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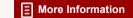
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Medical Control in Emergency Medical Services Systems: Subcommittee Report, Conclusions, and Recommendations

Subcommittee on Medical Control
Committee on Emergency Medical Services
Assembly of Life Sciences
National Research Council

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Report of the Subcommittee on Medical Control in EMS Systems

Introduction and Definitions

The evolution of emergency medical services (EMS) over the past de-cade from loose aggregations of ambulance companies providing, at best, basic life support to sophisticated systems of prehospital care providing varying degrees of advanced life support has given rise to an array of unresolved issues relating to "medical control" — physician management of field performance of emergency care. Among these are difficulties in reconciling federal guidelines and state regulations with local needs and resources; in providing the medical directors of EMS systems with the explicit authority for the powers that they must exercise; in reconciling the need for medical control with the imperatives of immediately life-threatening situations; in defining clearly and acceptably the roles, re-sponsibilities, and liabilities of paramedics, nurses, and physicians in re-gard to medical control; in determining the need for, and appropriate use of, various technological adjuncts such as telemetry and radio telephone switching systems (RTSS) in medical control, in a given EMS system; and in the type of medical control system appropriate to various local circum-stances. The present decline and impending termination of federal grants for EMS has given sharper focus to these problems, as EMS systems, fac-ing a crisis of survival, seek to continue the quality of service the public has come to expect, and must ask what forms of service and medical control are most cost-effective.

In reviewing these and related problems over the past two years, the NAS Committee on Emergency Medical Services has heard from persons prominent at both the national and local levels in the design and imple-mentation of medical control systems. The variety of ways in which medi-cal control has been successfully implemented and the breadth of views on national, state, and local guidelines for medical control have been impres-sive. The Committee concluded that it was important to hold a conference which would have three major purposes: to share significant experiences in implementing medical control in both urban and rural settings, to

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review present medical control guidelines, and to examine various related issues such as the legal aspects of medical control and the value of public training in cardiopulmonary resuscitation (CPR).

The rationale for medical control is clear: it is needed to ensure quality care in the field and to provide professional and public accountability. The EMTs and paramedics who act as "physician extenders" in out-of-hospital situations are required to observe, assess, and initiate therapy for a broad spectrum of acute medical conditions under trying environmental circumstances, and must have appropriate supervision. As in any physician-patient relationship, a physician must be accountable for the care provided, whether directly by himself or by field personnel following his orders. And the EMS system must be accountable to local or state authorities.

Thus, there is no disagreement over the need for medical control: debate centers on the form that medical control should take. Not the least of the sources of disagreement is the definition of medical control itself.

Federal guidelines have defined medical control in terms of the following attributes:

> 1) Designation of a supervisory ALS (on-line) medical director for each ALS program. Basic to this is the region/area emergency medical care planning and designation of a resource/base station, associate/receiving hospitals, and critical care centers and their organizational, operational and communications linkages.
>
> 2) Development and utilization of uniform regional/areawide treatment, triage, and transfer and operational protocols adopted by the EMS system. The ALS paramedic team operates from field care and transport to the appropriate level of definitive care according to systems configuration and design and established protocols.
>
> 3) The development of physician-directed hospital-based ALS medical control teams responsible for the remote management of the patients within their area of jurisdiction, along with an effective process for patient care, audit, and review.
>
> 4) Implementation of technologic adaptations and innovations which support the EMS systems operations for improved patient care (e.g., telemetry, MAST trousers, etc.)
>
> 5) Utilization of enabling legislation, local ordinances, and other mechanisms to establish care standards, set limits of liability, and define responsibility for medical-legal concerns for the regional/areawide ALS program.[2]

Further, federal guidelines identify two configurations of medical control, designated X and Y, for, respectively, systems in which all medical control is provided by a single regional (resource) hospital, or those in which it may be provided by an associate hospital.

Among the points of debate related to these guidelines are the following: Are there circumstances under which effective medical control can be

exercised without the designation of a "resource/base station" hospital which provides or monitors all medical control provided in the system? Are there EMS systems, such as those including both urban and rural areas, in which uniformity of "regional/areawide treatment, triage, and transfer and operational protocols" might be inappropriate? Must medical control always be provided from a hospital, or might it, for instance, be provided by an out-of-hospital physician with a portable transceiver? Are such technological innovations as telemetry and the radio-telephone switching system (RTSS) always advantageous for medical control? Are the X and Y models for medical control sufficiently inclusive, and are they appropriate for conditions other than trauma?

According to further federal guidelines, the "on-line medical control physician," in addition to directing field procedures, "reviews paramedics, mobile intensive care nurses, and physician competencies and recommends certification, recertification, and decertification of the personnel . . . conducts regular case reviews and other competency evaluations . . ."[2] This definition has been challenged by some who say that it creates problems in systems where the "on-line medical control physician" is responsible only for voice direction, by radio or telephone, of field personnel.

From discussions with EMS leaders over the past two years the EMS Committee has developed a set of definitions of some of the key terms related to medical control.

Broadly defined, medical control implies overall medical supervision and accountability in an EMS system. Within a prehospital EMS system, medical control entails at least three functional levels: 1) the medical management and direction of the entire system; 2) the off-line direction of EMTs and paramedics through training, provision and monitoring of protocols and standing orders, systematic case review with EMTs and paramedics, and data collection and evaluation; and 3) the on-line medical consultation, by radio or telephone, to EMTs or paramedics in the field.

