DISTANCE EDUCATION IN EMS:
A LITERATURE REVIEW AND RURAL/URBAN COMPARISON

U.S. Department of Health and Human Services
Health Resources and Services Administration (HRSA)
Office of Rural Health Policy (ORHP)

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Foreword

The initial training and continuing education of Emergency Medical Services (EMS) personnel in rural areas has been a persistent challenge. Academically based models present challenges of access for what is often a voluntary workforce. Conferences, workshops, and specialty trainings tend to happen in urban centers, forcing rural personnel to take time away from their primary jobs and family, not to mention leaving their home community vulnerable in their absence.

Distance education or distributive learning has been shown to be an effective means of delivering information and skill sets to a variety of professions. Over the past 2 decades, numerous distance learning products and delivery mechanisms have been developed. These include interactive video discs, interactive CD ROMs, televideo and Web-based applications, among others. Some of these have been developed with the use of Federal funds, for instance, through the Health Resources and Services Administration (HRSA) EMS for Children program. Therefore, many are available at little or no cost. Utilization of these training programs in rural areas, however, has not been widespread.

There are many theories about why such programs have not enjoyed broader dissemination and use. These range from a lack of awareness of their availability, to limited computer and bandwidth access, or the lack of personal or social contact during the asynchronous training event.

This document explores what is known about distance learning in EMS and how it is currently used. It proposes recommendations for future development and application. It is our sincerest hope that it will help direct future program development to ensure that training opportunities are more fully embraced and utilized by EMS professional-- one of rural America's most vital health care resources.

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Distance Education in EMS:

Literature Review

PART I

INTRODUCTION

Continuing professional education is valuable and essential to ensuring high quality health care in the prehospital arena.[1] Access to, and availability of, institutional-based Emergency Medical Services (EMS) education programs is limited in rural communities.[2,3] This places the burden of travel, costs, and time away from family on EMS professionals who have potentially limited resources. Education offered from a distance is seen as one alternative to reducing the burdens and challenges EMS professionals have with accessing initial and continuing education. Unfortunately, very little is known about distance education and continuing education in the EMS profession. We sought to investigate and increase what is known about these issues by undertaking a scientific review of the literature. The primary goal of this literature review was to examine the utilization of different types of distance education resources for fulfilling continuing education requirements in EMS.

LITERATURE SEARCH AND SELECTION

The review of literature was a multi-step process performed sequentially. It was performed specifically to identify published accounts of utilization of different types of distance education resources. The effectiveness, advantage, disadvantage, and ease of use of various resources were other issues of interest to investigators, and as such, were abstracted from the literature to enhance background knowledge.

The first step in the literature review process involved identifying the primary source of literature. MEDLINE (1966-February 2006), was used as the primary database for the literature search. Secondary searches were performed using email listserv announcements of newly published journal articles and technical / academic or government reports. Tertiary searches of the bibliographies of all abstracted articles were undertaken, but were cut short due to the study's timeline.

The search strategy was developed using the National Library of Medicine Medical Subject Heading (MeSH) keyword categorization developed specifically for MEDLINE. A medical research librarian from the Cecil G Sheps Center for Health Services Research at the University of North Carolina at Chapel Hill conducted the MeSH search and assisted with the interpretation of results. The search strategy used the following MeSH search terms: *Emergency Medical Services, Education-Distance, Education-Continuing, Inservice Training, and Organization & Administration.* Investigators performed a second search of the literature using all of the same MeSH search terms, except for Emergency Medical Services. This term was replaced with *Nursing.* The nursing profession is a health profession with a history and research base of greater depth than that of the Emergency Medical Services literature. Investigators searched the nursing literature to help fill in gaps in knowledge about the topic under study in this investigation. This approach seemed logical as issues and challenges experienced in the nursing profession are regularly compared to those encountered by Emergency Medical Technicians. For a detailed description of inclusion and exclusion criteria, and outline of the search strategies; see Appendix A and Tables A-1 and A-2.

RESULTS

The researchers reviewed 454 abstracts and 47 full-text articles. The mix of articles included random controlled trials, editorials, commentaries, evaluation studies, and case studies. Only one of the 47 full-text articles contained statistical data on the utilization of various EMS education methods. Dawson and associates'[4] study of nationally registered EMTs and Paramedics discovered that EMTs and Paramedics primarily use classroom instruction to fulfill continuing education requirements. Telemedicine, grand rounds, or national conferences were used less frequently (Figure 1.1).

One study, limited to urban environments and containing no information about differences in the methods used for fulfillment of continuing education, had identified that paramedic continuing education programs in most EMS systems mandate both didactic and clinical continuing education.[5] This particular study is informative, shedding light on continuing education course structure nationally, and is worth highlighting in this review. The study does not, however, improve what is known about use of distance education in EMS.

Publications evaluating the effectiveness or preferences of EMS professionals include research by Sanddal et al, Herman and associates, and Porter.[5-7] These studies closely examined the effectiveness of different methods for delivering continuing or initial EMS education, and identified EMS professionals' preferences for receiving continuing education -- all issues important to focused discussion in this report.

Editorials, commentaries, and other articles identified in the literature search discussed various aspects of initial, continuing, or distance education. Williams,[8] for example, addressed online EMS degree programs, commenting on program prevalence and trends over time. According to the author, many universities have begun offering portions of entire degree programs via distance learning. Drexel University, Western Carolina University, and George Washington University were specifically mentioned.

The remainder of the literature assessed in this review contained no national or State utilization estimates for any particular method of fulfilling continuing education requirements.

DISCUSSION

There are many methods available for fulfilling continuing education requirements in EMS. This review of the literature reveals that very little research has been done examining use of distance education for fulfillment of continuing education requirements. Only one study was identified containing information on the use of various distance education resources that can be extrapolated nationally. The bulk of information reviewed discusses distance education or continuing education in a general sense, or compares one method of education to another.

Below is a discussion of continuing education, distance education, and a review of terminology, requirements, and trends. These discussions are intended to expand upon the review of literature and contribute to guiding the future directions rural EMS professionals, policy makers, and advocates may pursue with respect to distance education in EMS.

