

MEDICAL
REQUIREMENTS
FOR AMBULANCE
DESIGN AND
EQUIPMENT

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**Committee on Emergency Medical Services
Division of Medical Sciences
National Academy of Sciences
National Research Council**

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
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Division of Emergency Health Services
5600 Fishers Lane, Rockville, Md. 20852**

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FOREWORD

Previous reports by committees of the Division of Medical Sciences, National Academy of Sciences-National Research Council (1,2), concerned with emergency care of the sick and injured included statements that there are no acceptable standards for ambulance design and that most ambulances in this country are unsuitable, have incomplete fixed equipment, carry inadequate supplies, and are manned by untrained attendants. As in many other areas of emergency care, the obvious conclusion is that the broad gap between knowledge and its application must be closed.

Responsible professional organizations have standardized modern resuscitative procedures (3-9) and have recommended means for community-wide application of these methods toward improving the management of all types of life-threatening emergencies (1,9). Equipment that should be carried on ambulances (4,7-10) and the training necessary to its use (4,9,10) have been prescribed. Few ambulance operators have voluntarily adopted these recommendations. A recent analysis of state statutes (11) on regulation of ambulance services reveals that only 10 of the 50 states require that equipment be carried, and only six of these recommend the minimal list of the American College of Surgeons.

The NAS-NRC Committee on Emergency Medical Services has enlisted professional and lay experts to develop nationally acceptable standards for ambulance design and for equipment for many reasons. The mortician's vehicle, or modification of it, and the station wagon, do not provide sufficient space for the necessary equipment or the carrying out of modern resuscitative procedures either at the scene or during transportation. Unsuitable vehicles are being improvised to replace those being withdrawn from public service by morticians for economic and other reasons. Guidelines for safety and performance are lacking for those who are pilot-testing enlarged ambulances or special-purpose vehicles designed for emergency care of categorized disease entities, such as "mobile coronary care units" or "mobile operating rooms." Communities are demanding improved ambulance services, manufacturers are exploring the feasibility of assembly-line production of ambulances, and emergency medical services highway standards of the Department of Transportation require development at each state level of programs that include provision of adequate types and numbers of emergency vehicles, including supplies and equipment to be carried. Current federal motor-vehicle safety standards (12) prescribe requirements for passenger cars, multipassenger vehicles,

buses, and trucks. Although some standards applicable to these vehicles might apply to ambulances, comprehensive standards for ambulances have not been spelled out, and there may well be a need for additional requirements unique to ambulance design.

In response to requests by the Hospital and Ambulance Services Branch of the Public Health Service and the Bureau of Traffic Safety of the Department of Transportation, task forces and consultants, under the aegis of the NAS-NRC Committee on Emergency Medical Services, are engaged in three related projects with the goal of developing nationally acceptable standards for ambulance design and for the equipment to be used by ambulance personnel.

The first project has been completed and the report is published (10). It prescribes the special training necessary to the administration of optimal emergency care at the scene and during transportation. The responsibilities and functions of ambulance attendants are identified in terms of driving of the ambulance, safeguarding at the scene, communication, rescue, proper use of equipment and supplies in rendering optimal emergency care before and during transport, and safe and efficient delivery to a hospital.

The second project is the subject of this report. The purpose is to relate to professional automotive designers and manufacturers the requirements that must be incorporated in an ambulance if it is to satisfy the demands of the physician in terms of the emergency care for which properly trained ambulance attendants can be held responsible.

The third project is now underway. Automotive engineers, physicians, and experienced ambulance operators will translate and enlarge on the medical requirements detailed in this report in terms of engineering and performance design criteria for an ambulance vehicle in sufficient detail to provide for industrial design and production.

INTRODUCTION

To be termed an ambulance, a vehicle must provide space for a driver, two attendants, and two litter patients, so positioned that at least one patient can be given intensive life-support during transit; carry equipment and supplies for two-way radio communication, for safeguarding personnel and patients under hazardous conditions, for light rescue procedures, and for optimal emergency care outside the vehicle and during transport; and be designed and constructed to afford maximum safety and comfort and to avoid aggravation of the patient's condition, exposure to complications, and threat to survival.

Although ambulances may be used for elective transport of nonambulatory patients—e.g., hospital to home or nursing home—or for outpatient visits, a vehicle used for this purpose that is not designed and equipped to respond to emergency calls should not be termed an ambulance. Unless the vehicle is suitable to both purposes, it should not be permitted to use ambulance-identifying insignia, flashing lights, or warning signal devices.

These recommendations are for regular emergency ambulances, but developments beyond this level, such as vehicles for more than two litter patients or mobile intensive-care units for more definitive therapy outside the hospital, should continue. Designing vehicles and equipment around only one disease entity, however, should be discouraged unless they incorporate design and equipment for the management of *all* critically ill or injured patients. It is, therefore, preferred that the term "mobile intensive-care unit" be applied to such vehicles, rather than "mobile coronary-care unit" (specifically for heart-attack patients) or "mobile operating room" (specifically for patients with trauma).

The equipment and supplies and the design factors necessary to their use in direct patient care included in this report are a composite of the recommendations of members of the Task Force and its consultants, the Committee on Trauma of the American College of Surgeons (7), the Ad Hoc Committee on Cardiopulmonary Resuscitation of the NAS-NRC (5,6), the American Heart Association (3,4), the Committee on Acute Medicine of the American Society of Anesthesiologists (9), and the Committee on Emergency Medical Services of the NAS-NRC (10). Items of equipment should satisfy the indications for use, performance requirements, and safeguards and other recommendations contained in publications of those organizations and in nationally endorsed training courses of the caliber of the cardiopulmonary resuscitation program of the American Heart Association (13).

The Ambulance

GENERAL VEHICULAR DESIGN

General Safety Standards. The ambulance must comply with motor-vehicle safety standards as may be issued by the United States Department of Transportation.

Identification of ambulances should be distinct from that of other emergency vehicles, with nationally uniform emblem, color, intermittent audible warning signal, and flashing roof light for easy recognition and to ensure traffic priority.