Depending on the size and design of the system, all levels may be performed by the same person, or at the other extreme, each level may be performed by several persons. Whatever the arrangement, all levels, representing a hierarchy of medical supervision and accountability, are required for effective medical control. Responsibilities at these three levels may be considered as 1) the functions of the system medical director; 2) the functions of the off-line medical control physician; and 3) the functions of the on-line physician. The chain of medical accountability extends from the state EMS authority, if one exists, through the system medical director and the off-line medical control physician, to the on-line physician directing the paramedics and EMTs in the field. Unless otherwise specified, "medical control," in this report, will refer to the on-line and off-line

direction of field personnel. For an on-line physician to function effectively, it is desirable that he participate in as many of such off-line functions as paramedic training, protocol preparation, and case review as possible.

It is clear that for all levels of medical control, and for prehospital as well as for inhospital care, the physician must take ultimate responsibility. This responsibility cannot be abdicated and must be clearly defined. In some circumstances it may be appropriate for a physician to delegate some medical control functions, such as portions of paramedic or EMT training, preliminary data assessment, or on-line voice direction, to qualified non-physician emergency personnel. In some systems, where reliance is placed on intensive training, in-service education, and experience of field personnel, and on detailed, field-tested protocols, on-line medical consultation is provided only at the request of field personnel. However, the medical control physician is still accountable and responsible.

The following specific definitions were provided in advance to conference participants in the hope of lending consistency and clarity to their presentations.

1. *Prehospital Medical Control:* Physician direction of emergency medical care delivered by basic EMTs, intermediate EMTs, or paramedics in the field, and of emergency medical communications personnel. This includes both of the following functions:

1.1. *Off-line medical control functions:* Direction of emergency medical personnel through use of protocols, review of cases and determination of outcomes, and through training programs.

1.2. *On-line medical control functions:* Direction, via radio or telephone, of field personnel at the site of the emergency and en route to a hosptial Emergency Department.

2. *Basic life support (BLS):* Non-invasive emergency medical procedures (e.g., bandaging, splinting, CPR).

3. *Advanced life support (ALS):* Invasive emergency medical procedures (e.g., intubation, IV therapy, drug administration, defibrillation).

4. *Field Personnel:* Those responsible for emergency treatment at the site of the event and en route to the hopsital; and those responsible for communicating with persons seeking emergency medical care.*

4.1. *Basic Emergency Medical Technicians (EMTs):* Certified field personnel who have completed the 81-hour EMT course, or its equivalent.

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*The following training materials are available from the Superintendent of Documents, U.S. Government Printing Office:
   Emergency Medical Technician–Ambulance (Basic Training Program)
   Emergency Medical Technician–Ambulance (Refresher Training Program)
   Emergency Medical Technician–Paramedic (National Training Course)
   Emergency Medical Services–Dispatcher Training Program

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   4.2. *Intermediate EMTs:* Field personnel certified as Basic EMTs and in specified portions of the federal paramedic course or its equivalent.
   4.3. *Paramedics:* Certified field personnel who have completed the full federal paramedic course or its equivalent.
   4.4. *EMS communication personnel:* Those who answer calls for aid, offer advice and referral, dispatch aid, and guide the flow of communications within an EMS system. The person performing this function is often referred to as the CMED–Central Emergency Medical Dispatcher.
   4.5. Citizens prepared to apply first aid and CPR may be considered to be additional community EMS resources and, thus, should also benefit from off-line medical direction.*
   5. *Regional Medical Director:* A physician responsible for ensuring the quality and efficiency of emergency medical care throughout a regional EMS system, including that of the off-line and on-line medical control functions.
   6. *Medical Control Physician:* A physician who provides either or both:
       6.1. Off-line medical direction.
       6.2. On-line medical direction.
   7. *Protocols:* Written procedures for diagnosis, triage, treatment, transport, or transfer of specified emergency medical cases under various circumstances. These procedures are part of the official policy of the system and are reviewed and approved by representatives of the medical community.
   8. *Algorithms:* Protocols in the form of decision trees or branching logic diagrams.
   9. *Standing Orders:* Instructions, approved by representatives of the medical community, directing field personnel to perform certain emergency medical care measures before, or in the absence of, communication with a medical control physician. These orders may serve as guidelines for application of protocols, with or without the presence of on-line medical control.
   10. *Resource hospital:* A major hospital having overall responsibility for providing on-line medical control for field personnel of the EMS system serving the region, and for monitoring all ALS communications within the region.
   11. *Associate hospital:* A hospital other than the resource hospital, within the same EMS region, which may, upon request or by pre-arrangement with the resource hospital, provide medical direction for field personnel.
   12. *Centralized medical control:* Descriptive of a system in which all medical control is provided by personnel in the resource hospital. This hospital, by protocol, may or may not receive the patients for whom medical control has been provided (X model).
   13. *Decentralized medical control:* Descriptive of a system in which medical control is provided by more than one hospital in a region. Associate hospitals providing medical control do so by referral or relay, by prearranged agreement and protocol, from the resource hospital or upon being called directly by the field personnel (Y model).

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*American Heart Association-American Red Cross standards for CPR have been published in the *Journal of the American Medical Association,* August 1, 1980, Vol. 244, No. 5.

Unity and Diversity in Medical Control

Medical control in an EMS system is designed to optimize patient care by making available to field personnel advice and direction by a physician at a base hospital, by protocols and standing orders, and by case review and follow-up. How these elements of medical control are blended in particular EMS systems varies widely depending on the size and geography of the system, the medical nature of the emergency, the legal and financial restraints within which the system operates, the degree of inter-hospital cooperation, the training levels of field personnel, local medical standards of practice, the familiarity of the public and the medical community with the EMS system, and the extent to which hospital Emergency Department (ED) and field personnel work as a team.