Distance education, distance learning, distributed learning

Used interchangeably, distance education, distance learning, and distributed learning are terms used to describe a type of educational delivery. There is no single definition or uniformly accepted description of distance education. Many organizations like the United States Distance Learning Association (USDLA) describe distance learning as "*The acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance.*"[9]

The California Distance Learning Project (CDLP) defines distance learning as: "*an instructional delivery system that connects learners with educational resources. Distance learning provides educational access to learners not enrolled in educational institutions and can augment the learning opportunities of current students. The implementation of distance learning is a process that uses available resources and will evolve to incorporate emerging technologies.*"[10]

The Continuing Education Coordinating Board for Emergency Medical Services (CECBEMS) defines distributed learning as: *an educational activity in which the learner, the instructor, and the educational materials are not all present in the same place at the same time. Therefore, continuing education activities that are offered on the Internet, via CD ROM or video, or through reading journal articles or listening to audio tapes are considered distributed learning*.[11]

Types of distance education

Instructors, educational institutions, and private industry use journals, CD-ROMS, teleconferencing, satellite broadcasting, the Internet, and mailing of materials to facilitate education of students from a distance. Effective use of these often requires that the learner possess a variety of resources, including computers and other electronics. For educators and institutions providing Internet based learning, the learner must possess a computer, Internet provider, and high-speed or telephone dial-up Internet connectivity. Depending on the course, the learner may be required to purchase one or more software applications or hardware to facilitate distance education/learning.

For courses offered via audio/video-cassette or via CD-ROMS, the learner should have in his or her possession a stereo-cassette system, television, VCR, DVD player, or computer with a CD drive. Additional requirements may include software to read CD-ROM materials and subscription fees. A valid mailing address is a requirement for receiving distance education via professional or trade industry journals. Students signed up to receive education via satellite or teleconferencing may be required to travel to a local institution or facility receiving broadcasts from the designated home institution.

Continuing education

Most medical professionals are required to continually educate themselves. Continuing education is used to keep health care providers competent and familiar with the latest trends in their discipline and delivery of care. Continuing education can be described as organized learning experiences that are typically offered to those professions that have previously received a degree or certification/licensure. Colleges, universities, community and technical colleges, private organizations, government regulatory agencies, and businesses offer or fund the provision of continuing education. While not the norm, some may offer college-level credit to be applied towards completion of a degree or certificate program. Some form of educational credit may also be awarded by professional societies as a mark of professional distinction and further education. In terms of demographics, recipients of continuing education are typically adults, which is why the phrase “adult learner” is commonly seen in descriptions of continuing education courses.

Trends in distance education

Continuing education has advanced significantly since the mid-19th century when students and instructors used the postal service to mail assignments and exams. Mailing materials and other educational correspondence represented the beginning of distance education. As technology evolved, television and audio media replaced or augmented this process. Today, the Internet plays a key role in providing opportunities for distance education and learning.

Total distance education program enrollment data are not readily available. Numerous Internet Web sites, journals, magazines, and other sources provide a wide assortment of data and information, much of which is difficult to validate. Data and information available from the National Center for Educational Statistics show that over 3 million students in the U.S. enrolled in 127,400 different distance education courses between 2000 and 2001.[12] Fifty-six percent of all Title IV eligible, 2-year and 4-year degree institutions offered distance education courses for any level and any audience between 2000 and 2001.[12] Most students used Internet and video technologies. Based on a survey by the Sloan Consortium, over 1.6 million students were enrolled in some form of on-line education program in the fall months of 2002.[13] Other data from the Sloan Consortium shows that over one-third of the 1.6 million students completed all courses online.

In 1994, 35 percent of public elementary and secondary schools in the United States had access to the Internet. In 2003, 100 percent of these public schools had Internet access. Public schools have made steady progress towards increasing the availability of Internet access to students and facilitating learning through use of computers, closed circuit television, and other educational media. Institutions of higher learning have also expanded distance education opportunities for completion of baccalaureate, master's, and doctoral degree programs. Continuing education programs have expanded significantly in concert with other advancements, offering adult learners flexibility to meet their respective occupational continuing education requirements. The observed trend in education at present is to support distance learning using computers and other strategies to facilitate independent education. The familiarity younger students have with computers and Internet technologies will require institutions of higher learning, as well as other providers of education, to adapt to the needs and wants of a more independent and technologically sophisticated learner/student. Perhaps, not surprisingly, the resounding growth in distance education has called into question the future of institution-based learning environments.

Use of distance education to fulfill continuing education requirements

Rules and regulations adopted by State medical licensing boards, national societies, and educational governing bodies play a key role in decisions involving use of distance education. Using the State of North Carolina as an example, below is a discussion of the rules and regulations guiding physician and nurse use of distance education resources for fulfillment of continuing education requirements. Restrictions imposed on EMTs and Paramedics by the National Registry of EMTs is also presented.

Medical physicians

A States' general assembly delegates the authority to regulate the practice of medicine by medical doctors and physician extenders to State medical boards. This authority varies across States and so do the continuing education requirements for renewing licensure. According to the most recent (2006) State medical licensure requirements gathered by the American Medical Association (AMA); 58 boards require anywhere from 12 hours (Alabama) to 50 hours (several States) of continuing medical education (CME) per year for license re-registration.[14]

Under Title 21, Chapter 32 (.0101-.0102) of the North Carolina Medical Board medical education regulations, the board requires that each person licensed to practice medicine in the State shall complete 150 hours of relevant CME every three years.[15] The rule further States that at least 60 hours involve one of the following four options: formal courses, scientific/clinical presentations or publications, enduring material (printed or electronic), or skill development.[15] The remaining hours can be fulfilled through physician-initiated CME (e.g., self study, mentoring, journal clubs, or teaching).[15]

Other restrictions on physician use may be imposed by specialty boards. For example, the American Board of Emergency Medicine (ABEM) may require a physician or extender accumulate CME credits that focus on a specific medical specialty. The ABEM specifically requires that physicians applying for Emergency Medicine recertification complete and submit for review an average of 50 hours of CME per year in Emergency Medicine.[16] It is possible that additional hours of CME be completed if the physician does not apply within a certain time period after graduation from a residency program. In addition to the required CME credits per year, board certified emergency physicians must also have completed eight Lifelong Learning and Self Assessment (LLSA) tests equivalents every 10 years.[17]

Restrictions on the type of resources used to fulfill continuing education requirements are uncommon. Although dependent on specialty board and State medical regulatory board requirements, physicians have substantial flexibility in choosing the method in which they receive continuing education.

Nurses

Similar to the variability in regulations guiding the continuing education and licensure of physicians, the licensing authorities regulating the practice of nursing vary considerably from State to State. Nurse practitioners and mid-wives, as well as physician assistants, are often considered physician extenders and must adhere to a different set of CME requirements.