Speed and Acceleration. Because rapid and safe arrival of an ambulance at the scene of an accident or in case of the onset of life-threatening illness may be essential to survival, the vehicle must be capable of acceleration comparable with that of other passenger-carrying vehicles; however, optimum preparation before transport and the requirements of comfort, safety, and avoidance of aggravation of the patient's condition preclude excess speed, rapid acceleration, or traffic violation, in delivery of the patient to a medical facility.

Riding characteristics must ensure smooth, gentle, and comfortable transportation. Ease and reliability of handling are essential. The ambulance should be equipped with a positive-traction differential. Provision for four-wheel drive may be necessary in areas where required by the terrain. The braking system should be adequate. There should be minimal pitch, roll, and side-wind effect. The center of gravity should be as low as possible for ease of loading and maximum stability. Puncture-proof tires are essential. Road clearance must be adequate for country roads or disrupted city streets. Underseal of the body is desirable to avoid flooding.

The floor should be at the lowest level consistent with adequate clearance and the space for litters and for attendants at the ends and sides should have a flat surface and be unencumbered by wheel wells, drive shaft tunnels, etc. It should have a nonskid surface that is easily cleaned.

Collision reinforcing bars should be incorporated in the sides and rear and roll bars or other reinforcement should be incorporated in the roof, to protect occupants in the event of an accident.

The electrical power supply provided by the motor should be capable of producing sufficient current at 12 volts to meet such vehicular requirements as lighting, radio, and temperature control, and the battery should be of sufficient capacity to function for at least 20 min with the motor not running. In addition, a 110-volt, at least 3000-watt, power supply must be provided for installed and portable equipment.

DRIVER AREA

Separation from the patient area is essential to afford privacy for radio communication and to protect the driver from an unruly patient. The bulkhead must be strong enough to support an attendant's seat in the patient area at the top of the patient's head and to withstand deceleration forces of the attendant in case of accident.

Access to the driver area is to be provided by two doors, one on each side. Access to the patient area must be both direct (by passing through an opening in the bulkhead) and indirect (by leaving the driver area and entering an external door to the patient area). There must be provision for both visual and voice communication between the two compartments.

Lighting must be available for both the driver and an attendant, if riding in the driving compartment, to read maps, records, etc. There must be shielding of the driver's area from the lights in the patient compartment.

Environmental control should allow for adequate ventilation, heating, and cooling. This equipment must be capable of reaching 75°F in a reasonable time and maintaining this temperature under various operating conditions. Rapid air exchange (ventilation) may prove necessary under certain circumstances—for instance, during the transport of gas-contaminated victims. Entry of exhaust gases must be avoided.

Safety requirements for the driver area include restraining devices, dash padding, collapsible steering wheel, and such other safeguards as prescribed by the Department of Transportation.

Communication equipment requiring space in the driver area consists of two-way radio (see "Communication and Documentation"), a tachograph, maps, manuals, and such records as the driver may need to maintain.

PATIENT AREA

Over-all dimensions of the patient area must provide for two litters (each 76 in. long and 23 in. wide), two attendants, space for administering life-supporting care, and all equipment and supplies not carried in the driver area or on the outside of the vehicle.

Minimum space between the head of the litter and the bulkhead must be 25 in., including a seat for an operator who sits at the patient's head for respiratory care and resuscitation.

Minimum space at the foot of the litters must be 15 in. to accommodate traction splints and/or an attendant. The handles of folding litters that extend beyond 76 in. are accommodated within this space.

Minimum space between litters must be 25 in. to provide room for the operator to kneel while performing external cardiac compression and other functions.

The minimal height throughout this area is 54 in. from floor to ceiling. A height of 60 in. is preferable. The minimal height affords only 39 in. from the surface of the litter to the ceiling when the litter is adjusted to a height of 15 in., to allow an operator to kneel beside the patient on a pillow and use maximal body weight in performing cardiac compression with his arms straight.

In summary, the minimal over-all internal dimensions of the patient area are: width, 71 in. (2 litters 23 in. wide plus 25-in. space between litters); length, 116 in. (25 in. at the head plus 15 in. at the foot of a 76-in. litter); and height, 54 in. from floor to ceiling.

Crash-stable fasteners must be provided to secure litters to the floor or side walls. Litters must not be suspended by wall brackets or from the ceiling. Where a single patient may be centered in the area on the wheeled litter, additional attachments should be provided. Floor and side-wall attachments should be flush with the surface when not in use.

Seats must be provided for attendants, one at the top of the patient's head, as described above. In addition, seating space with restraints should be provided for ambulatory patients, for example, in the form of a fixed bench, otherwise used to support a folding litter.

Equipment, installed or portable, and all supplies must be positioned for ready accessibility and not impinge on litter or access

areas. Storage cabinets and installed equipment should be designed or positioned to avoid projecting injurious objects, including recessed ceiling hooks for suspension of intravenous-fluid containers. (The basis for space and location of these items is covered under "Emergency Care Equipment and Supplies.")

Doors must be provided at the rear and curbside at the front of the patient area. The rear doors should be hinged to open flush with the sides and ceiling of the patient area and stabilized in the open position to permit litters to be placed into their ultimate riding positions with minimum movement of patients. Latches should permit easy opening by an attendant with one hand while he is carrying a litter. The curbside door must allow the attendant to position himself rapidly and easily at the head of the patient and to remove patients in an emergency if the rear door is jammed.

Steps, if present, should be built to prevent slipping and accumulation of snow, ice, or mud.

Communication with the driver area, both visual and by voice, must be provided. Access to the two-way radio equipment is required for communication with dispatchers, hospitals, physicians, etc. (See "Communication and Documentation").

Illumination must be adequate throughout the compartment, and provide an intensity of 40 ft.-candles at the level of the patient for adequate observation of vital signs, such as skin color and pupillary reflex, and for care in transit. Lights should be controllable from the entry doors, the head of the patient, and the driver's compartment. Windows, if present, should not encroach on necessary storage space, and, while providing daylight, should ensure patient privacy and safety.