Thus, in practice, some EMS systems and some states (e.g., Pennsylvania), require paramedics to obtain medical consultation before undertaking advanced life support (ALS) measures, whereas others, (e.g., Columbus, Ohio) allow paramedics to act almost entirely on the basis of standing orders and protocols. Some (e.g., Dallas) require telemetry on all cardiac cases; others (e.g., Philadelphia) find telemetry nonessential. In some systems (e.g., northern New Hampshire), medical control is provided from a single central hospital; in others (e.g., San Bernardino County), by whichever hospital is to receive the patient. Some systems (e.g., Seattle) rely on the dispatchers to screen calls and send an appropriate (or no) response; others (e.g., Cleveland) provide the same response to every call. In some systems, voice direction must be provided by an appropriate physician specialist; in many others, this responsibility is delegated to specially trained nurses.

If there is a common element in the successful practice of on-line medical control, it is close teamwork between field, hospital, and communications personnel, extending from the involvement of medical control physicians in developing protocols and training field personnel to their immediate review and follow-up of every ambulance run entailing ALS or in which any questionable procedure was used.

The variety of ways in which medical control is exercised raises the question: Should the design of medical control systems follow specified models, such as those described in federal guidelines, or is the present diversity necessary or, perhaps, desirable? The Committee recognizes the necessity of standardization in important areas, such as training and communications, and the fact that any federal agency, in carrying out the mandates of Congress, must define the standards essential to its program. The problem is in a large measure one of striking a balance between such requirements and the basic pluralism and diversity of American society which would allow communities to adapt these standards to their own

needs and resources. In considering this question, it may be useful to examine the functions which any medical control system must perform, and the circumstances that make these functions possible.

There is general agreement that three basic functions of medical control are 1) to assure that field personnel have immediately available expert direction for emergency care at whatever level they are capable of providing; 2) to assure a continuing high quality of field performance; and 3) to provide the means for on-going medical audit of both field performance and of the medical control itself.

Direction of field personnel is usually by a combination of voice communication and protocols; a necessary precondition is a thorough knowledge by medical control officers of the capabilities of the field personnel, of the circumstances under which they perform, and of the protocols governing their actions. Ideally, the on-line medical control physician should be skilled in the kind of emergency presented. In practice, this function is often filled by whatever physician is on duty in the Emergency Department, or by a designated surrogate, such as the chief ED nurse. In the latter event, detailed protocols for the direction of field personnel should be available to the person performing on-line medical control.

Protocols and standing orders for field personnel should include not only guidelines for the recognition and treatment of specific medical emergencies but also explicit directions on when on-line medical control should be obtained, on what medical procedures may be performed before obtaining, or in the absence of, medical control, and on the disposition of specific kinds of acute medical emergency victims. Many EMS systems, such as those in Seattle, Washington; Columbus, Ohio; Hawaii; and Cape Cod, Massachusetts, have developed treatment protocols appropriate to their circumstances. Conference participants suggested that since the development of such protocols is a long and tedious process, new systems might be well advised to adapt to their own circumstances protocols already formulated.

Quality in field performance begins with the training of basic and intermediate EMTs and paramedics and entails retraining as necessary, continual monitoring of field performance, and case review meetings of field and ED personnel. Of these, the most difficult is monitoring field performance. Some systems conduct immediate reviews, by medical control physicians with paramedics of all ALS runs. Some use observers on ambulances. Some large systems use a computerized analysis of ambulance report forms to detect discrepancies between protocols and actual procedures used. Some feel that a rigid requirement that telemetry be used tends to avert "shortcuts" in field procedures by paramedics who have become over confident. Many systems gain an additional opportunity for observation of paramedics while assisting them to maintain their skills by

employing them in the emergency department when they are not on run. Of course, a necessary precondition for effective monitoring of field performance is the authority to take remedial action as needed.

A major determinant of the nature and extent of medical control in a given EMS system is the nature and extent of training of field personnel. In the early days of the national EMS program two categories of field personnel, basic EMTs and paramedics, were recognized. It was then felt that only paramedics required medical control. Since then, a wide variety of intermediate training programs have been developed locally to meet local needs. New Hampshire trains and certifies four categories of intermediate EMTs — Advanced Airway Management/Esophageal Obturator Airway, Military Anti-Shock Trousers (MAST), Intravenous (IV) Fluids, and Cardiac. Medical control for the first category consists of standing orders; for MAST and IV, a physician or ED nurse; and for Cardiac, a cardiologist or ACLS certified physician. In King County, Washington, basic EMTs with an additional 10 hours training in recognition of fibrillation and use of the defibrillator have been tried with good results.[10] Their medical control consists of standing orders together with detailed case follow-up, using tapes from a recorder built into their defibrillation equipment. In the Louisiana Acadian EMS system, basic EMTs are trained and authorized (by standing orders) to administer IV fluids. In central Virginia, trauma technicians — basic EMTs who have had an additional 81 hours of trauma care — are authorized to use specified invasive procedures and drugs under standing orders and voice direction.[6]

Notwithstanding the federal standardization of the paramedic training program, paramedic training itself still varies widely from place to place, ranging from 200 to 1500 hours, with resultant differences in the kinds of medical control required. In many EMS systems, there is an evolutionary pattern. When ALS and medical control are instituted, field personnel are required to obtain voice authorization for any ALS procedure. The next step is to provide protocols and standing orders to permit specified ALS procedures when voice communication cannot be established or when any delay would have life-threatening consequences. A third stage is provision of protocols and standing orders authorizing field personnel routinely to perform various ALS procedures *before* calling for medical control. Finally, in some systems, paramedics are permitted to act almost entirely on the basis of protocols and standing orders.

This evolution results from the increasing experience, over time, of the field personnel and from the development of teamwork based on a mutual appreciation of capabilities between field and hospital personnel, and is accompanied by an increasing emphasis on case review and follow-up. It may be misleading to speak, as is often done, of this evolution as a "relaxation" of medical control; rather, it represents a shift in the method of

medical control, with increasing emphasis on off-line functions. Of course, in instances in which there is a regularly high turnover of personnel either in the ED or in the field, such teamwork cannot develop and rigorous requirements for voice authorization may be permanently necessary.