North Carolina, a State that has recently changed its requirements, offers a good example of CME requirements for nurses. As of July 2006, all nurses licensed by the North Carolina Board of Nursing must do the following every 2 years prior to receiving a renewed license. 1) Perform a self-assessment of practice. 2) Develop a plan for continued learning. 3) Identify one or more objectives consistent with dimensions of practice. 4) Select one activity from a list of eight learning activity options. Available options are included in the table below.

Available / approved learning activity options for NC licensed nurses fulfilling continuing education requirements
Obtain national certification
Complete 30 contact hours of continuing education activities related to nurse's practice
Complete of a board approved refresher course
Complete a minimum of 2 semester hours of post-licensure academic education related to nursing practice
Complete 15 contact hours of a continuing education activity related to nurse's practice and complete a formal nursing project or research study as principal or co-investigator which includes a statement of the problem, project objectives, methods, and summary of findings
Complete 15 contact hours of a continuing education activity related to nurse's practice and author or co-author a published nursing related article, paper, book or book chapter
Complete 15 contact hours of a continuing education activity related to nurse's practice and conduct an educational presentation or presentations totaling a minimum of 5 contact hours for nurses or other health professionals; or
Complete 15 contact hours of a continuing education activity related to the nurse's practice and 640 hours of active practice within the previous 2 years

Nurses with certain specialties may also be required or encouraged to become nationally certified. The American Nurses Association (ANA) is one of the largest nursing certification organizations in the U.S. The ANA and American Nurses Credentialing Center (ANCC) have partnered to provide material recognition of professional achievement in nursing. Certifying more than 150,000 nurses, the ANA and ANCC's basic re-certification requirements call for applicants to complete two of the five activities every 5 years:

1) Complete 75 contact hours, of which half must come from an ANCC approved course.

2) Complete five academic semester hour credits towards higher education in nursing (no core course allowed).

3) Present or lecture a total of five times to other allied health professionals on topics related to area of certification.

4) Publish one article or book chapter or one research project or one "other educational media" project or complete a doctoral dissertation or master's thesis in the specialty area.

5) Complete 120 hours of a preceptorship. Each individual requirement has restrictions and each medical specialty has its own requirements in addition to these core requirements.

Emergency Medical Technicians and Paramedics

The amount of hours and ways in which continuing education can be obtained by an EMT or Paramedic varies from State to State. Those that are nationally registered EMT-Basics and Paramedics, however, must fulfill a uniform set of continuing education requirements for re-certification by the National Registry of EMTs (NREMT).

Every two years, nationally registered EMT-Basics must complete a 24-hour refresher course, have evidence of current Cardio-Pulmonary Resuscitation (CPR) training, and complete 48 hours of additional continuing education. The source of the continuing education must be approved by the Continuing Education Coordinating Board for Emergency Medical Services (CECBEMS). The NREMT policy allows EMTs and Paramedics to use distributed learning resources to fulfill a portion of their total continuing education requirements. Ten hours of the 24-hour refresher course can be taken via distributed learning. Of the additional 48 hours of continuing education, 24 hours can be taken via a distance education resource.

Nationally registered Paramedics' continuing education requirements differ from those required of EMT-Basics. Paramedics must complete a 48-hour refresher course, have current CPR and Advanced Cardiac Life Support (ACLS) certifications, and fulfill 24 hours of additional continuing education. All courses must be approved by the Continuing Education Coordinating Board for Emergency Medical Services (CECBEMS) and Paramedics cannot use distributed learning resources to fulfill more than 10 hours of the 48-hour refresher course or 12 of the additional 24 hours of additional continuing education. Notably, use of distance learning by EMTs or Paramedics may be less in some States than in others. For example, State offices of EMS can require that all refresher course hours be taken in a classroom setting, limiting the opportunities EMTs and Paramedics may have to use distance education resources.

SUMMARY REMARKS

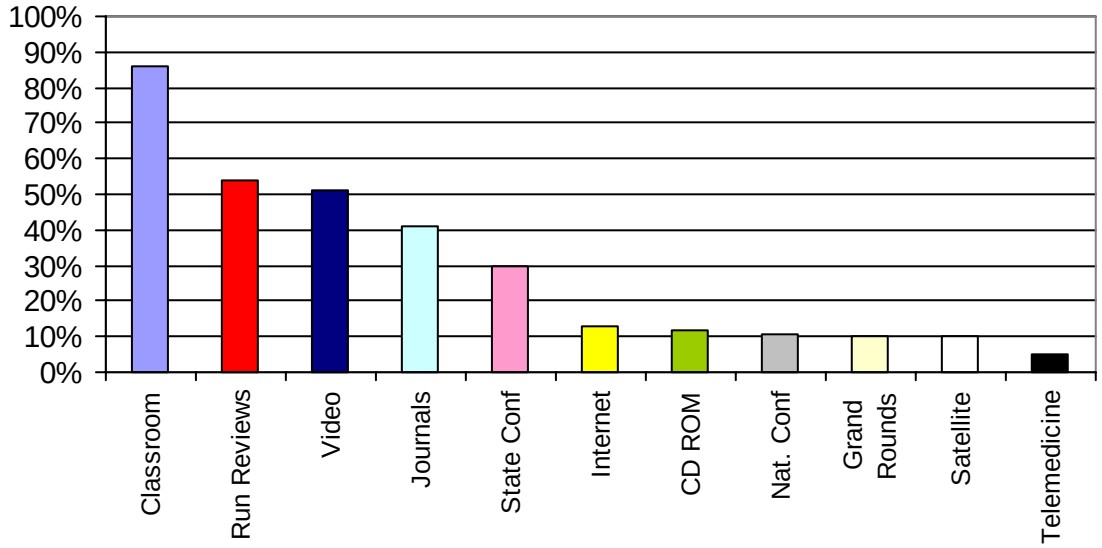
This study used MEDLINE, a popular medical search engine, to identify research focused on distance education, continuing education, and EMS professionals. Other databases were not explored using the systematic approach involving PUBMED's MEDLINE, Old MEDLINE, and in-process citations, and the collection of references contained within primary article bibliographies was limited. The results of this study, therefore, are subject to some criticism based on these methodological limitations. Additional research addressing the issues under study, accordingly, may be indicated.

In light of the study's limitations, several conclusions are clear.

1. **Very little is known about use of distance education to fulfill continuing education requirements within the EMS profession.**

Data from the study by Dawson and associates[4] is the only study referenced containing national utilization estimates for various methods of continuing education delivery, including methods common to distance education.

Figure 1.1: Resources – methods – used previously to fulfill continuing education requirements among Nationally Registered EMT-Basics and Paramedics (1999) [source: Dawson et al, 2003].