Environmental control of the patient area must allow for adequate ventilation with doors and windows closed and for comfortable heating and cooling. The system should provide a temperature of 75°F within minutes and be able to maintain it under extremes of operating conditions. Entry of exhaust gases must be avoided.

Interior surfaces of the patient area must be insulated; resistant to water, heat, and chemicals; and easily cleaned. There should be no sharp projections that could be injurious.

Restraints for attendants must be provided and their seats must be strong enough to meet deceleration requirements of the Department of Transportation. A padded headrest should be installed

above the seat fixed to the bulkhead. Restraints must also be provided for patient protection during transit, including control of the unruly or mentally disturbed patient.

Power outlets for 110 volts should be provided inside near the patient for use of specialized equipment during transport and for recharging battery-powered equipment, and outside for floodlights and electrically powered rescue tools. Receptacles should be approved, grounded units.

Security and Rescue Equipment

SECURITY

Safeguarding of patients and ambulance personnel at the scene of an accident or disaster requires equipment to direct and control traffic and bystanders, isolate areas, and remove victims from hazardous situations. Such equipment should be readily accessible from the outside of the vehicle. Items of equipment include:

Illumination devices, i.e., flares, reflectors, and flashlights; and floodlights with extension cords at least 100 ft long for treating patients outside the vehicle.

Fire extinguisher, 5-lb, dry-powder BC.

Voice amplification devices, installed and portable.

***Gas masks**—self-contained breathing apparatus (not oxygen-generating).

Disposable gauntlets.

RESCUE

Rescue of victims with lightweight equipment may be mandatory when specially equipped rescue vehicles are not readily available, in areas where such vehicles may be nonexistent, or when valuable time might be lost in calling from the scene of the accident for equipment. Ambulance personnel must be provided with such simplified light rescue equipment as may be carried on the ambulance, and they must be trained in its proper use. Reliance must not be placed on the tools necessary for vehicle maintenance.

Release from entrapment and confinement requires lifting, prying, battering, and cutting tools.

Extrication and short-distance removal requires long and short backboards, straps and ropes, or a litter, if designed for the purpose.

*As determined by local hazards or ready availability from other sources.

Emergency Care Equipment and Supplies

SPACE REQUIREMENTS

For purposes of estimating space requirements for installed, portable, and stored equipment and supplies, and for location for optimal accessibility, designers must be familiar with the size, weight, shape, and power requirements for each item as applicable.

Design must not be limited to accommodation of contemporary equipment and supplies. Allowance should be made for additional space and power supply so as to adapt to inevitable scientific advances in resuscitation and immediate wound care, and to the new and refined equipment that will be used by increasingly proficient ambulance attendants to whom professional advice and direction will be available through voice and perhaps video transmission (10).

The location of equipment and supplies is dictated by the relative importance of ready accessibility to attendants, with priority given to items necessary to cope with life-threatening conditions at the scene and in transit. Thus, the equipment and supplies necessary for airway care, artificial ventilation, oxygenation, and suction should be within reach of the attendant at the head of the litter, and those for cardiac resuscitation, control of external hemorrhage, administration of intravenous agents, and the monitoring of blood pressure should be readily available to the attendant at the side of the litter.

To the maximum extent possible, equipment and supplies should be so standardized and durable as to make acceptable a regular practice of interchange between ambulances and between ambulances and hospitals.

Storage cabinets, drawers, and kits should be easily opened, but should not come open in transit. For rapid identification of contents, it may be desirable to use transparent material for the fronts of some cabinets and drawers. Otherwise, labeling of the contents of these and others for identification and inventory is recommended. Drawers should be removable.

PATIENT TRANSFER—LITTERS

Each ambulance should be provided with (1) a wheeled litter, (2) a folding litter, and (3) a collapsible device that enables attendants to carry a patient over stairways and other narrow spaces where a rigid litter cannot be used. Litters (2) and (3) may be combined as one folding litter. Litters must be easy to move, load, store, clean, and disinfect. The folding litter should keep the patient above floor level; the wheeled litter, adjustable in height, should be designed so that in the low riding position the top may be as low as 15 in. above the floor of the ambulance. Litters should be equipped with a nonremovable, collapsible, telescoping support for intravenous infusion bottles.

The head of the litter must be capable of being tilted upward to a 60-deg. semisitting position, and the entire litter capable of being tilted into the head-down position of at least 10 deg. (for airway care). To permit lying full length in the supine, prone, or lateral position, litters must be at least 69 in. long and 20 in. wide. Most standard litters are 75-86 in. long and 22-23 in. wide. The frame or handles should be designed to permit up to four persons to carry the litter and should provide for fasteners to secure it firmly to the floor or side of the vehicle during transport. Restraining devices must be provided to prevent longitudinal or transverse dislodgment of the patient during transport. It is preferable that litter tops be radio-translucent and interchangeable at the emergency department so that the patient can be carried from the scene, in the ambulance, and through the emergency room, X-ray department, and operating room, and removed from it only once to be placed on a bed.

AIRWAY CARE, ARTIFICIAL VENTILATION, AND OXYGENATION

Artificial-ventilation devices must be portable and independent of a supply of oxygen. Two units are desirable, one for use in the ambulance and the other for use outside the ambulance and serving as a spare unit.

The artificial-ventilation device should be a manually operated, self-refilling, portable bag-valve-mask unit that operates with either air or oxygen enrichment (5,9). When used in the ambulance, it should permit delivery of 100% oxygen, for instance, by attaching an oxygen reservoir tube. The unit should be easy

to clean and decontaminate. It should have one standard universal adapter (15-mm tracheal tube/22-mm mask). The non-rebreathing valve should permit inhalation of oxygen during artificial and spontaneous breathing from the bag. Masks, in sizes for adults, children, and infants, should be preinflated and transparent to permit rapid recognition of color change, vomiting, and breathing (clouding during exhalation), and should permit fastening to the patient's face.

Oxygen-powered, manually triggered inflation devices are acceptable if properly designed (5), but their dependence on compressed oxygen limits their use to inside the vehicle.