There are no data, and may never be, to demonstrate the relative efficacy of various configurations of medical control. Most ALS systems use data from medical control for quality control. However, data are accumulating, as indicated in the presentations by Drs. Boyd, Crampton, and Micik, that systematized prehospital care under medical control has had a positive impact on morbidity and mortality from trauma and cardiac disease, and on morbidity from poisoning.

As indicated in the presentations, medical control has a different meaning in each of these contexts. In cardiac care, designed, in effect, to bring the emergency department to the scene of the emergency, the most important elements of medical control are on-line voice direction and detailed treatment protocols. In trauma care, where the principal objective is to bring the acutely injured to adequate definitive care as soon as possible, the major elements of medical control are system design, hospital categorization, and triage and transport protocols. At a poison control center, where the principal activity is providing advice to callers, the important elements are the training and monitoring of the telephone responders, preparation and use of treatment protocols, and patient follow-up by telephone. The importance of medical control, itself, is indicated in a study of emergency care in two California areas;[16] it was shown that the implementation of an EMS system in which trauma centers were designated, triage and transport protocols enforced, and physicians were certified as medical control officers had a significant impact on death and disability.

Intermediate EMTs and paramedics, because they are performing invasive procedures, require more stringent and sophisticated medical control and consultation than do basic EMTs. However, some elements of medical control are, or should be, common to all EMS systems, whatever the training level of field personnel. The need of the acutely ill and injured for rapid transport to the hospitals best able to care for them is as great in a BLS system as in an ALS system. This implies an equal need for such off-line elements of medical control as hospital categorization, triage and transport protocols, and on-line direction to assure adherence to protocols. Even a purely BLS system may require medical advice to help EMTs deal, for instance, with the dilemma faced by every ambulance crew: whether to take time to stabilize the patient at the scene or to transport immediately to an appropriate hospital. Many elements of off-line medical control, such as teamwork between prehospital and hospital personnel; quality control through training, case review, and analysis of ambulance reports; and

overall medical supervision and accountability, are no less important for BLS than for ALS. In rural areas, intermediate EMTs, whose basic training has been supplemented with specific skills varying from administration of IV fluids to defibrillation, require medical control tailored to their capabilities. Thus, the assumption prevalent in the early days of EMS that the implementation of a system for medical control was something that could be deferred until full-fledged paramedics were in the field can no longer be considered valid.

Relevant Medical Data

Data on the medical impact of EMS is sketchy and often suspect.* The Committee has attempted to review available data in terms of the level of care provided.

Cardiac

In assessing the relative efficacy of paramedics, intermediate EMTs, and basic EMTs in treating cardiac patients, including individuals with cardiac arrest, paramedics and intermediate EMTs proved superior to basic EMTs in that the long-term resuscitation rates were significantly higher in the former two as compared to the latter.[7,10] The importance of training this new intermediate level of EMT is underscored by the fact that a 10-hour course for basic EMTs in the recognition of fibrillation and its treatment by electric shock resulted in a long-term survival rate similar to the field results achieved by paramedics, nurses, and physicians.[5]

The Impact of Cardiopulmonary Resuscitation

The long-term survival rates of out-of-hospital cardiac arrest victims who received advanced life support measures have been very favorably influenced by cardiopulmonary resuscitation provided by basic EMTs or citizens prior to the arrival of ALS units. This suggests that prehospital BLS should become a function of off-line medical control if maximum benefit if to be derived from ALS.[3,7,8,9,10, 11,15]

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* A detailed review of the literature and evaluation of published data pertaining to the medical impact of mobile coronary care (MCC) units is contained in *The Effect of Emergency Medical Systems on Prehospital Cardiovascular Care,* National Highway Traffic Safety Administration; National Heart, Lung, and Blood Institute, NIH, Washington, D.C., 1981.

Citizen CPR clearly expedites long-term survival of the victim of out-of-hospital cardiac arrest.[3,8,11,15] This type of first response, whether by trained public or by basic EMTs, has proved particularly effective if rendered less than 4 minutes after collapse of the victim and if defibrillation occurred 8 minutes or less after collapse.[8] Citizen CPR, like CPR given by the basic EMT, must be coupled with prompt prehospital ALS to achieve the maximum number of long-term survivors. These preliminary data do not distinguish defibrillation performed by a paramedic from that performed by an intermediate EMT trained in this technique.[3,8,10,15] If these observations are substantiated, training for this new level of intermediate EMT may become another aspect of off-line medical control. Although striking, the results of this study of the intermediate EMT who defibrillates should not be construed as supplanting or rending obsolete classical intravenous drug therapy designed to prevent cardiac arrest and preclude the need for resuscitation, or designed to avert refibrillation.[4, 14]

It should be emphasized that citizen CPR should not be thought of as a possible alternative to ALS. Both procedures are valuable and are synergistic. The impressive record of the Seattle system in saving cardiac victims was made possible only by widespread citizen CPR training *together* with a rapid response by the ALS system.

