

REVIEW

Residency training in emergency medicine: the challenges of the 21st century

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Abstract. Emergency Medicine is a relatively young specialty in the United States as well as in other parts of the world. It was only 36 years ago, in 1968, that the American College of Emergency Physicians was founded. Two years later, the University of Cincinnati in Cincinnati, Ohio, USA launched the first Emergency Medicine Residency Training Program. Until the inception of this program, staffing of "Emergency Rooms" consisted largely of physicians who were not trained in the specialty of Emergency Medicine. Emergency Medicine Residency training programs fulfill the need to have Emergency Medicine trained physicians staffing Emergency Departments. There are three and four year training formats for Emergency Medicine in the United States. The University of Cincinnati program is a full four-year program, which teaches residents to master the many diagnostic, procedural, and interpersonal skills required of Emergency Medicine physicians. Diagnostic skills must encompass the pathology affecting all organ systems in all age groups and both sexes. Procedural skills include airway management, vascular access, cavity access, and wound repair. Interpersonal skills are demanding as well, requiring leadership/management of the Emergency Department care team, immediate patient rapport, and dealing with patient/family grief. The Residency Review Committee of the Accreditation Council for Graduate Medical Education (ACGME) ensures that all programs have a structured curriculum complete with both didactic and bedside teaching, as well as structured methods for evaluation of both residents and faculty. According to manpower studies, a great need still exists for Emergency Physicians in many United States hospitals, particularly in rural communities. (Keio J Med 53 (4): 203–209, December 2004)

Key words: emergency medicine, residency, specialty training

Introduction

Emergency Medicine is a challenging and complex field requiring specific training in many disciplines. Television programs such as *911*, *ER*, *Chicago Hope*, and *Trauma: Life in the ER* glamorize this relatively new field of medicine and have projected an image of emergency department care throughout the world. There are approximately 5,000 emergency departments in the United States with 25,000 physicians practicing in these centers. Currently more than 2,700 physicians are being trained in the 132 Emergency Medicine Residency Training Programs approved by the Accreditation Council for Graduate Medical Education (ACGME) in the United States. The ACGME is a pri-

vate, professional organization responsible for the accreditation (approval) of nearly 7,800 residency programs in all specialties. Membership of the ACGME is composed of members from institutions (hospitals), representatives of the American Board of Medical Specialties, health care payors, government representatives and the general public. The ACGME accredits 110 specialty and subspecialty programs for ultimate board certification by the 24 member boards of the American Board of Medical Specialties. Each year these programs graduate approximately 800 physicians that are eligible to become certified as Emergency Medicine specialists. Emergency Medicine has been and continues to be, one of the most competitive specialties for medical student applicants. The American College of

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Emergency Physicians (ACEP), which began with eight physicians in 1968, now has nearly 20,000 members. There are more than 4,000 members of Emergency Medicine's academic organization, the Society for Academic Emergency Medicine (SAEM). There are 56 departments of emergency medicine within the nation's academic medical centers, in addition to more than 20 divisions and sections. Four established peer-review journals highlight research in the field, among many textbooks, journals, and other publications which emphasize emergency services.

The History of Emergency Medicine in the United States

The annual number of emergency department visits has increased exponentially since the concept of the "Emergency Room" originated in the early 1960s, with over 105,000,000 patient visits recorded in 2003.¹ Three major factors conspired during this decade to set the stage for the development of this new specialty. First, an increasingly mobile population did not remain in one place long enough to establish physician/patient relationships. In addition, third party payers began assuring payment for outpatient medical services rendered in a hospital. Lastly, new experiences in Vietnam with the treatment of traumatically wounded soldiers demonstrated that lives could be saved if skilled patient care was delivered early, particularly within the first hour after injury. Patient visits to hospital emergency services increased 367% between 1955 and 1971, more than any other hospital service. Adequate physician staffing was necessary to meet the increasing patient numbers presenting to hospital emergency rooms.¹⁻³