Airways. Oropharyngeal airways for adults, children, and infants should be provided. Airways for mouth-to-mouth ventilation should also be carried in all sizes.

Mouth gags or tongue blades taped together should be provided for use during convulsions to prevent injury to the patient's tongue.

For ventilation and oxygenation of tracheotomized patients, 15-mm tracheostomy tube male adapters of various sizes should be available.

Oxygen inhalation equipment. There should be two oxygen supplies, one portable, the other installed.

The portable unit of 300-liter capacity located near a door for ready use outside should be equipped with a yoke, pressure gauge, flowmeter (not gravity-dependent), delivery tube, and oxygen mask. The unit should be capable of delivering an oxygen flow of at least 10 liters/min. An extra 300-liter-capacity cylinder should be available.

The installed unit is supplied by at least 3000 liters of oxygen contained in two tanks and delivered by a two-stage regulator under 50 psi. There should be yokes, reducing valves, flowmeters (not gravity-dependent), humidifiers with sterile water and unbreakable bottles, delivery tubes, and oxygen masks for two patients. Oxygen pressure gauge and flowmeters, humidifiers, and delivery tubes should be visible and accessible to the attendant seated at the head of the litter. Delivery tubes should reach to the face of patients transported in the horizontal position and deliver a continuous flow of at least 10 liters/min. and should connect readily to oxygen masks and the bag-valve-mask ventilation unit.

Oxygen masks (with or without bags) should be semi-open, valveless, transparent, disposable (or easy to clean and decontaminate), and in sizes for adults, children, and infants.

Suction Equipment. Portable and installed suction equipment should be available. The portable unit should provide vacuum and flow adequate for pharyngeal suction. It should be fitted with large-bore, nonkinking suction tubing and a rigid pharyngeal suction tip. There should also be sterile suction catheters of various sizes for suctioning via tracheal tube or tracheostomy tube, a non-breakable collection bottle, and a supply of water for rinsing tubes. The installed suction unit should be powerful enough to provide an airflow of over 30 liters/min. at the end of the delivery tube and a vacuum of over 300 mm Hg when the tube is clamped (8,9). The suction force should be controllable for use on children and intubated patients. There should be an additional set of rigid pharyngeal suction tips (tonsil suction tips) and sterile tracheal suction catheters of various sizes. For tracheal suction, a Y- or T-piece or a lateral opening should be between the suction tube and suction source for on-off control. The suction yoke, collection bottle, water for rinsing, and suction tube should be readily accessible to the attendant at the head of the litter, and the tube should reach the airways of patients regardless of their position. Suction apparatus must be easily cleaned and decontaminated.

EXTERNAL CARDIAC COMPRESSION

A backboard should be readily available and, when placed under the patient in bed or on a litter, provide the necessary resistance for effective external cardiac compression and raise the patient's shoulders 3-4 in. above the level of the litter in order to keep his head in a position of maximal backward tilt, and in a straight position without manual support. This may help maintain an open airway during cardiopulmonary resuscitation by one operator during transportation. A special backboard may be used, or the long or short spinal-fracture board supplemented with a tightly rolled sheet under the patient's shoulders and a head stabilizer, such as a doughnut-shape rest or sandbags.

The superiority of mechanical over manual external cardiac compression has not yet been established. In anticipation of future development of satisfactory equipment, space should be provided for this equipment.

IMMOBILIZATION OF FRACTURES

The following supplies must be carried for immobilization of fractures or suspected fractures (7):

A hinged, half-ring lower-extremity splint with a minimum ring size of 9 in. and minimum over-all length of 43 in., and with padded ankle-hitch or skin-traction device, with either a built-in turnbuckle device or a supplemental "Spanish windlass" device.

Splints for the upper and lower extremities, such as padded boards, of material comparable with four-ply wood in widths of 3 in. and lengths of 15, 36, and 54 in.; cardboard, plastic, wire ladder, canvas-slotted lace-on and inflatable types; the number and types of splints to be determined by local experience in the area served.

Triangular bandages for fractures of the shoulder and upper arm.

Short and long spineboards and accessories (7,14) for safe extrication, as well as immobilization in case of actual or suspected injuries of the spine.

WOUND DRESSINGS

Supplies to be carried for dressing of open wounds and for padding and application of splints include:

Sterile gauze pads of conventional sizes for covering wounds.

Multiple-width 5-yard soft roller and elastic bandages (soft roller preferred) for application of large dressings, for securing of pressure dressings for control of hemorrhage,* and for securing traction or coaptation splints.

Sterile nonporous dressings for occlusion of sucking wounds of the chest.

Universal dressings, approximately 10 in. by 36 in., packaged folded to 10 in. by 9 in., for covering large wounds, including burns, and for compression, padding of splints, or application as a cervical collar.

*Application of pressure dressings is the procedure of choice for control of hemorrhage, except for inaccessible sites, where direct digital pressure may be life saving. Inflatable splints have proved effective for hemorrhage below the elbow or knee. If carrying of tourniquets is elected, strict limitations in their use must be imposed.

Adhesive tape—1-, 2-, and 3-in.
Safety pins, large.
Bandage shears.

PREVENTION AND TREATMENT OF SHOCK

Equipment should include sterile intravenous agents, preferably in plastic bags, such as isotonic saline solution, 5% dextrose in lactated Ringer's solution, 5% albumin, or dextran; and sterile, disposable intravenous administration sets and injection kits (needles, catheter needles, syringes, antiseptic sponges, venous tourniquet, tape).

EMERGENCY CHILDBIRTH

In addition to sterile dressings and towels, a sterile kit containing gloves, scissors, and umbilical clamps or umbilical tape should be carried.

TRANSPORTATION OF NEWBORN INFANTS

Each ambulance service should have available immediately from hospitals or other sources a portable incubator that can be secured on the litter for transporting newborn infants. The incubator should permit oxygen enrichment, humidification, control of body temperature, and accessibility of the baby's head for resuscitation. There should be artificial-ventilation and sterile tracheal-intubation equipment in appropriate sizes for this purpose.