2. **Additional research exploring utilization and preference of different methods of receiving and delivering continuing education is needed.**

Data from the National Center for Educational Statistics show that technologies used to deliver distance education are abundant in our elementary, secondary, and educational institutions of higher learning. The younger cohort of EMS professionals, therefore, is not only familiar with the Internet, computers, and computer technologies; but may actually prefer to receive continuing education through one or more of these media over education delivered in a classroom setting.

Research identifying the supply and availability of continuing education programs for initial and continuing EMS education is needed. Studies of educational delivery in other health care disciplines are also basic and few in number.[18] At least one researcher has failed to identify use of any valid theoretical framework for delivering and evaluating continuing education.[18] Approaches and programs delivering continuing education are unfocused, using no real outcomes for evaluation and quality assessment.

Although limited, research in other disciplines offer some insights and direction for formulating research questions and hypotheses. The Internet, according to one study, is an effective tool for delivering continuing education.[18] Computer competency and technological difficulties are issues of importance, however.[18] Gender,[19-21] literacy,[22] organizational infrastructure and support, [23] and costs[24] are also important, and actually may play a role in facilitating or limiting use of distance education resources focused on the delivery of continuing education. Research should also address preference, identifying which among the many distance education technologies is most sought after by EMS professionals.

3. Distance education as the rule instead of the exception.

Leaders in medical education have a new, global vision for the delivery of continuing medical education.[25] There are old and new demands that health care professionals must meet in an environment which is growing more complex daily. It may no longer be convenient or cost-effective to deliver or receive education in a fixed location[26] particularly in rural environments. Use of electronic tools for fulfilling continuing education requirements has grown considerably in recent history; [18, 20] and significant differences in achievement of learning objectives are thought to exist. Distance-based learning programs may be superior to traditional classroom-based programs.[26] Experts are focused on differences in learning styles and student needs, individualized study plans, appropriate human interaction, material and activity variety, and continuous quality assessment.[26] As noted, considerable advances have been made, and many in EMS are attempting to use these advancements to improve the EMS education experience.[27]

There are important implications accompanying the growth and utilization of new and various methods of delivering EMS education via distance. It is safe to say that acceptance of, and comfort with, these newer techniques in education will continue to increase. It is important that those concerned with EMS continuing education expand the knowledge base on utilization, preference, and challenges to using distance education.

Distance Education in EMS:

Rural/Urban Comparison

PART II

INTRODUCTION

Like many health professionals, Emergency Medical Technicians (EMTs) and Paramedics are required to have continuing education to maintain licensure or certification. Every 2 years, nationally registered EMTs and Paramedics must complete a total of 72 hours of continuing education and refresher training. Individual State requirements vary, but are often similar to these national guidelines. Some systems require as much as 200 hours of didactic and 120 hours of clinical continuing education every year.[5] For professionals practicing or residing in rural and frontier areas, meeting these requirements is difficult. There is limited availability of institution-based EMS education programs in the sparsely populated areas that are prevalent in rural and frontier America. Accessing existing programs can be a challenge when in-service training and education is limited.[2]

As the number of volunteer and paid EMS personnel decreases nationwide,[28-33] reducing or eliminating challenges and burdens associated with fulfilling EMS continuing education requirements should be a high priority for parties concerned with the well-being of our nation's EMS systems. Recent advances in educational technologies have increased, such as those offered through the Internet. This may help reduce challenges and burdens of educating and retaining EMS professionals.

While distance education holds much promise, and appears to be gaining more acceptance in EMS circles, [34, 35] overall, very little is known about its availability and use in EMS on a national level. What is known is that EMTs and Paramedics have received continuing education using a wide variety of mechanisms.[4] Most urban-based EMS systems mandate Paramedics receive continuing education through didactic instruction.[5] Geographic variation in EMT and Paramedic acquisition of continuing education has not been investigated in detail. Identification of any rural-urban variations in the use of commonly used methods may be very informative for EMS education professionals and should help improve the availability of continuing education resources where needed, via changes in education policy and resource allocation.

The purpose of this study is to examine rural/urban or other differences in the mechanisms commonly used to fulfill continuing education requirements in EMS. It explores the nature of geographic differences using a nationally representative sample of EMTs and Paramedics. Careful attention will be given to EMT demographic and professional practice factors. Any of these factors may explain variations in use of certain mechanisms when differences between rural and urban groups are identified.

METHODS

Data Source and Population

Data used for this study come from the 1999 core and educational supplement of the Longitudinal Emergency Medical Technician Attributes and Demographics Study (LEADS) survey. The LEADS Project is a 10-year longitudinal study of the EMT workforce supported by the U.S. Department of Transportation, National Highway Traffic and Safety Administration (NHTSA) Office of EMS, and administered by the National Registry of EMTs (NREMT). The NREMT LEADS committee manages and coordinates the LEADS project, as well as, approves all proposals involving analysis of LEADS data.

The core survey contains 47 questions divided into 6 different categories (i.e. general, professional, education related, personal, finance related, demographic and background). The 1999 educational supplement contained 16 questions related to the use, type, and expenses of EMS education.

Each year, approximately 5,700 nationally registered EMT-Basics and Paramedics are randomly selected from the population of Nationally Registered EMTs and Paramedics; near 185,000 in 1999.[36] Those randomly selected receive the core and a supplemental survey on a topic of interest. The national registry organization samples EMT-Basics and Paramedics across three categories and six strata: certification, race, and experience. Weights are applied to each respondent to allow for national extrapolation. A detailed description of the survey methodology and sampling is presented elsewhere.[36]

Study investigators received approval to undertake the study described here by the Institutional Review Board (IRB) of the University of North Carolina, School of Medicine and research review committee of the National Registry of Emergency Medical Technicians (NREMT).

Dependent and Independent Variables

The primary dependent variables of interest were drawn from question #16 in the 1999 EMS education supplement survey. The question and its responses are noted in Table 2.1:

Table 2.1 In which of the following ways have you received continuing EMS education?

Classroom instruction	*Yes*	*No*
State conferences	*Yes*	*No*
National conferences	*Yes*	*No*
Run reviews or case reviews	*Yes*	*No*
Internet	*Yes*	*No*
CD-ROM and interactive computer programs	*Yes*	*No*
Telemedicine	*Yes*	*No*
Journal articles	*Yes*	*No*
Grand rounds	*Yes*	*No*
Video cassette	*Yes*	*No*
Satellite TV	*Yes*	*No*

The primary independent variable of interest was practice location, which we refer to as rural status of the EMT. Rural status was defined using responses to question #4 of the core survey. This question requested respondents select one of eight possible responses that best describe the community in which the EMT does most of his/her work. Responses were collapsed into the following 4 categories: Rural area (less than 2,500 people), Small town (2,500 – 24,999 people), Medium-sized town (25,000 – 74,999 people), and All others (75,000 + people).