The precipitating events that created the specialty of Emergency Medicine in the United States actually began in the post-World War II era. Epidemiologic, healthcare, and economic forces were responsible. The population of the United States increased with the "baby boom" resulting from soldiers returning from the war in the late 1940's and early 1950's, and urban sprawl became commonplace around major cities. Primary care physicians found themselves unable to make house calls any longer and their busy office practices were often so overburdened that they sent patients directly to the hospital for care. In addition, federal and third party insurance companies began supporting hospital-based services more heavily than those provided in the office or at home.³⁻⁵ Finally, with medical advances, people began to think of the concept of specialty certification in particular medical fields as a necessity. The cessation of house calls, increasing number of indigent patients, the concept of specialty training, decreased access to primary care, and economic reimbursement for hospital-based services caused patients

to come to hospitals for care in ever-increasing numbers. The number of patient visits to emergency departments increased 367% from 1955 to 1971.³

Hospitals were evolving as well. Diagnostic and therapeutic modalities were becoming increasingly sophisticated. Intensive care units, with constant monitoring by skilled nurses, allowed survival of increasingly sicker patients. Unfortunately, the "Emergency Rooms" of the time were ill equipped and under-staffed to handle the new demands that were placed on them. An "ER" was often a single room staffed by one nurse and an on-call, but off-site, physician. In teaching hospitals, the unsupervised junior house officers and interns provided emergency care. Faculty supervision was virtually non-existent. In non-teaching hospitals, emergency care duty was left to disaffected members of the medical staff such as new specialists, physiologically impaired physicians, or those unhappy with their own practice. Often these individuals were newly graduated physicians with little or no experience, or those who could not find work in other areas of the medical care system. Hospitals desperately needed to improve methods for staffing their emergency departments.

In 1961, four physicians in Alexandria, Virginia left their office practices and formed the first full-time physician group dedicated exclusively to providing medical care in the emergency department. James D. Mills, Jr., MD conceived of this staffing concept, which became known as the "Alexandria Plan". Shortly thereafter, two other similar staffing designs were established by other physicians in Pontiac and Flint, Michigan. These physicians were devoted to emergency care and searched for information to help improve their diagnostic and management skills. However, there were no educational programs devoted to emergency care at that time. The next step was the establishment of organizations dedicated to meeting the professional needs of career emergency physicians particularly with regard to education and training.¹

On August 16, 1968, eight emergency physicians met in Lansing, Michigan to discuss forming a society that would meet the professional needs of career emergency physicians. At this meeting, the American College of Emergency Physicians (ACEP) was founded. Two years later, the University of Cincinnati launched the first Emergency Medicine Residency Training Program in 1970.⁶ By 1975, there were 23 approved residencies with 100 residents and two academic Departments of Emergency Medicine. That year the American Medical Association's House of Delegates approved a permanent section of Emergency Medicine and accepted standards for Emergency Medicine residents. In 1979, the American Board of Medical Specialties (ABMS) voted to approve the American Board of Emergency Medicine (ABEM) as a conjoint modified board.

Table 1 History of Emergency Medicine in the United States

1968	American College of Emergency Physicians formed
1969	Annals of Emergency Medicine founded
1970	University of Cincinnati Emergency Medicine Residency Training Program started University Association for Emergency Medical Services founded
1979	American Board of Emergency Medicine becomes Conjoint (Probational) Board
1980	43 residency training programs in Emergency Medicine available
1984	Emergency Medicine becomes a separate Department (with Surgery, Medicine, Pediatrics, etc) of the University of Cincinnati College of Medicine
1989	American Board of Emergency Medicine becomes a full, separate board of the American Board of Medical Specialties
1990	81 residency training programs in Emergency Medicine
1993	Academic Emergency Medicine journal founded
2003	132 Emergency Medicine training programs available
2004	62 Full Departments of Emergency Medicine in the U.S. Listing of Emergency Medicine on National Institutes of Health web site with 10 departments having National Institutes of Health funding

Emergency Medicine therefore became the 23rd official medical specialty in the United States. Certification examinations followed the next year. In 1982, special requirements for Emergency Medicine residency training programs were approved by the Accreditation Council for Graduate Medical Education (ACGME). In 1989, primary board status was granted by the ABMS. Four subspecialties have been established within Emergency Medicine: Medical Toxicology, Pediatric Emergency Medicine, Sports Medicine, and Hyperbaric Medicine⁷ (Table 1).