ACUTE POISONING

Activated charcoal and syrup of ipecac should be provided, as well as potable water and equipment for oral administration and for irrigation of the conjunctiva and skin. Snakebite kits should be carried in areas where the hazard of snakebite exists.

MISCELLANEOUS EQUIPMENT

The following miscellaneous equipment should be carried on each ambulance: pillows, blankets, sheets, pillow cases, towels, tissues, emesis basin, urinal, bed pan, thermometer, aneroid blood-pressure manometer and cuff, stethoscope, drinking water, disposable cups, and sandbags.

SPECIAL EQUIPMENT FOR USE BY PHYSICIAN OR OTHERS TRAINED IN ITS USE

There should be space in the ambulance for additional special equipment to be used by physicians or others with special training. Wherever possible, special-purpose equipment should be in the form of kits and items disposable or easy to sterilize. This equipment includes: tracheal intubation kit (including cricothyrotome and nasopharyngeal tubes), pleural decompression set (including trocars, chest tubes of various sizes, and one-way valves), drug-injection kit, tracheostomy kit, portable cardioscope/external defibrillator, and cardiac compression machine.

Communication and Documentation

RADIO

Equipment for communication by two-way radio is mandatory for direct voice dispatching, routing, notification of emergency departments, and direction and assistance from physicians, and for cross-communication for liaison with fire, police, and civil-defense authorities and other ambulance units. Regardless of the location of the basic radio equipment, it must be adaptable for use by both the driver and the attendant in the patient area with volume control, in the interests of the patient. Portable radios should be provided for communication between attendants working at a distance from the vehicle.

TELEMETRY EQUIPMENT

Advances in the development of devices for telemetering physiologic data warrant provision of space in an ambulance for installation of this equipment.

DOCUMENTATION

Space should be provided for recording devices (tapes or records being interchangeable with hospitals) for detailed reports on patients, to include time intervals from the time of dispatch to delivery to the hospital, physical condition at the scene and during transport, and care rendered. In addition to verbal and written reports to emergency department personnel and such other reports as may be required by the ambulance operator, the recording tapes or records should be delivered with the patient for transcription and incorporation into the permanent hospital record. Photographic documentation is encouraged.

Transportation by Air

Helicopters or aircraft used for the transportation of critically ill and injured patients should be designed and equipped to permit the same resuscitative and life-supporting measures and other emergency-care procedures as are described above for land ambulances.

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TRAINING

of ambulance personnel
and others responsible for
emergency care of the
sick and injured at the
scene and during transport



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TRAINING

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**Guidelines and Recommendations of the
Committee on Emergency Medical Services
Division of Medical Sciences
National Academy of Sciences
National Research Council**

**Prepared under SA-896-68 and Contract PH 110-68-1 with the
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Services and Mental Health Administration
Division of Emergency Health Services
5600 Fishers Lane, Rockville, Md. 20852**

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FOREWORD

In a report entitled "Accidental Death and Disability: The Neglected Disease of Modern Society," prepared by committees of the Division of Medical Sciences, NAS-NRC, in September 1966, and a summary report of a Task Force on Ambulance Services of April 1967, it was affirmed that the majority of ambulance personnel are inadequately trained, and that there are no generally accepted standards for the competence or training of ambulance attendants. In response to a recommendation by these groups that a standard course of instruction be prescribed, the NAS-NRC Committee on Emergency Medical Services was requested by the Division of Direct Health Services of the Public Health Service "to develop nationally accepted guidelines and recommendations for advanced specialized training for ambulance attendants, policemen, firemen, rescue personnel, and other public servants involved in providing immediate care to emergency sick and injured," and "to make recommendations on a course of action to assure development of a nationally acceptable training course for ambulance attendants and other lay personnel for use in emergency care." Guidelines for training and recommendations on a course of action were prepared by an expert task force under the aegis of the NAS-NRC Committee on Emergency Medical Services, and forwarded to the Public Health Service in March 1968.

In view of the wide disparity of current training programs, the immediate need to raise standards of emergency care, and the delay involved in implementation of advanced training programs, a summary of the Committee recommendations is published at this time for the information and guidance of those who seek to improve proficiency in immediate care and for those empowered to set standards for certification of ambulance personnel.

RESPONSIBILITIES OF AMBULANCE ATTENDANTS AND OTHER LAY PERSONNEL ENGAGED IN DELIVERY OF EMERGENCY HEALTH SERVICES

Employees or volunteer members of public and private organizations having a responsibility for the delivery of health services must be trained in and held accountable for administration of specialized emergency care and delivery of the victims of injury or acute illness to a medical facility. This category of lay persons includes ambulance personnel, rescue squad workers, policemen, firemen, lifeguards, workers in first aid or health facilities of public buildings and industrial plants, attendants at sports events, civil defense workers, paramedical personnel, and employees of public or private health service agencies. Specialized training, retraining, and accreditation of such persons necessitate development of training courses, manuals, and training aids adequate to provide instruction in all emergency care short of that rendered by physicians or by paramedical personnel under their direct supervision.

Ambulance personnel are responsible for all lay emergency care from the time they first see the victim through transportation and delivery to the care of a physician. They must therefore be able not only to appraise the extent of first aid rendered by others, but also to carry out whatever additional measures will make it safe to move the victim and minimize morbidity and mortality. They must operate the emergency vehicle safely and efficiently; maintain communication between the scene of the emergency, traffic authorities, dispatchers, and emergency departments; render necessary additional care en route; and transmit records and reports to medical and other authorities. Although the emphasis on certain subjects will vary with the nature of employment of those who are not ambulance personnel but who have a responsibility for delivery of health services, they should be equally trained so that maximum care can be ensured, whether they transfer responsibility to the ambulance attendant or, in his absence, carry out all functions required of him.

Need for Standardized Training

An analysis of the current courses of training and of state statutes on the regulation of ambulance services reveals that there is no uniformity in the course of instruction and that there are no generally accepted standards of proficiency to be used by those empowered to certify ambulance personnel.

