to assist teaching and learning via the Internet. It helps students acquire resources and skills that encourage them to become effective lifelong learners.

CyberSchool combines two powerful entities: the Internet and CAI. New hypertext and multimedia technology (HTML), as well as the wide acceptance of the Internet, enhances the efficacy of CAI. The World Wide Web allows users to receive a graphic representation of data and point-and-click to more information. Data can be accessed any place, any time, as long as a computer with a proper modem is available. Reproducible visual stimuli can be turned into graphic images; rashes, wounds, and physical findings, as well as x-rays, CT scans, MRIs, and ultrasound (even in real time), can all be presented using this technology. More important, a lecture, review, or case conference does not have to be missed simply because a student is tired after working an overnight shift. Lessons can be given right in the ED during lulls in patient volume. The same presentation can also be given simultaneously at different sites, without having to coordinate transportation of individuals to a single location.

CyberSchool consists of 3 educational components: EM Case Conference, Photoland, and Interesting Case of the Week.

- 1) **EM Case Conference:** A case-based interactive tool that includes 8 modules: Advanced Cardiac Life Support (ACLS) review, Ear-Nose-Throat (ENT), toxicology, trauma, environmental emergencies, Obstetrics/Gynecology, ophthalmology, and orthopedics. Each module contains 3–5 cases which illustrate the presentation and management of common EM problems.
- 2) **Photoland:** Each photograph has a mini-case presentation and asks sample questions for group discussion. It is followed by a mini review of didactic material. The photographs are obtained using digital images photographed in the Mount Sinai ED, with written patient consent.
- 3) **Interesting Case of the Week (I.C.O.W.):** This feature, currently being beta tested, will be a case-based interactive tool that presents an actual patient seen in the ED. It allows the user to determine a differential diagnosis and attempt

to manage the patient. A new case will be presented each week, including pertinent patient photos, x-rays, ECGs or sonograms. This tool will allow individuals who are unfamiliar with HTML to put their cases into the necessary format to be put onto the website. Thus, the use of CAI by faculty to aid in their teaching duties will not be limited to individuals with specialized expertise in HTML programming.

In conjunction with the development of the CyberSchool, a research protocol has been established to study its impact on the education of Mount Sinai medical students. Supported by an "Innovation in Medical Education Grant" from the Emergency Medicine Foundation, the accessibility and impact of this CAI educational tool is being studied. Half of the Mount Sinai students have access to the CyberSchool during their EM rotation while the other half do not. Preliminary data suggests that 73% (36/49) of students are in favor of CAI as an adjunct to their EM curriculum. The number of a student who had access and who actually used the educational tool was 36% (9/25). The data on whether or not the users performed better on the final examination, and whether they were more satisfied with their EM educational experience, is still being collected and analyzed.

The Future of EM at the Mount Sinai School of Medicine

The Mount Sinai School of Medicine is in the final stages of a complete review and redesign of the undergraduate curriculum. A new curriculum will be introduced beginning with the Class of 2004. Important features include integrated, non-department-based courses, early introduction of clinical experiences, increased use of small-group teaching, and the effort to foster lifelong learning and evidence-based practice skills.

The undergraduate curriculum in EM can help meet these goals from several perspectives. During the EM clerkship, students will be exposed to a large number of new patients with a broad range of presenting problems and chief complaints. The EM curriculum will be designed to assist students in making sound decisions by applying evidence-based information relating to patient diagnosis, management, and prognosis. In addition, because the ED's scope of practice is so broad, the curriculum can help students review the basic mechanisms of disease, normal physiology, and pathophysiology for a large number of disease entities and presentations.

In the future, we expect that much more sophistication will be required in information

management and technologies. To prepare Mount Sinai graduates, the ED curriculum will present selected topics in medical informatics and database management. This process has already begun with the creation of the Department of Emergency Medicine's CyberSchool website. In the future, elements used in the CyberSchool will be presented by a consortium of educators drawn from a number of departments, in addition to Emergency Medicine.

We believe that bedside technologies will continue to expand and that there will be diagnostic modalities available at the bedside which will render the stethoscope almost obsolete. These modalities will include imaging techniques, as well as very sophisticated, inexpensive point-of-care testing equipment. The current practice that requires most patients to schedule testing, obtain the tests, and then return for test results and follow-up will be a foreign concept. "One-stop shopping" will be the rule. If a patient requires a consultation, it may be performed on-line via a telemedicine hook-up, thus saving the patient and the consultant time and money. Our students will need the training and practice in the use of these clinical modalities, and the ED will be in the forefront of this technological revolution.

Finally, we hope to change the focus of our practice from one which not only responds to intercurrent emergencies and urgencies, but one that also focuses on elements of preventive medicine. Thus, the curriculum will encompass a review and overview of the preventive measures that have been shown in an evidence-based fashion to be important, and strive to incorporate these measures into our practice patterns whenever it is appropriate. This focus will continue to blur the sharp demarcation of functions and services that are provided in an ED and those provided in primary care settings. Since EDs are always open and have periods of reduced traffic, the provision of preventive health services in the Emergency Department will be a cost-effective and convenient vehicle to maximize public health. Our trainees will have these elements of preventive health care both discussed and illustrated during their rotations through our department.

At this juncture, the future looks very bright, busy, challenging, and exciting for both faculty and students. For students rotating through emergency medical programs, the quality of their professional lives and their ability to offer their patients and families exemplary care will be supported and enhanced by a curriculum that will anticipate their needs and the needs of their patient as we begin the twenty-first century.

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