The Development of Academic Emergency Medicine in the United States

Early milestones in academic Emergency Medicine are actually noted in legislative documents, rather than the scientific literature. In 1966, the National Academy of Sciences published a report entitled “Accidental Death and Disability: The Neglected Disease of Modern Society”, which led to passage of the Highway Safety Act. This act required all states to develop regional emergency medical service systems.⁴ Then, in 1968, the American Telephone and Telegraph Company enabled telephone companies to offer 911 service. The Emergency Medical Services Act was passed in 1973 and provided funding for comprehensive emergency care systems. In 1985, the National Research Council published “Injury in America: A Continuing Public Health Problem”.⁸ This document emphasized the need for integrated pre-hospital, emergency, and in-hospital trauma care. In 1986, congress passed

the Consolidated Omnibus Budget Reconciliation Act (COBRA), which contained the Emergency Medical Treatment and Labor Act (EMTALA). This statute required that all patients who present to an emergency department receive an emergency medical screening examination as well as stabilization regardless of payor status. Thus, the emergency department has become the safety net for the entire population, as it is the single point of universal access to healthcare in the United States.⁴

There were initially no educational or academic training programs in Emergency Medicine. ACEP was founded in August of 1968 to initiate the process of education and communication among emergency physicians, and the first Emergency Medicine Residency Training Program was established at the University of Cincinnati in 1970. That same year the University Association for Emergency Medical Services (UAEMS) was formed. In 1974, UAEMS invited Emergency Medicine residents to participate in their meetings, laying the foundation for what would become the Emergency Medicine Residents’ Association (EMRA).¹

UAEMS and ACEP then jointly tackled the formidable task of developing an Emergency Medicine certifying board and establishing accredited residency training programs. These organizations had to define the content of this proposed new specialty, establish a model curriculum for residency programs, develop a voluntary residency accreditation body modeled on the established Residency Review Committees, incorporate a certifying board, and develop a specialty examination. Part of the original strategy to gain formal recognition of this new specialty was to establish a Section Council on Emergency Medicine within the American Medical Association (AMA). Therefore, a coalition of UAEMS, ACEP, and the Society of Critical Care Medicine formed a Federation for Emergency and Critical Care Medicine in 1973. The AMA sponsored a conference that identified the parameters of undergraduate, graduate, and continuing education for Emergency Medicine. The formal Section on Emergency Medicine was ultimately approved in 1976.¹

Meanwhile, many practicing and academic emergency physicians felt it was time for Emergency Medicine to become a recognized specialty within the American Board of Medical Specialties (ABMS). The ABMS develops criteria for a specialty to exist. Essentially, those criteria are the following: 1) content domain that represents a distinct area of medicine, 2) certification that is tied to Accreditation Council for Graduate Medical Education (ACGME) accredited training, 3) a board that is representative of the specialty, 4) broad professional support for the specialty, and 5) an appropriate evaluation and testing system.

In 1975, ACEP established the Committee on Board Establishment to set the standards for credentialing and certification in emergency medicine. ABEM was charged with the tasks of developing the certification examination and planning the logistics of its administration. An application for primary board status was filed on ABEM's behalf by UAEMS and ACEP and was initially rejected. Several member boards worked together, however, to form a conjoint board consisting of 19 directors, with 12 additional members belonging to ACEP, UAEMS, and the AMA. The 7 remaining positions on the Board would belong to the American Boards of Family Practice, Internal Medicine, Obstetrics and Gynecology, Pediatrics, Psychiatry, Neurology, and Surgery. Interestingly, these 7 co-sponsoring boards were independently polled regarding how many months of the Emergency Medicine curriculum should be devoted to components of their specialty. The cumulative curriculum would have exceeded 15 years of training in Emergency Medicine. Clearly, an integrated curriculum was needed. A more appropriate training period was selected (3 to 4 years), and on September 21, 1979 ABEM was formally recognized as a conjoint, modified specialty board by the ABMS. Emergency Medicine became the 23rd academic specialty in the House of Medicine. Over 600 emergency physicians presented for the first certification examination in February, 1980.