Training courses for ambulance attendants are conducted at hospitals, medical schools, universities, colleges, health departments, police departments, and fire departments. Ironically, ambulance attendants of the small community or the rural area, where the fatality rate from traffic accidents is highest, do not have access to these organizations, and may be trained not at all, or only to the extent that local physicians or small hospital staffs can train them with limited facilities and equipment. Rarely is the isolated ambulance attendant afforded the time or financial means to undergo formal training at a central training site.

A review of more than 70 short courses of instruction, varying from a few hours to 3 days, and of over 20 textbooks related to training of ambulance personnel, reveals a marked lack of uniformity or completeness of instruction, and none includes all the subjects listed in the guidelines recommended in this report. The greatest degree of uniformity is in short courses conducted under the aegis of the Committee on Trauma of the American College of Surgeons and of the Committee on Injuries of the American Academy of Orthopaedic Surgeons. Few courses require either the standard or advanced first aid courses of the American National Red Cross as a prerequisite and, although instruction generally includes emergency childbirth, cardiopulmonary resuscitation, and the management of psychiatric emergencies, little attention is given to the operation of emergency vehicles, safety precautions at the scene of the accident, priorities of care, records, the use of communication systems, the use of equipment and supplies, medicolegal problems, or rescue procedures. Although it is generally stated that courses of more than a few hours are conducted by institutions, local fire or police departments, or individuals who travel periodically to outlying communities, the most complete curriculum of an organized course of instruction of which the Task Force is aware is that of the military forces for the training of enlisted technicians, ambulance attendants, and combat corpsmen.

A recent survey of state statutes reveals that only 18 "regulate" ambulance services, and of these only eight require instruction at the level of the standard or advanced course of the American Red Cross. Six states require "instruction in first aid," but do not prescribe the level of training.

It is recognized that superior ambulance services are rendered to a small segment of the population by well-regulated public and private ambulance and rescue organizations whose personnel are

highly trained, and that in some communities highly motivated volunteers or employees have attained a high level of proficiency. It is apparent, however, that these groups have depended mainly on local medical talent for training and that most often the level of proficiency attained is a reflection of the dedication and extra efforts of individual physicians, rather than of established faculties.

The diversity and incompleteness of courses of training and the lack of guidelines by which to test proficiency or to regulate ambulance services attest to the need for adoption of nationwide standards not only for the training of ambulance personnel, but also for the equipment and the vehicles on which they depend for delivery of emergency care.

The Committee on Emergency Medical Services recognizes that the levels of proficiency to be attained by the course of instruction recommended in this report are goals to be reached in increments in most areas of the country within a reasonable period. Furthermore, it would be reasonable for these levels of proficiency to be used as standards by those empowered to certify ambulance personnel in each state.

GUIDELINES FOR TRAINING OF AMBULANCE PERSONNEL

Section One—Emergency Care

Anatomy and Physiology

Musculoskeletal system	Gastrointestinal tract
Nervous system	Abdomen
Respiratory system	Skin
Circulatory system	Eye
Genitourinary system	Topographic anatomy

Vital Signs and their Significance

Normal ranges of vital signs and abnormalities related to injuries and other emergencies, to include pulse, respiration, blood pressure, skin temperature, color of skin and mucous membranes, pupils, states of consciousness, paralysis, and reaction to pain.

Life-Threatening Emergencies

Airway maintenance, artificial ventilation and oxygenation

Cardiac arrest and cardiopulmonary resuscitation

Instruction as prescribed by the American Heart Association.

Bleeding

Pressure dressings, pressure points; emphasis on strict limitations on use of tourniquets.

Shock

Include administration of intravenous fluids.

Injuries

Wounds—General

Definition. Open, closed; abrasion, puncture, incision, avulsion; penetrating, perforating.

General Effects. Interference with function; shock.

Local Effects: Hemorrhage, external, internal; interference with blood supply; destruction; foreign bodies; contamination.

Injuries of bones and joints

Under each heading, instructions as appropriate on techniques of handling extremities, methods of moving victim, dressings, splinting, traction, positioning during transport. Emphasis on treating sprains and strains as if they were fractures or dislocations.

Fractures and dislocations of upper extremities

Fractures and dislocations of lower extremities

Fractures and dislocations of spine

Fractures of pelvis

Injuries other than of bones and joints

Under each heading, instructions as appropriate on airway obstruction, cardiac arrest, hemorrhage, techniques of moving, release from impalement, dressings, splints, positioning, preservation of avulsed parts (ear, nose, digits, extremities) and possible complications during transport.

Scalp and skull

Brain

Eye, ear, nose

Face and jaws

Neck

Chest

Abdomen, pelvis

Genitalia

Back

Extremities

Burns

Environmental Emergencies

Instruction as appropriate on prevention of additional injury, methods and hazards of removal from environment, initial care, contamination, possible cardiopulmonary complications during transport.

Exposure to cold

Exposure to heat

Exposure to radiation

Electrical injuries

Near-drowning

Explosions

Acute Poisoning

Medical Emergencies

Fainting; stroke; heart attack; convulsions; acute alcoholism; diabetic states; perforated viscus; hemorrhage; asthma; emphysema; nosebleed; shock; unconscious states; allergic reactions; urinary retention; strangulated hernia; protracted vomiting; drug withdrawal; spontaneous pneumothorax; communicable disease; (special emphasis on pediatric emergencies).

Emergency Childbirth

Management of Emotionally Disturbed and Unruly

Section Two — Ambulance Services

Personnel

Effective service requires proper attitudes and conduct in work; show of responsibility; skills obtained by experience and training; acting within limitations of capabilities.

Attendants and drivers must be equally trained in each other's duties and responsibilities so that they may function interchangeably or independently in caring for multiple casualties.

Duties as an Attendant

Personal attitudes and conduct:

Professional manner. Definition; ethical standards required; control of emotion; courtesy; tone of voice; refrains from smoking while engaged in duties related to care of patients; uses appropriate topics of conversation.

Personal appearance. Hygiene and grooming; proper wearing of uniform; identifying insignia.