Trauma, and Other Medical Emergencies

Intermediate EMTs, trained with an additional 81-hour course to collect blood samples and to give intravenous infusions and specified pharmaceuticals, have favorably influenced morbidity and mortality in a rural EMS system. Victims of auto accidents, gunshot wounds, severe lacerations, and miscellaneous trauma have had documented pressor responses to infusion of intravenous fluids and methylprednisolone without the use of MAST trousers. Likewise, the medical emergencies of hypoglycemia, respiratory depression from drug overdose, cardiac arrest, anaphylaxis from bee sting, and ischemic chest pain responded favorably to intervention with selected drugs and intravenous solutions.[6]

Poisoning and Poison Control Centers

In general, cases of poisoning fall into either of two categories: intentional self-poisoning by adults or accidental poisoning of children. The former make up the bulk of the poisoning cases to which ambulance crews respond; the latter comprise the majority of cases handled by telephone at poison control centers. Experience at the San Diego poison control center, cited by Dr. Micik, indicates that of the 30,000 calls received per million

population approximately 80% are for actual poisonings, of which 85% are successfully managed at home. There, during the 4 years of poison center operation, emergency department visits for poisoning of children under 12 years old dropped from 6.1% to 1.0% of the total emergency department visits. Comparing the costs of poison center operation with the average cost of ED visits, it has been calculated that a poison center results in an annual saving of $700,000 per million population. This figure does not take into account the additional savings to the dispatcher-ambulance side of EMS operations.

The clinical effectiveness of poison control centers is suggested by data from the Pittsburgh center: "No child under the age of five . . . has died because of accidentally ingested poison in over five years in Allegheny County, of which Pittsburgh is the center."[12]

Duties and Qualifications of the On-Line Medical Control Physician

The primary responsibility of the on-line medical control physician is to supervise and monitor BLS and ALS in the field. His effectiveness in this role will be enhanced by his participation in case reviews, data collection, and audits of the EMS systems; his participation, with the regional medical director, in EMS program development to meet community needs; his ability to provide a communication route between the regional EMS system and other physicians; and his participation, with the training director, in reviewing the competency of paramedics, MICU nurses, and physicians, and in the conduct of the continuing education programs for the various levels.

There is general agreement that to qualify as a provider of on-line medical control, a physician should have a personal familiarity with patient management in the field; know the local EMS system design, goals, operations, including protocols for emergency care, and specific local components; be a qualified provider of Advanced Cardiac Life Support and Advanced Trauma Life Support; and be a licensed physician experienced in emergency medical care. Residency training in emergency medicine provides an excellent underpinning for a provider of on-line medical control.

Legal Responsibility

As non-MD emergency care personnel continue to perform more invasive and potentially life-threatening (as well as life-saving) procedures, concerns have been raised about the legal responsibility and liability of EMTs and paramedics delivering care at the scene; of physicians (and

nurses) who exercise on-line medical control over this care; of the hospitals from which such medical orders are given and to which such patients are transferred; of physicians who exercise off-line medical control (e.g., case follow-up, training); and of the regional medical director.

Despite the fact that a wide variety of levels and types of ALS systems have been in place for as much as 10 years, there has been virtually no litigation concerning malpractice in such cases. Indeed, it appears that in the development of EMS systems, the great majority have been very careful to clearly identify precisely who is responsible including the actual responsibility and authority of the on-line and off-line medical control officers. In addition, most systems have started conservatively in the delegation of additional functions to EMTs and paramedics, and have expanded these functions where appropriate based on experience.

In addition to the liability issue, the question of the basic authority of non-physicians to perform invasive procedures has been raised. The Committee does not believe that this expanded role of EMS field personnel differs in kind from the roles taken by physicians' assistants and nurse practitioners.

The 1978 NAS report *EMS at Midpassage* noted:

> In the early 1970s, the American Medical Association, the American Hospital Association and DHEW recommended that states enact amendments to their medical practice acts to codify the right of physicians to delegate tasks to personnel working under their supervision and control. Although the doctrine of "custom and usage" has always established the authority of physicians to delegate tasks, it does not readily apply to innovations in the use of existing health workers or to new types of personnel. Most states have now adopted some form of legislation to facilitate such delegation.
>
> Most laws make no attempt to define actual tasks or situations in which they may be delegated, but provide that "any act, task or function" may be delegated, by the physician. Delegation amendments require that the act be performed under the "supervision, control and responsibility" of a licensed physician. "Supervision" and "control" are rarely defined in the statute, leaving the legal resolution of this question, if it arises, to the courts on a case-by-case basis. This is probably wise in view of the enormous variety of situations in which such personnel can perform.
>
> Supervision can take at least three forms: over the shoulder, on the premises, or remote with regular monitoring and review. This is particularly important in emergency care, in which EMTs and paramedics often work at substantial distances from the physician, but still can legally be said to be supervised because their actions are subject to continuing medical review and direction.[13]

The legal ramifications of on-line and off-line medical control fit readily into well-established legal precedents, particularly those relating to the respondent-superior and "borrowed servant" doctrines. The American

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Law Institute has defined the latter doctrine as follows: "A servant directed or permitted by his master to perform services for another may become the servant of such other in performing the services. He may become the other's servant as to some acts and not as to others. . . ."[1]

For example, the on-line and off-line medical directors of an ALS or BLS system would function as the borrower of another's servants or employees. Thus, EMTs or paramedics employed by a fire department or private ambulance company would, when they were on an ambulance run, be the "borrowed servants" of the EMS medical director.

In some areas, physicians' concern over legal liability has been a major deterrent to the exercise of medical control by physicians. On the other hand, in some systems they feel relatively secure in providing medical control because of extension by the state of "good samaritan" or similar laws to cover EMTs and paramedics. A review of relevant laws and court actions does not support either of these positions. A major fact is that there have been very few suits brought based on actions of EMTs or paramedics, and even fewer against physicians as accountable for the practices of field personnel. A second consideration is that the few suits which have been brought appear to be largely concentrated in those EMS systems in which medical control is weak or virtually absent. Indeed, strong medical control appears to provide the best insurance against legal action. Finally, there is reason to question whether "good samaritan" laws, designed originally to protect non-professional persons volunteering assistance in an emergency, would be applied to health professionals applying emergency care.