During the 1980s, academic Emergency Medicine expanded, and the number of residencies increased as well. UAEMS and the Society for Teachers of Emergency Medicine merged in 1989, bringing research and education in Emergency Medicine together under one name, the Society for Academic Emergency Medicine (SAEM). This organization attracts researchers and academicians in Emergency Medicine to its Annual Meeting which focuses on promoting academic Emergency Medicine through education and research. A new organization of residency program directors was formed, known as the Council of Emergency Medicine Residency Directors (CORD). These individuals were dedicated to the education and training of Emergency Medicine residents, EMRA continued to expand as well, claiming two ACEP Council seats in 1989. In recognition of these advances in academic Emergency Medicine, the ABMS voted unanimously to approve ABEM as a full primary board on September 22, 1989, ten years after its approval as a conjoint board. The number of academic Departments of Emergency Medicine in United States medical schools more than doubled in the early 1990's and the Association of Academic Chairs of Emergency Medicine was founded in 1989.

Academic Emergency Medicine continues to thrive, with the combined goals of SAEM and ACEP sum-

marized by "Research Directions in Emergency Medicine", a consensus report that was published in March 1996. This paper was based on a symposium "The Role of Emergency Medicine in the Future of American Medical Care". The report recommends the following: 1) enhanced support for basic, clinical and health services research 2) promotion of collaborative interdisciplinary research 3) development of new systems to manage clinical information 4) development of new methods to assess the outcomes of emergency care and 5) securing increased funding for Emergency Medicine research⁵ (Table 1).

Curriculum

Emergency Medicine Residency Training Programs fulfill the need to have Emergency Medicine trained physicians staffing emergency departments. In order to become an Emergency Medicine trained specialist, one undertakes the following course of study:⁷

- a) 12 years of primary/secondary school
- b) 4 years of undergraduate (college) education
- c) 4 years of medical school
- d) And finally 3 to 4 years of Emergency Medicine Residency Training.

Guidelines from the Residency Review Committee on Emergency Medicine

There are three basic formats for Emergency Medicine training in the United States following medical school: 1) three-year programs, 2) four-year programs that include a general transitional first year, and 3) four-year programs with all four years focused on Emergency Medicine. The Residency Review Committee (RRC) of the Accreditation Council for Graduate Medical Education (ACGME) ensures that all accredited programs have a structured curriculum complete with both didactic and bedside teaching, as well as structured methods for evaluation of both residents and faculty. Residents are defined for the following discussion as emergency physicians in training⁷ (Table 2).

According to the RRC for Emergency Medicine, the Program Director and faculty of an Emergency Medi-

Table 2 Residency Training in Emergency Medicine in the United States

Formats:	
16	1, 2, 3, 4 year programs
16	2, 3, 4 programs (3 years after separate 1 year internship)
100	1, 2, 3 year programs (3 years including the internship year)

Adapted from www.SAEM.org and www.acgme.org

cine Residency Training Program must prepare and comply with written educational goals. All educational components of a residency program should be linked to these program goals. An adequate number of patients of all ages and both sexes with diverse clinical problems must be available to provide a patient population sufficient to meet the educational needs of Emergency Medicine residents and residents who rotate in the emergency department from other services such as Internal Medicine and Surgery. The primary clinical site for an Emergency Medicine Residency Training Program should have residents rotate for 4 months or longer and have at least 30,000 emergency department visits annually. The pediatric experience is defined as the care of patients less than 18 years of age and should consist of at least 16% of all resident emergency department encounters, or 4 months of fulltime-equivalent experience dedicated to the care of infants and children. Although this experience must include the critical care of infants and children, at least 50% of the 4 months should be in an emergency setting. The number of critically-ill or critically-injured patients treated by the residents at the primary clinical site should be significant, constituting at least 3% or 1,200 of the emergency department patients per year (whichever is greater) who are admitted to monitored care settings, operative care, or the morgue following treatment in the emergency department. Additional critical care experience is required during off-service rotations, such as months spent in the medical and surgical intensive care units.

All residents within the emergency department must be under the supervision of Emergency Medicine faculty 24 hours per day, 365 days per year. Sufficient faculty must be present to provide the supervision necessary for the care of each patient. Supervision should be commensurate with the resident's level of training. The Program Director must ensure that the degree of professional responsibility accorded to a resident is progressively increased throughout the course of training, and appropriate for skill and experience level of the individual resident. There should be opportunities to develop clinical and administrative judgment in the areas of patient care, teaching, administration, and leadership.