General conduct. Shows interest in job; concern for victims; "common sense" care; teamwork efficiency; prevents embarrassment to victim; gives reassurance to victim; uses victim's resourcefulness in helping himself; shows responsibility for safety of victim, self, others; cooperation.

Response to victim's need for religious comfort in face of death. Obligation to notify clergyman when requested by victim; responds to victim's inclination to talk; performs baptismal rites if requested when clergyman is unavailable; administration of last rites.

In cases of apparent death or death. Handling of deceased. Definition of death; examines for signs of death; when death is certain, moves body in accordance with local ordinances or regulations; for ethical and humanitarian reasons, remains with deceased until arrival of police or medical examiner; shows courtesy, respect, and consideration in handling and exposure of the deceased.

Disclosing bad news. Creates proper atmosphere; displays attitude to mitigate bad effects; demonstrates sympathetic air.

Responsibilities to the victim:

Prompt and efficient care. Performs lifesaving measures; provides for safety and protection; gives all possible emergency care when extrication is delayed; undertakes extrication to permit emergency care; avoids undue haste and mishandling; searches for medical identification emblems.

Preparation for transport to hospital. Immobilizes injured parts; prevents disturbance and exhaustion before transport; makes sure of victim's cooperation; ensures optimal preparation before decision to transport; protects victim's valuables.

Continuing care en route, and delivery to hospital emergency department in best possible condition. Rides in compartment with victim; continually observes and protects; administers fluids and other measures as instructed or indicated; reports changes in victim's condition during transport.

Skill in the use of ambulance equipment and supplies.

Cooperation. When a physician or a paramedical person is present at scene of accident, assumes subordinate role and gives full cooperation; in their absence, carries out functions that are the usual responsibilities of police officers, firemen, other ambulance personnel, public utilities personnel, clergymen; cooperates fully with hospital emergency department staffs.

Duties as the Driver

Personal attitudes and conduct.

The same standards of professional manner, personal appearance, and conduct as pertain to the attendant have application for the driver.

Responsibilities to the victim.

Transports victim in such a manner that it minimizes disturbance to affected part and ensures maximum comfort, prevents shock, allows freedom of breathing, avoids further danger to the victim; knows and abides by laws and traffic regulations pertaining to ambulances.

Vehicle operation.

Practices "defensive driving"; exercises emergency privileges properly; prevents accidents; engages in safe driving practices; knows and uses proper operating speeds; knows importance of gentle driving, starting, and stopping; knows the relationships of speed to "reaction distance," "braking distance," and "stopping distance"; makes proper use of lights and sirens.

Transportation of mass casualties.

Drives along assigned routes cleared by police; does not alter routes unless directed by police or central dispatcher; proceeds only to designated areas or hospitals; cooperates in a coordinated, constantly-flowing effort.

Maintenance of vehicle.

Understands principles of engine and can make minor repairs; routinely inspects and services mechanical parts; checks safety equipment; cleans debris from vehicle; decontaminates inside after transport of victim with contagious infection or radiation exposure.

Emergency Vehicles

Ambulances

Regardless of the degree of injury or illness for which the ambulance is dispatched, the ambulance and its equipment must be adequate to cope with the most serious emergencies.

Helicopters

Because helicopters cruise at low altitudes, the medical problems pertaining to transport in a fixed-wing aircraft are not pertinent. At altitudes under 1,000 feet, the indications for oxygen administration are the same and the problems encountered in case of vomiting, sucking wounds of the chest, and injuries to the sinuses, ears, and brain are dealt with in the same manner as during ambulance transportation.

Criteria for use. Accessibility to victim; speed in transport of attendants to accident scene, and of victim to initial emergency care facility, or transfer to a medical center.

Special problems. Dust requires covering of all open wounds; moving rotor blades dictate pattern in approaching and leaving helicopter; air turbulence requires special attention to securing of litter and victim; noise interferes with communication and evaluation of vital signs; vibration may make procedures such as intravenous administration or intubation difficult.

Rescue vehicles

The space requirement for personnel and equipment in rescue vehicles designed for medium and heavy rescue procedures precludes their use as ambulances. Light rescue equipment should be carried on ambulances as well as on rescue vehicles and ambulance personnel trained in its use.

The Use of Equipment and Supplies

Thorough familiarity with the theory of any particular device, indications for its use, the desired effects when it is used, its capabilities and limitations, and its malfunctional problems.

Maintenance, exchange, and periodic inventory.

Efficiency in use, as prescribed in the section on emergency care.

Emergency care

Airway maintenance, artificial ventilation and oxygenation. Suction apparatus, installed and portable; catheters;* airways, mouth-to-mouth and oropharyngeal;* mouth gags; bag-mask resuscitation unit, installed and portable;* oxygen tanks and masks;* manually triggered oxygen-powered ventilation apparatus.*

*Appropriate sizes for adults, children, and infants.

Control of hemorrhage. Compression dressings; tourniquets (emphasis on strict limitations in their use).

Immobilization of spine and extremities. Backboards; half-ring splints; padded boards; inflatable splints; triangular bandages.

Dressings. Large universal dressings; pads; bandages; pins; tape; shears.

Fluids. Intravenous fluids and administration sets.

Emergency childbirth. Obstetrical kits.

Snakebites. Snakebite kit, including antivenin.

Acute poisoning. Medicinal charcoal; syrup of ipecac.

Lighting. Flashlights; floodlights; generator.

Safe and efficient transport

Warning devices; lights; temperature and humidity controls; restraining devices for litters and occupants; litters; blankets; pillows; neck rolls.

Safety equipment

Warning flags and flares; fire extinguishers; helmets; rubber gloves.

Light rescue tools

Lifting, prying, cutting, and battering tools; backboards; ropes; straps.

Communication

Radio equipment.

Elective equipment—for use by physicians or other persons trained in its use

Tracheal intubation kits; mechanical external cardiac compression machine; radiation detection equipment; tracheotomy or cricothyrotomy set; equipment for monitoring of vital signs; cardioscope/defibrillator; pleural drainage set for tension pneumothorax.