In the light of the past 10 years experience, we believe that EMTs, paramedics, nurses, and physicians involved in providing emergency medical care should be held legally responsible for their actions according to the level of training and skills they have achieved. We do not believe that legal immunity as embodied in Good Samaritan laws should apply to such professionals. The latter statutes were designed to encourage individuals to voluntarily stop and render aid at emergency scenes. They should not apply to medical professionals involved in EMS.

Another legal consideration that surfaced during the conference is that, in view of the growing concern of the public and the courts with quality of life, emergency medical personnel may, in the future, expect to be sued for having initiated resuscitation when it was medically contraindicated, bringing back to life a brain-damaged individual whose subsequent maintenance will entail a tremendous financial, and perhaps psychological, drain on his family. However, since there appears to be disagreement concerning criteria for contraindications to resuscitation, and since this instance of "prolongation of death" does not seem to differ substantially from the still unresolved more general formulation of this ethical-legal problem, it would appear that the safest course is to attempt resuscitation as long as there is any possibility of success.

The Role of the State EMS Office
in Medical Control

The chief of the HSS office of Emergency Medical Services has stated that it is federal EMS policy to encourage state health authorities to assume responsibility for the EMS programs in their jurisdictions. A concommitant policy is that an EMS system's medical director should be an officer of the state health department. This policy is designed to promote EMS continuity by giving regional EMS systems a basis of sufficient strength to ensure successful management.

Against this policy it has been argued that the state is too remote from regional systems to provide effective management, that the state health departments commonly lack the expertise or interest to fill this role effectively, and that state intervention in local systems tends to take the form of regulation which may stifle local initiative.

Based on testimony and evidence presented to it, the Committee has concluded that the state EMS offices or legislatures should set minimum standards for EMS systems, for EMTs and paramedics, and for MICU nurses and on-line medical control physicians, but should not attempt to define or delimit methods or scope of operations, which should be determined locally, based on local needs and resources. The state EMS office should provide technical and financial assistance in establishing EMS systems; it should see that frequencies are coordinated to prevent interference and facilitate patient transfer from one region to another. Further, the state office should empower regions within the state to develop EMS systems, giving local systems directors the requisite authority.

However, the Committee sees an EMS system as a local phenomenon, locally managed and accountable to the citizenry served. We feel it is the responsibility of a local management entity — city, county, Council of Governments, Health Systems Agency, health department, or medical society — to designate its EMS medical director and to design a system, consistent with state guidelines where feasible, for the provision of medical control that matches local needs and resources.

The Designation of a Single Regional Hospital
to Provide Regional Medical Control

While the federal EMS program recognizes the diversity evident among ALS systems, its policy is to encourage designation of a single resource hospital as the *sole source of medical control* for paramedics for a region or subregion. This configuration (the federal "X" model) has the advantages of concentrating advisory expertise, of making for greater consistency in medical direction, of promoting field-hospital teamwork, of simplifying communications and obviating frequency crowding, and of

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facilitating system management. In some systems, another configuration is used, patching medical control from the area resource hospital to an associate hospital, with the former monitoring communications (the federal "Y" model). Both the X and the Y models use triage and treatment protocols locally developed and approved by an appropriate medical body.

In cities where these configurations are used, problems have arisen when hospitals were unwilling to take a secondary role, wishing to retain full medical control for incoming patients, fearing diversion of traditional custom. Some have claimed that this pattern of medical control, designed mainly for the transport of acute trauma cases to trauma centers, is less applicable for cardiac, neonatal, psychiatric, and other emergencies (with which various hospitals may be prepared to deal).

It should be borne in mind, particularly by those framing state and local regulations for EMS, that the federal models are descriptive in intent, rather than prescriptive, and that modifications, shaped to local realities, should be considered acceptable and, in some circumstances, perhaps preferable. When the federal X and Y models are interpreted prescriptively, as in their rigid embodiment in state laws, problems arise as local systems find the models inconsistent with local conditions.

Whatever the model, each level of medical management will have its counterpart in operational management. Thus, in many systems, the operational counterpart of the system medical director is the fire chief. At all levels, personnel of the two sides must work closely together, on a daily basis, since many of the problems encountered by one will directly affect the other. It must be clearly understood that when responding to a medical emergency, field personnel are responsible to, and are the responsibility of, only the medical control officer.

The Interface of the Private Physician with EMS Medical Control

Although it is very important that the private physician's authority and responsibility for the care of his patients be preserved, it is also important that the line of authority under which the EMT or paramedic functions be maintained and clearly defined. Situations often arise when an apparent conflict of these two areas of responsibility, if not recognized and dealt with, can cause a mobilization of the medical community against the system.

It cannot necessarily be assumed that unless the patient's personal physician stays with the patient at the site and rides with the patient in the ambulance, he has abandoned his patient and the on-line direction or

protocol supervenes. For instance, the physician may have been in attendance and called for an ambulance after formulating his working diagnosis from his past knowledge of the patient and present findings. He may leave an order and depart to make arrangements at the receiving hospital for the further diagnostic workup in preparation for the patient's arrival, only to find 45 minutes later that his patient has not arrived because the intermediate EMTs or paramedics have been performing procedures that were not part of his order. On the other hand, the system breaks down if the ambulance attendant follows other than his established protocols.

At the other extreme is the physician passer-by who declares himself and wishes to instruct the EMT or paramedic with orders which conflict with the system protocols.

Thus, the system must take cognizance of two factors: one, that the system cannot ignore or disregard direct responsibility of a physician for care of his patient who has an emergency; and the other, that a system breaks down when the base of authority in that system becomes unclear.