A minimum of 6 residents per year of training is required in order to achieve a major impact in the emergency department and a cohesive program. This number also helps to ensure meaningful attendance at Emergency Medicine conferences, and to foster a sense of residency program and departmental identity.

At a minimum, residents shall be allowed 1 full day in 7 days away from the institution and free from any clinical or academic responsibilities, including planned educational experiences. While on duty in the emer-

gency department, residents may not work longer than 12 continuous scheduled hours. There must be at least an equivalent period of continuous time off between scheduled work periods. A resident should not work more than 60 scheduled hours per week seeing patients in the emergency department and no more than 72 duty hours per week. Duty hours comprise all clinical duty time and conferences, whether spent within or outside the educational program, including all on-call hours.

The Program Director must provide each resident physician and member of the faculty, in writing and in advance of the experience, a comprehensive curriculum specific to the educational needs of the Emergency Medicine resident and designed to accomplish the defined goals and core competencies of the Emergency Medicine Residency Training Program. The curriculum shall include the educational objectives for each rotation or other program assignment, as well as methods of implementation, evaluation processes, and mechanisms for feedback.

In terms of educational experiences, the RRC requires each program to offer its residents an average of at least 5 hours per week of planned educational experiences developed by the Emergency Medicine Residency Training Program. These educational experiences should include presentations based on the defined curriculum, morbidity and mortality conferences, journal review, administrative seminars, and research methods. The RRC recommends that programs ensure that residents are relieved of clinical duties to attend these planned educational experiences. The program should require that each resident participate in at least 70% of the planned Emergency Medicine educational experiences.

At least 50% of the training beyond the first year must take place in the emergency department. Of the total educational experience, no less than 50% should take place under the supervision of Emergency Medicine faculty. Such experiences can include Emergency Medical Services, Toxicology, Pediatric Emergency Medicine, Sports Medicine, Emergency Medicine Administration, and research in Emergency Medicine (Table 3).

As pre-hospital care is an integral and vital part of Emergency Medicine, there must be a formal, structured resident experience in this area. This should include participation in paramedic base station communications, emergency transportation and care in the field including ground units and if possible air ambulance units, teaching and oversight of pre-hospital personnel, and disaster planning and drills.

Each resident physician must have sufficient opportunities to perform invasive procedures, monitor unstable patients, and direct major resuscitations of all types on all age groups. A major resuscitation is patient

Table 3 Curriculum for Residents in the University of Cincinnati Emergency Medicine Residency Training Program

Year 1	Orientation Emergency Medicine – 4 months Orthopaedics ENT Pediatric EM CCU MICU Peds Anesthesia
Year 2	Emergency Medicine – 5 months Peds ICU Community ED Trauma Obstetrics Neurosurgery Elective
Year 3	Emergency Medicine – 6 months Plastic Surgery Community ED SICU Elective – 2 months
Year 4	Emergency Medicine – 6 months Community ED Elective – 4 months (EMS, Toxicology, Administration, Air Care, etc)

care for which prolonged physician attention is needed and interventions such as defibrillation, cardiac pacing, treatment of shock, intravenous use of drugs including thrombolytics, vasopressors, neuromuscular blocking agents, or invasive procedures such as cutdowns, central line insertion, tube thoracostomy, or endotracheal intubation are necessary for stabilization and treatment. The resident must have the opportunity to make admission recommendations and direct resuscitations.

Emergency Medicine Residency Training Programs must maintain a record of all major resuscitations and procedures performed by each resident. Only one resident may be credited with the direction of each resuscitation and the performance of each procedure.

The RRC recommends that the staff as a whole, including residents, must demonstrate broad involvement in scholarly activity. Examples of scholarly activities include participation in journal clubs and research conferences, or involvement in regional or national professional and scientific societies. Ideally this involvement is represented by presentations at the organizations' meetings and publications in their journals, experiences in research, or a collective review or case report. The future of Emergency Medicine rests in the hands of those motivated resident physicians who are well prepared for roles in academics, research, and administration.