Other independent variables of interest included certification level, volunteer status, age, EMT tenure status, and type of EMS service in which the EMT was employed.

Analysis

Frequencies and percentages were used to describe the sample across the four categories of community size. Chi-square tests were used to identify significant differences based on community size for all dependent and independent variables. Significant variations in the dependent variables were explored further using multivariable logistic regression models controlling for all independent variables of interest. Significance for chi-square and multivariable tests was determined using a p-value of 0.05. All analyses were performed in SAS Callable SUDAAN Version 9.1 (Cary, North Carolina).

Exclusions and missing data

The 1999 supplement contained responses from 1,743 EMT-Basics and Paramedics (~28% overall response rate[4]). For the purposes of this study, all EMTs indicating that they were temporarily or permanently not practicing or have already left the profession were excluded from the analysis (n=212). An additional 37 EMTs and Paramedics were missing information about the size of the community in which they did most of their work.

The proportion of EMTs and Paramedics missing gender was excessive, and therefore prevented its inclusion in all analyses. For the dependent variables of interest, missing responses were relatively minimal (< 7 percent).

Variable	***Frequency Missing***	***Percent Missing***
Classroom instruction	54	3.6%
Run/Case reviews	77	5.2%
Video-cassette	80	5.4%
State Conferences	85	5.7%
Journal Articles	84	5.6%
Satellite TV	94	6.3%
Internet	90	6.0%
Grand Rounds	105	7.0%
Telemedicine	93	6.2%

Calculation denominator = 1,494

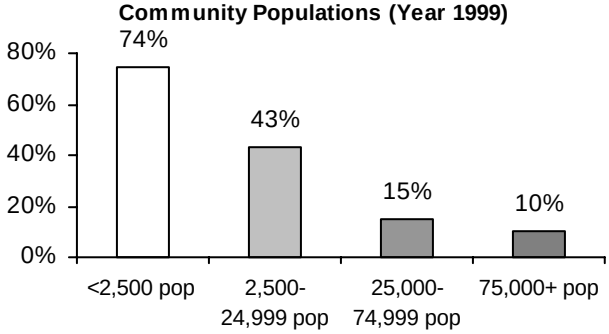
All analyses were performed on 1,494 or 85.7% of the original sample 1,743.

RESULTS

The 1999 EMT & Paramedic Workforce

While data show that one-third of all nationally registered EMTs and Paramedics are volunteers (Table 1), our analyses also find that there is substantial variation in the proportion of volunteers to paid professionals when examined in relation to community size (Figure 1). Three quarters (74 percent) of all EMTs and Paramedics in rural areas with less than 2,500 residents are volunteers. The number of volunteers practicing in a community is inversely proportional to the size of the community.

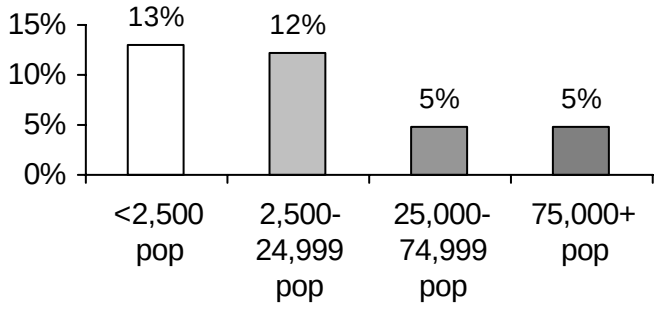
Figure 2.1: Percent of Volunteers Across Community Populations (Year 1999)



Two-thirds of all NREMT member EMS professionals are certified at the EMT-Basic level (Table 2.2). Ninety percent of Emergency Medical Technicians working in communities with less than 2,500 residents are certified at the EMT-Basic level. The proportion of EMT-Basics decreases as the size of the community increases.

One in every three (33 percent) EMT and Paramedic works at a Fire-based EMS agency (Table 2.2). Employment at a Fire-based EMS agency is significantly less in communities with fewer than 25,000 residents as compared to communities with 25,000 residents or more. One in five professionals works at a county / municipal or volunteer rescue squad. Most EMTs and Paramedics working in sparsely populated communities work at volunteer rescue squads or in EMS agencies operated by the county or other municipal government.

Figure 2.2: Geographic Distribution of EMTs & Paramedics age 50 years or older



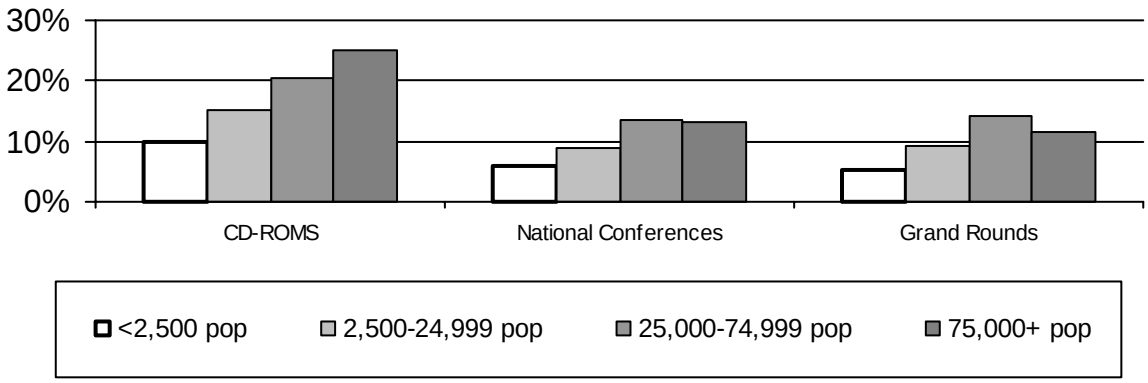
Half of all Emergency Medical Technicians are between the ages of 18 and 34 (Table 1). While overall less than 10 percent of EMS professionals are 50 or older; more older respondents appear to be practicing in smaller communities (Figure 2.2). Nearly one-third (31.5 percent) of all EMTs and Paramedics working in a rural area had been certified for less than 1 year when they completed the LEADS survey. Comparatively, one-quarter of professionals working in densely populated communities were certified for 1 year or less.