There are two approaches which should be taken to alleviate this problem. One is to gain initially the widest possible acceptance in the medical community of the system's protocols, and at the same time to conduct an intensive physician-education campaign to familiarize the medical practitioners with the nature and objectives of the EMS system and medical control. The second is to formulate protocols specifically governing the conduct of field personnel in situations of potential conflict with private physicians. Examples (drawn from Suffolk County, N.Y.) of such protocols follow:

- If a physician is attending a patient at the scene of an emergency and has assumed responsibility for the patient, the ambulance crew should assist the physician in contacting Medical Control by either radio or telephone before proceeding with their own care of the patient. Contact between the on-scene physician and Medical Control will then result in orders to the crew from Medical Control.

- Should the on-scene physician refuse to communicate with Medical Control, the ambulance crew is not obligated to follow the directions of the on-scene physician and should contact Medical Control for directions.

- If contact with Medical Control cannot be established, the ambulance crew may take orders from an on-scene physician if that physician agrees to accompany the patient in the ambulance to the hospital. If the physician does not agree to do so, the ambulance crew is not obligated to follow the physician's orders.

- If a physician is not actually present, the EMT should follow protocol and contact Medical Control. Any medical history or patient care plan provided at the scene by a medical professional individual (i.e., MD, RN, PA, LPN, etc.) should be communicated to Medical Control as a priority.

Gatekeeper of the EMS System

The Central Medical Emergency Dispatcher (CMED) is a member of the EMS team, often an EMT or paramedic, who is commonly bypassed in terms of medical control. Yet this is a person who, depending on the type of system, may have to decide what level of response, if any, is required; to determine what special medical consultative services should be brought on-line; to provide reassurance or interim first aid advice to the caller; and to coordinate a variety of medical responses. As the central source of information on current status of hospitals and emergency departments, he may have the decisive voice in determining where a patient should be taken.

Off-line medical control is clearly appropriate in terms of training and protocols to assist the CMED in eliciting necessary information under adverse circumstances, in being aware of all the medical and emergency response resources available, and in providing advice when appropriate. In addition to providing medical supervision of the CMED, the off-line medical control officer, in cooperation with the operational supervisor, should regularly monitor the CMED's performance, using tapes of communications traffic, for quality control.

Technology and Medical Control

We believe that the rapid advance of technology in communications and resuscitative devices is one reason for not attempting to define rigidly a single pattern for the design of medical control communications systems.

The most common communications adjunct of ALS systems, beyond the radio itself, is telemetry. Although telemetry may not be essential for the recognition of the need to defibrillate, large systems should have the capability of telemetry, particularly for the management of complex rhythms which may follow defibrillation. Further, telemetry may prove desirable as a curb on independent action by experienced paramedics. Small systems, whose case load or funding may not justify telemetry, should consider the less expensive alternative of transmitting some vital signs by radio.

Two relatively recent communications adjuncts of medical control are the radio telephone switching system (RTSS) and satellite communications. The RTSS links the ambulance radio to the public telephone system, permitting the ambulance crew to dial directly a hospital, physician, or other number, but may inhibit some aspects of medical control. Satellite technology, used in some southern states, permits communication with remote areas, such as oil rigs far offshore, and makes possible immediate conferencing with medical expertise throughout the area served. This technology may prove particularly effective in the coordination of disaster response, when other communication links may be disrupted.

Conclusions and Recommendations

Although this report is addressed principally to those EMS systems providing advanced life support (ALS), whether by paramedics and intermediate EMTs, much that is said here also applies to basic life support (BLS) systems. The EMS Committee believes that medical control, appropriate to local circumstances, should be an integral part of every EMS system.

1. Planning for Medical Control

Many of the problems which have arisen in the operation of medical control have their origin in inadequate planning — from lack of coordination among planners and from failure to realize that the design and implementation of a system for medical control is not primarily a technological problem but a community problem, requiring a high degree of cooperation among a wide variety of health care providers, political forces, and public entities.

A. The planning body should include a wide representation of concerned medical, public, and political interests.

B. A primary concern of the planners should be the identification or formulation of an organization with the authority and expertise to implement and enforce medical control.

C. Effective system planning for a BLS system should allow for the eventual inclusion of ALS and medical control.

D. Design of a medical control system should be sufficiently flexible to allow for optimum treatment and transport of the various categories of emergencies (e.g., trauma, cardiac poisoning, and psychiatric).

E. Given the present evolutionary stage of EMS, any system design for medical control should be considered acceptable which incorporates the major functions of overall medical supervision of the system; off-line direction of field personnel through training, provision and monitoring of protocols and standing orders, systematic case reviews, and data collection and evaluation; and on-line medical consultation with EMTs and paramedics.

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2. Implementation of Medical Control

Successful management by physicians of ALS field interventions has been achieved in a wide variety of systems, ranging from those which require prior voice authorization and the use when appropriate of telemetry to those which rely almost entirely on protocols and case review, and from those with centralized medical control at a regional resource hospital to others in which medical control is provided by the receiving hospital or by physicians carrying portable transceivers. Geography, local medical standards, teamwork, finances, training levels, and experience are among the factors affecting the nature of the medical control provided. In common among successful systems are dedicated personnel, strong rapport between emergency department and field personnel, consistent policies and protocols, and knowledge, by the medical control physicians, of what is being done in the field. The Committee regards the present diversity among medical control systems as both inevitable, given the variety of circumstances under which they have arisen and the pluralism of American society, and desirable insofar as no final answers are yet in on the relative effectiveness of various designs.

A. The Committee recommends that newly established medical control systems adopt firm operational protocols, requiring voice authorization for ALS procedures with provision for extraordinary circumstances, and use of telemetry, where available and appropriate. However, in view of the evolutionary pattern often evidenced in established medical control systems, with increasing reliance over time on standing orders and case follow-up, we recommend that such operational protocols not be incorporated in state regulations.