The First Emergency Medicine Residency Training Program: The University of Cincinnati

The Emergency Medicine Residency Training Program at the University of Cincinnati Medical Center is known internationally for excellence in training resident emergency physicians. This program was the first Emergency Medicine Residency Training Program. Since its inception in 1970, it has maintained a strong reputation. The program has over 250 graduates, with greater than 50% of the graduates filling academic positions throughout the United States. Graduates are also located in other countries such as Iceland and Turkey.

The University of Cincinnati Emergency Department was established as the Emergency Medicine specialty itself was evolving. In the late 1960's, patients in Cincinnati were lobbying for better emergency care, and hospitals were recognizing the need to staff emergency departments to handle this greater influx of patients. At the Cincinnati General Hospital and University of Cincinnati College of Medicine, Richard Vilter, MD, Chairman of the Department of Internal Medicine recruited Herbert Flessa, MD, Internist and Oncologist to assume the role of Director of Ambulatory Services, including emergency services. The emergency department of Cincinnati General Hospital at that time saw over 100,000 patients each year, with care provided by interns from various departments supervised by senior Surgery and Internal Medicine residents. There was no faculty physician supervision. Dr. Flessa realized that the care in the emergency room needed to be improved and recognized the need for a specific training program for physicians practicing Emergency Medicine. Dr. Flessa collaborated with Dr. Joe Lindner, MD, Medical Director of the Cincinnati General Hospital and Paul Lewis, MD, a Neurosurgeon, to create an Emergency Medicine Residency Training Program. On July 1, 1970, Bruce Janiak, MD, became the first Emergency Medicine resident in the United States. He entered a then two-year program to study Emergency Medicine at the University of Cincinnati Medical Center. The program was approved by the AMA as a two-year residency which followed a rotating first year of training as an intern. At the completion of Dr. Janiak's first year, three additional residents were added as Emergency Medicine residents, and by 1974 the number accepted per year was six. The program has expanded to the current number of 12 residency physicians per year. In 1975, Dr. Richard Levy assumed the directorship of the Emergency Medicine Residency Training Program and eventually the chairmanship of the Department of Emergency Medicine. He served in this capacity until May, 1995 when he was succeeded by W. Brian Gibler, MD. During Dr. Levy's tenure, the

residency training program became a four-year program with twenty-four hour emergency department Attending level physician supervision and teaching, attained full departmental status within the College of Medicine in 1984, and initiated a research focus for this new specialty. The University of Cincinnati Emergency Medicine Residency Training Program is now a full four-year program, which teaches residents to master the many diagnostic, procedural, and interpersonal skills required of Emergency Medicine physicians. Diagnostic skills must encompass the pathology affecting all organ systems in all age groups and both sexes. Procedural skills such as airway management, vascular access, cavity access, and wound repair are perfected. Interpersonal skills are demanding as well, requiring leadership and management of the care team, immediate patient rapport, and dealing with patient as well as family grief. The University of Cincinnati Emergency Medicine Resident Training Program employs graded responsibility for development of these skills. Year 1 emphasizes complex diagnostic skill development, while Year 2 emphasizes procedural skills and flying on the helicopter air ambulance. Year 3 focuses on the care of the critically ill patient. Year 4 emphasizes the resident in the role of leader, educator, and preceptor. Residents spend approximately 50% of their time, 24 months, in the emergency department at the University Hospital, Children's Hospital Medical Center, and several community hospitals. Residents spend 5 months in critical care units, including the Surgical Intensive Care Unit (ICU), Medical ICU, Neurosurgical ICU, Pediatric ICU, and Coronary ICU. Other valuable rotations include months spent rotating on Trauma Surgery, Orthopedic Surgery, Plastic Surgery, Anesthesia, Otolaryngology and Obstetrics. There is also ample elective time for residents to explore interests that include, but are not limited to, Toxicology, Hyperbaric Medicine,

EMS, Air Care (the hospital's critical care air transport service) or development of their skills as a researcher or clinical educator.

Conclusion

Emergency Medicine is a complex field requiring specific training in many disciplines. Over the last 33 years, training in the field of Emergency Medicine has evolved from a single program at the University of Cincinnati Hospital to 118 programs throughout the United States. The breadth and depth of Emergency Medicine training challenges residents and faculty to strengthen the field through research and innovative educational experiences.

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