Methods of Receiving Continuing Education

For many of the methods by which an EMS professional receives continuing education, there is no difference in prior use between providers working in sparsely populated communities and those working in more densely populated communities (Table 2.3). The most common methods used to meet continuing education requirements in all locations include classroom instruction, run reviews, and video cassettes. The least common methods include telemedicine, grand rounds, and national conferences.

In examining the individual methods utilized by the entire study group, variations in experience or practices using CD-ROMS (p=0.0001), national conferences (p=0.0226), and grand rounds (p=0.0173) were identified (Table 2.3). The proportion of EMTs and Paramedics having received continuing education using CD-ROMS, attending national conferences, and via grand rounds is significantly greater among those working in communities with 75,000 residents or more than among those working in communities with less than 25,000 residents (Figure 2.3 & Table 2.3).

Figure 2.3: Percent of EMTs & Paramedics Receiving Continuing Education via CD-ROM, National Conferences, and Grand Rounds Across Different Geographies Based on Work Location



Likelihood of Receiving Continuing Education via CD-ROMS, National Conferences, and Grand Rounds

Bivariate analysis presented in Table 2.3 show significant geographic differences in use of CD ROM, National Conferences, and Grand Rounds. After controlling for multiple EMT demographic, professional, and systems characteristics, geographic differences are not demonstrated (Tables 2.4, 2.5, 2.6). Factors such as the level of certification are more predictive of an EMT's experience with using CD ROMs, National Conferences, and Grand Rounds. Paramedics were more likely than were EMT-Basics to have received continuing education using CD-ROMS or other interactive computer programs (Table 2.4). Receiving continuing education via National Conferences was also much lower among EMT Basics than among Paramedics, and was significantly lower among younger aged EMTs and Paramedics than among those 50 years and older (Table 2.5). Newly certified EMTs and Paramedics were also less likely to have received continuing education via National Conferences than were professionals certified longer than one year. EMT-Basics and professionals with less than 1 year tenure were much less likely to have received continuing education via Grand Rounds than their respective referent groups (Table 2.6).

DISCUSSION

This study utilized the 1999 core and educational supplement Longitudinal EMT Attributes and Demographics Study (LEADS) surveys to explore existence of rural-urban differences in commonly used mediums for fulfilling continuing education requirements in EMS. Among all EMTs and Paramedics, the two most commonly used methods for fulfilling continuing education requirements were classroom instruction and run reviews or case reviews. Eight of the eleven continuing education media were utilized equally across EMTs and Paramedics working in communities of various population sizes.

Likelihood of acquiring CME by any medium is greater in larger communities than in less densely populated ones. The medium utilized appears to be dependent on social and professional factors, such as certification level, age, and job tenure. Utilization of various media does not appear to be dependent on the size of the community where the EMT is practicing.

The lack of prior research in this area prevents testing of prior hypotheses or comparisons across different populations or over different time periods. The current study was an exploratory investigation of general educational medium utilization, and sought to identify possible geographic variations in reported use. These preliminary findings may have several potential explanations.

First, vendors preferentially produce EMS education materials and may market computer-based education programs more aggressively to Paramedics. Paramedic-level trained EMS professionals are in high demand.[33] Rural EMS experts suggest that communities have come to expect Paramedic level care when accessing the EMS system.[2] This expectation of advanced EMS care, quite possibly, has influenced the

development of EMS education curriculums and programs, resulting in a decrease in the variety and availability of EMT-Basic level certification programs nationally. Vendors may be producing more educational materials and developing innovative CD-ROM software programs targeting Paramedic and other advanced level providers rather than Basic-level providers. Additional research is needed to confirm such a theory.

With regard to the demonstrated variation in use of national conferences between EMT-Basics and Paramedics, this may be related to the EMT's experience. In general, EMT-Basics are less experienced than Paramedics and quite possibly less concerned with industry developments. National conferences are venues for debate and discussion of old and new techniques and technologies for delivering patient care. Paramedics are certified to provide advanced levels of patient care and are thus more likely concerned with care quality improving the way in which care is provided. Alternatively, EMS administrators may reward experience by offering scholarships or other funding to attend national conferences. The less experienced EMT-Basic, therefore, may lack the resources of Paramedic colleagues. Additionally, given that many members of the EMT-Basic strata are volunteers, time away from work to attend national conferences may create a financial disincentive for participants. Lastly, while geography does not seem to be a significant factor in the choice of media for CME, attendance of conferences for CME purposes seem to be more prevalent among professionals working in larger communities; where such conferences are typically held.

Another issue is that "grand rounds" are a CME activity used by academic medical institutions to keep staff current and expose medical students, nursing students, and other allied health professionals to patient care. An EMT-Basic's scope of practice is limited with respect to patient assessment and administration of medications and procedures. A Paramedic, on the other hand, is instructed in medication administration, inserting intravenous catheters, and in performing detailed patient assessments and medical procedures. Grand rounds, therefore, are intuitively more relevant to the daily duties and responsibilities of a Paramedic than of an EMT-Basic. The findings show that EMT-Basics and EMTs with less tenure report using grand rounds less than Paramedics and more experienced professionals should not be interpreted as surprising. Local availability and relevance to the practice of both EMT-Basics and Paramedics remain problematic, in that grand rounds are usually oriented toward the patient rather than around pre-hospital issues.

Finally, continuing education policies adopted by EMS education, certification and licensing agencies or organizations limit the use of distance learning for fulfillment of continuing education requirements. Undeniably, National Registry policies permitting (or restricting) use of distance education resources influence an EMS professional's decision to use such resources. To the best of our knowledge, the amount of influence these policies have on a professional's educational resource decisions has not been explored.

CONCLUSIONS AND RECOMMENDATIONS

Many EMTs and Paramedics possess a less than favorable view of the continuing education process.[37, 38] Travel associated with continuing education has been identified as burdensome by some, the process too repetitive and costly, [38] and too time consuming, taking up limited time EMS professionals have with family members.[37] Further study of distance education in EMS may lead to a better understanding of its use, professional preference, and policies.

Consideration should be given to the following conclusions and final thoughts:

1) There is little information available regarding methods used to acquire EMS CME or the use of distance learning strategies to deliver it.

2) Time and effort should be devoted to further identifying and addressing incentives and disincentives to obtaining EMS CME stratified by social, professional, and population density factors shown to be influential in this study.

3) There are challenges in delivering EMS CME related to provider attitudes towards CME, cost, inconvenience and evidence of positive impact on practice or patient outcomes.

4) Preliminary findings of this study would suggest a role and need for distance learning, particularly for those EMS providers practicing in smaller communities. It also suggests that the use of certain delivery media may be influenced more so by social and professional factors, such as length of time in practice and certification level, rather than size of the community in which providers practice.