B. Given the potential of the Central Emergency Medical Dispatcher, both as a source of emergency care resource allocation and priority assignment and of interim advice to persons involved in emergencies, the Committee urges the employment, when feasible, of dispatchers with EMS field experience, and their inclusion under the purview and guidance of the medical supervisor.

C. Because medical control cannot function effectively unless the medical control physicians and field personnel know and trust each other, the Committee urges that an EMS system's qualifications for medical control physicians include a willingness to participate in EMT and paramedic training programs and in frequent case follow-up sessions with field personnel.

D. Inasmuch as clinical data, although fragmentary, indicate that citizen CPR, coupled with prompt ALS response and intervention, significantly reduces mortality from cardiac emergencies, we urge EMS systems to work closely with the American Heart Association and the American

Red Cross in developing CPR training programs in schools, industries, police and fire departments, and for the public at large, including in such programs familiarization with the use and capabilities of the local EMS system.

E. The Committee recognizes the value, suggested by available clinical data, of intermediate EMTs, performing at a level of training and skills appropriate to local needs and circumstances, and emphasizes the importance of effective medical control at all levels of field care.

F. Protocols must be appropriate to the skills of the users. This requires particular attention in large systems employing field personnel of varying skills.

3. Federal, State, and Local Authority in Medical Control

The Committee has learned of problems in medical control which have arisen when local systems felt excluded from federal funding because of inability to comply wIth federal guidelines for medical control, when state or regional authorities have translated federal guidelines into rigid requirements which may be inappropriate to some local systems, or, conversely, when state or regional authorities have failed to exercise their legitimate role in this area.

A. The Committee recommends that eligibility for state or federal support should be extended to any ALS system which fulfills the basic functions of medical control: on-line voice direction available to prehospital field personnel by an ED physician or designated surrogate; off-line direction by protocols and standing orders, case follow-up and review, and training; and quality maintenance through system monitoring and enforcement of adherance to approved procedures. We do not believe that the configuration of the communications system through which medical control is exercised should be a determinant of state or federal support.

B. We recommend that the role of a state EMS office be to provide technical and financial assistance, to provide for and ensure frequency coordination among EMS systems, and to empower regions within the state to develop EMS systems, giving local systems directors the sanction of the state. The state should set minimum standards for EMS systems, EMTs and paramedics, MICU nurses, and on-line medical control physicians, but should not attempt to control the design or operations of individual systems, or to designate the local or regional medical director of an EMS system.

C. The design of an ALS system with appropriate medical control, the designation of the system medical director, and the manner in which the system is operated are the proper function of local or regional bodies, so

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that the resulting system will be responsive to local needs and accountable to the citizenry served.

D. The Committee urges that in the present federal climate of decentralization, support for emergency medical services be a top priority for state funding.

4. Legal Considerations

Experience of various EMS systems with and without medical control strongly suggests that a firm system of medical control, with treatment, triage, and transport protocols accepted by the medical community and enforced by the system's medical director, is the best insurance against legal action. It does not appear that Good Samaritan laws, designed originally to protect lay persons offering assistance at an emergency, should be applied to professionally trained EMS personnel. In any event, malpractice lawsuits involving EMS personnel are so rare that the question of legal liability does not appear to be a major barrier to the development of an ALS system.

A. All persons within an EMS system who directly provide emergency medical care should be legally responsible for providing care appropriate to their training and skills. However, we recommend that the EMS system itself, or its parent body, such as a municipality, should bear insurance costs entailed in the legal liability of EMTs, paramedics, and of medical supervisors in their exercise of medical control functions. State Good Samaritan laws should apply only to lay persons providing aid at the scene of an emergency.

B. The responsibility to attempt resuscitation exists as long as there is possibility of brain life; once begun, resuscitation should be terminated only on order of the supervising physician. The question of possible liability for resuscitating after brain damage is unresolved, but does not appear to differ in kind from the more general questions related to artificial prolongation of life.

5. Qualifications for Medical Control

The nature and quality of medical control in a given EMS system are closely related to the kinds of training that the EMTs, paramedics, nurses, and emergency physicians have had: the more extensive the training of field personnel, the higher must be the professional qualifications of physicians (or nurses) providing medical control. In addition to professional expertise, a medical control physician must be familiar with the capabili-

ties and equipment of the paramedics and EMTs whom he directs, and with the field conditions and protocols under which they work, as well as with the medical resources of the region.

A. EMS systems are urged to adopt mininum qualifications, in terms of training, experience, and familiarity with the local EMS system and personnel, for medical control physicians.

B. Physicians providing on-line medical control should participate in EMT and paramedic training and in case review, and periodically accompany an ambulance crew on its runs.

6. Technological Adjuncts in Medical Control

EMS communications technology is continually evolving. Innovations such as the federally encouraged radio telephone switching system (RTSS), satellite relay with its potential for disaster management and the provision of medical advice to remote areas, the politically expedient device of routing 911 calls to local dispatching centers, and the use of computers to assist dispatch and retrieve current resource information, all bear directly on the ways in which medical control can be effected.

The ways in which technological innovations are used also changes. Telemetry, initially seen as essential in the management of all cardiac emergencies and as desirable to interest physicians in EMS, is now frequently seen as essential in managing only the more complex arrhythmias and as desirable for ensuring paramedic adherance to protocols.

A. In view of the rapid evolution of EMS communications technology, the Committee recommends that federal and state requirements for EMS communications be couched in terms of functions rather than equipment specifications.

B. The Committee urges those EMS/ALS systems which are contemplating adoption of innovative communications technology to require demonstration to assure themselves that the new technology would not have an adverse effect on their exercise of medical control.

C. We recommend that the use of telemetry remain a local option, albeit a highly desirable one; that in systems where telemetry is not feasible, other means of transmitting some vital signs be sought; and that federal and state authorities encourage and support studies to determine the impact of the use of telemetry on medical outcomes.

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