5) More research into distance learning targeted at EMS should be undertaken, concentrated on Web-based, interactive modalities, and on the development of media that offer choices to the learner.

Table 2.2: Characteristics of nationally registered Emergency Medical Technician (EMT) Basics and Paramedics reported across size of community in which they work

	TOTAL (n=1,494)	Rural Area (<2,500) (n=235)	Small town (2,500-24,999) (n=372)	Medium sized town (25,000-74,999) (n=306)	All others (75,000 +) (n=581)	Chi-square p-value
Volunteers	34.1%	74.1%	43.1%	14.9%	10%	<0.0001
EMT-Basics	64.3%	91.4%	70.8%	53.5%	46.2%	<0.0001
Type of EMS service working at:						<0.0001
Hospital-based	13.6%	10%	15.3%	13.4%	14.6%	
Fire-based	32.7%	9.2%	28.8%	43.5%	46%	
County / Municipal	19.7%	20.9%	19.4%	16.2%	21.2%	
Volunteer rescue squad	18.8%	42.9%	23.8%	8.6%	3.7%	
Other	14.2%	15.7%	11.3%	17.3%	13.7%	
Unaffiliated	1.1%	1.3%	1.3%	0.9%	0.5%	
Age category						0.0001
18-34	50.7%	38.5%	47.4%	55.8%	59.2%	
35-49	40.6%	48.4%	40.4%	39.4%	36.1%	
50+	8.7%	13.1%	12.2%	4.9%	4.8%	
New EMT or Paramedic (< 1 year as an EMT or as a new Paramedic)	28.2%	31.5%	30.1%	27.4%	24.9%	0.1777

n=1,494

Table 2.3: Geographic differences in use of various types of resources for fulfillment of continuing education requirements

Have previously received or used the following for fulfillment of continuing education requirements	TOTAL (n=1,494)	Rural Area (<2,500) (n=235)	Small town (2,500-24,999) (n=372)	Medium sized town (25,000-74,999) (n=306)	All others (75,000 +) (n=581)	Chi-square p-value
Classroom instruction	93.8%	95.3%	91%	95.4%	94.1%	0.2184
Run reviews or case reviews	65.2%	65.6%	62.4%	65.6%	67.2%	0.7162
Video cassette	57.9%	56.4%	59.5%	53.7%	60%	0.5373
State conferences	39.6%	45.2%	41.5%	38.1%	35%	0.1447
Journal articles	50.6%	44.4%	51.8%	52.5%	52.9%	0.3232
Satellite TV	10.9%	14.4%	12.3%	10%	7.7%	0.1191
Internet	14.5%	13.7%	13.7%	15.7%	15.1%	0.9117
CD ROM and interactive computer programs	18.3%	10%	15.3%	20.6%	25.2%	**0.0001**
National conferences	10.5%	6%	8.8%	13.4%	13.2%	**0.0226**
Grand rounds	10.1%	5.3%	9.3%	14.2%	11.7%	**0.0173**
Telemedicine	5.3%	5.2%	7.8%	3.8%	4.1%	0.2996

n=1,494

Table 2.4: Likelihood of having received continuing education from CD-ROM or other interactive computer programs

PARAMETER	Beta	SE	ODDS RATIO	95% CI	P-VALUE
Intercept	-0.4662	0.4332	0.6274	0.2683, 1.4674	
Rurality					
Rural (<2,500)	-0.5650	0.3443	0.5683	0.2893, 1.1165	
Small town (2,500-24,999)	-0.3661	0.2371	0.6935	0.4355, 1.1041	0.2997
Medium town (25,000-74,999)	-0.1791	0.2311	0.8361	0.5313, 1.3155	
All others (75,000+)	----	----	----	----	
Volunteer Status					
Volunteer	-0.3178	0.3149	0.7277	0.3924, 1.3495	0.3129
Non-Volunteer	----	----	----	----	
EMT Certification					
Basic	-0.8919	0.2080	0.4099	0.2726, 0.6164	**0.0000**
Paramedic	----	----	----	----	
Type of EMS service working at:					
Hospital-based	-0.2443	0.2686	0.7833	0.4626, 1.3264	
County / Municipal	-0.0584	0.2294	0.9433	0.6015, 1.4794	
Volunteer rescue squad	0.1313	0.3492	1.1403	0.5749, 2.2617	0.4088
Unaffiliated	1.2718	0.7471	3.5671	0.8241, 15.4407	
Other	-0.3000	0.3007	0.7408	0.4107, 1.3362	
Fire-based	----	----	----	----	
Age category					
18-34	-0.2940	0.4171	0.7453	0.3289, 1.6888	
35-49	-0.1450	0.4176	0.8650	0.3814, 1.9622	0.6263
50+	----	----	----	----	
EMT tenure status					
New EMT/Paramedic (< 1 year as EMT)	0.1157	0.1723	1.1226	0.8007, 1.5739	0.5021
Old EMT/Paramedic (> 1 year as EMT)	----	----	----	----	

n=1,494

Table 2.5: Likelihood of having received continuing education at national conferences

PARAMETER	Beta	SE	ODDS RATIO	95% CI	P-VALUE
Intercept	-0.6253	0.4566	0.5351	0.2185, 1.3103	
Rurality					
Rural (<2,500)	-0.1444	0.4806	0.8655	0.3372, 2.2214	
Small town (2,500-24,999)	-0.3044	0.3152	0.7376	0.3975, 1.3687	0.7282
Medium town (25,000-74,999)	0.0816	0.2917	1.0850	0.6123, 1.9227	
All others (75,000+)	----	----	----	----	
Volunteer Status					
Volunteer	-0.2189	0.4883	0.8034	0.3083, 2.0934	0.6540
Non-Volunteer	----	----	----	----	
EMT Certification					
Basic	-1.4124	0.3218	0.2436	0.1296, 0.4579	**0.0000**
Paramedic	----	----	----	----	
Type of EMS service working at:					
Hospital-based	0.3367	0.3099	1.4003	0.7625, 2.5717	
County / Municipal	0.3397	0.3173	1.4045	0.7537, 2.6172	
Volunteer rescue squad	0.1202	0.5860	1.1278	0.3573, 3.5594	0.6857
Unaffiliated	*	.	.	.	
Other	-0.0797	0.3865	0.9234	0.4327, 1.9706	
Fire-based	----	----	----	----	
Age category					
18-34	-1.0654	0.4179	0.3446	0.1518, 0.7820	
35-49	-0.4072	0.4065	0.6655	0.2998, 1.4771	**0.0072**
50+	----	----	----	----	
EMT tenure status					
New EMT/Paramedic (< 1 year as EMT)	-1.1699	0.2481	0.3104	0.1908, 0.5049	**0.0000**
Old EMT/Paramedic (> 1 year as EMT)	----	----	----	----	

n=1,494

* Statistics could not be produced for this category because all responding EMTs falling within this particular category selected yes or no. There was no variation in responses.

Table 2.6: Likelihood of having received continuing education via Grand Rounds

PARAMETER	Beta	SE	ODDS RATIO	95% CI	P-VALUE
Intercept	-2.0081	0.5747	0.1342	0.0435, 0.4144	
Rurality					
Rural (<2,500)	-0.5037	0.4603	0.6043	0.2450, 1.4906	
Small town (2,500-24,999)	-0.0374	0.3308	0.9633	0.5035, 1.8432	0.3730
Medium town (25,000-74,999)	0.2787	0.2880	1.3215	0.7512, 2.3245	
All others (75,000+)	----	----	----	----	
Volunteer Status					
Volunteer	-0.0629	0.3462	0.9391	0.4763, 1.8517	0.8559
Non-Volunteer	----	----	----	----	
EMT Certification					
Basic	-1.1613	0.3062	0.3131	0.1717, 0.5708	**0.0002**
Paramedic	----	----	----	----	
Type of EMS service working at:					
Hospital-based	0.4470	0.3481	1.5637	0.7901, 3.0947	
County / Municipal	0.2933	0.3343	1.3409	0.6961, 2.5831	
Volunteer rescue squad	0.8538	0.4153	2.3484	1.0399, 5.3036	0.2300
Unaffiliated	1.1911	0.7893	3.2906	0.6998, 15.4727	
Other	0.7001	0.3554	2.0139	1.0031, 4.0434	
Fire-based	----	----	----	----	
Age category					
18-34	0.2510	0.5282	1.2853	0.4561, 3.6215	
35-49	0.3470	0.5287	1.4149	0.5016, 3.9906	0.7817
50+	----	----	----	----	
EMT tenure status					
New EMT/Paramedic (< 1 year as EMT)	-1.0040	0.2528	0.3664	0.2232, 0.6016	**0.0001**
	----	----	----	----	
Old EMT/Paramedic (> 1 year as EMT)					

n=1,494

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APPENDIX A: Methods

Inclusion and exclusion criteria were developed for literature searches to help focus the literature review and help reduce the total number of articles included in the study to an appropriate and searchable quantity.

Inclusion criteria include the following:

- The article was an empirical investigation, review article, evaluation study, or editorial.
- The study population must include Emergency Medical Technicians or other Emergency Medical Services personnel.
- All studies related to the research questions (both broad and focused) were included.
- The study design included controlled trials, cohort studies, case studies, or cross-sectional studies.

Exclusion criteria include the following:

- The article did not address distance education or any of the other terms falling under the broader term of distance education (e.g. distributed learning and continuing education).
- The study population was not Emergency Medical Technicians or other Emergency Medical Services personnel.
- Articles did not meet inclusion criteria.

Except for the Emergency Medical Technicians or other Emergency Medical Services personnel criteria, all articles meeting inclusion and exclusion criteria but focused on the nursing profession were included. The search of the nursing literature was performed separately from the initial search of Emergency Medical Services literature. Results from these separate searches are presented in tables A-1 and A-2.

Our MeSH keyword literature search of both the Emergency Medical Services and Nursing disciplines yielded 861 English language articles, of which 454 had abstracts available. The abstract of each article was reviewed against study inclusion and exclusion criteria by the principal investigator. No additional review of articles without abstracts was undertaken.

MEDLINE Search #1 and Search #2 produced 300 and 154 English language abstracts, respectively. All were reviewed by the principal investigator across inclusion and exclusion criteria. At the full-text screening stage, 47 articles were reviewed independently by the principal investigator. Seventeen additional articles could not be accessed through university (free, full-text) agreements with publishers or journals. Based on review of article title, journal in which it was published, and MeSH keywords outlined in the MEDLINE display; these 17 were determined to not offer any additional information. The full-text review involved a search for actual utilization figures or estimates of use of distance education resources. Findings are presented in the results section.

Table A-1: Summary of search strategy for Emergency Medical Services and Distance Education

MEDLINE MeSH Search #1		
Search #	**Search Description**	**Results**
#6	Search “Education, Distance” [MeSH] or “Education, Continuing” [MeSH]	39731
#10	Search “Emergency Medical Services” [MeSH]	53813
#11	Search #6 AND #10	633
#12	Search #6 AND #10 Field: All Fields, Limits: English	557
#13	Search #6 AND #10 Field: All Fields, Limits: English, Review	38
#15	Select 38 document(s)	38
#16	Search #6 AND #10 Field: All Fields, Limits: English, Randomized Controlled Trial	4
#18	Search #6 AND #10 Field: All Fields, Limits: English, Editorial	7
#20	Search #6 AND #10 Field: All Fields, Limits: English, Practice Guideline	2
#21	Search #19 OR #16 OR #13	49
#22	Search #12 NOT #21	508
#24	Search "Emergency Medical Services"[MAJR]	36254
#25	Search #22 AND #24	351
#27	Search #22 NOT #26	157
#40	Search In-service Training/*organization & administration	3726
#41	Search #10 AND #40	155
#42	Search #41 NOT #12	120
#43	Search #41 NOT #12 Field: All Fields, Limits: English	117

Table A-2: Summary of search strategy for Nursing and Distance Education

MEDLINE MeSH Search #1		Results
#29	Search nursing	394025
#30	Search #6 AND #29	17597
#32	Search #30 NOT #10	17377
#40	Search Inservice Training/*organization & administration	3726
#45	Search #29 AND #40 Limits: English	1703
#46	Search #29 AND #40 Field: All Fields, Limits: English, Randomized Controlled Trial	20
#48	Search evaluation studies [pt] Field: All Fields, Limits: English	61961
#49	Search #45 AND #48 Limits: English	162
#51	Search #45 AND #48 All Fields, Limits: English, Review	131

APPENDIX B: ACKNOWLEDGEMENTS

Data for the statistical analysis component of this study was made available by the National Registry of EMTs (NREMT), whom approved the plan of analysis December 13, 2005. We would like to extend a special thanks to the Longitudinal EMT Attributes and Demographics Study (LEADS) committee. Without access to the LEADS survey data, this study would not have been possible.

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