Communication

Instruction and demonstration by communication experts on use, regulations, limitations, and maintenance of equipment, and by physicians or paramedical personnel on coordination of care and delivery of victims. Emphasis on importance of day-to-day use as a prerequisite to efficient operation in disaster.

Uses of communication equipment

Dispatch and control movement of ambulances; clear traffic lanes; mobilize rescue equipment; dispatch professional personnel and supplies; advise ambulance personnel on care of victims at scene and during transport; alert emergency departments of expected arrival and condition of victims; distribute victims to appropriate medical facilities; coordinate with local government and civil defense officials and with backup ambulance services.

Design of communication system

Radio communication. Twenty-four hour capability; central dispatching; area to be served; terrain features; flexibility of cross-communication with other systems; system not in parallel with, or isolated from, other networks; compatibility with radio or video transmission of vital signs.

Auxiliary communication. "Walkie-talkie"; telephone; messengers.

Limitations on use of equipment

Federal Communications Commission regulations; standby power essential at fixed installations; telephone systems may be blocked.

Relationships with Hospital Emergency Departments

Thorough familiarity with care rendered in emergency departments to ensure adequacy of measures taken by ambulance personnel.

Problems for ambulance personnel

Delays in delivery of victim. Blocked access; traffic control; inconvenient location of facilities.

Delays in continuation of care. Unavailability of emergency department personnel; inadequacy of examining or treatment facilities; lengthy history taking; lack of triage.

Delays in return or exchange of equipment and supplies.

Rapport

Mutual courtesy and understanding of each other's problems; efficiency of reporting by ambulance personnel; willingness to cooperate and to assist on request.

Cooperation

By emergency department personnel. Assistance in clearing way and moving victim; avoidance of delay; return or exchange of equipment; replacement of supplies; constructive criticism of inadequate or improper care rendered; credit for use of good judgment and proper care; priority of emergency department attention to life-threatening situations; periodic critiques of quality of emergency care.

By ambulance personnel. Optimal emergency care and efficient and safe transport in advance of delivery to emergency department; advance notification of arrival; identification of victims whose conditions might warrant high priority of reception and resuscitation; assistance as needed or requested; compliance with hospital regulations; rendering of reports to hospital personnel and to police, if indicated; retrieval of equipment and supplies; prompt departure from emergency department; participation in disaster drills and critiques.

Control of the Accident Scene

Immediate attention to life-threatening emergencies supersedes any action to control the scene by ambulance personnel.

Needs for control

To permit access, prompt care, extrication, protection from further hazards; clear lanes for departure.

Actions at scene

Anticipate, en route, possible hazards posed by location and type of emergency.

Prevent further accident or hazard by: precaution in parking ambulance; removal from situations threatening to lives of the victim and ambulance personnel, such as spilled gasoline or chemicals, escaping gases, downed power lines, spreading fire, flooding water; warning devices to divert traffic.

Restrain bystanders from crowding, mishandling of victim. Obtain assistance of volunteers and specify tasks.

Manage relatives by allaying hysteria; reassurance; questioning and informing away from presence of victim; prevent mishandling of victim.

Avoid assuming functions of police or other authorities when they are present. Do not permit their actions to compromise care of victim.

Rescue Procedures Applicable to Ambulance Personnel

In urban areas, when specially equipped rescue vehicles may not be readily available, and in rural areas, where such vehicles are nonexistent, or valuable time might be lost in calling from the scene of the accident for equipment, ambulance personnel must be provided such light rescue equipment as may be carried on the ambulance, and they must be trained in its proper use.

When rescue from entrapment or confinement, or removal from poles, water, or other hazardous environments may be delayed, emergency care for life-threatening conditions must be carried out to the extent that access to the victim permits. Short-distance removal from immediate hazards may be necessary before emergency care can be rendered.

Ambulance personnel should not engage in rescue procedures when qualified rescue persons are present.

Short-distance removal.

Drags; manual carries; litters, improvised or standard; backboards; chair carry; ladder rescue; rope sling.

Extrication procedures.

From vehicles; building debris; electrical lines and equipment; water; vats and tanks; caissons, tunnels, wells, and caves; heights; farm and industrial machinery; locked or blocked living or working areas.

Light rescue equipment and its use.

Lifting, prying, battering, and cutting tools for release from entrapment or for forcible entry; backboards, ropes, straps for removal; portable lighting and firefighting equipment.

Medicolegal Problems

Ambulance attendants must be thoroughly informed by appropriate local legal authorities of federal laws, state statutes, and local government ordinances regulating operation of ambulance services and communication systems and standards for personnel, vehicles, and equipment.

Operation of ambulance services

General. Levels of responsibility as apply to a local government operation, a commercial enterprise, or a voluntary organization; subsidy; liability coverage.

Vehicles. Licensure; safety inspections; use of warning devices; traffic regulation compliance and exemptions; sanitation.

Communication. Violations of FCC regulations; coordination with other networks.

Personnel standards

Qualifications for employment; training requirements; certification and licensure; liability insurance; compliance with traffic laws; acts within limits of training and ability; protection under "Good Samaritan" law; abandonment.

Vehicles and equipment

Warning devices; identification symbol; safety specifications; safety devices.

Victim Care Situations

Mentally disturbed or unruly; accompaniment of females; use of restraining devices; requirements for police escort; management of alcoholics; reporting of animal bites and disposition of animal carcass; management of attempted suicide, including search, protection of records and evidence; dying declaration; disposition of dead, including assurance

of death, authorization for movement, notification of authorities; reporting of accidents involving felonies.

Records and Reports

Adequate reporting and recordkeeping are essential duties of ambulance personnel in transferring responsibility for the victim's care to the personnel in medical facilities, in complying with the requirements of law enforcement and health departments, and in fulfilling administrative needs of the ambulance operator.

Purposes served

Further continuity of care; basis for correction of infractions; source of information for determining quality and adequacy of ambulance services; provides data for analysis of causes, types, and degrees of injuries and illnesses requiring emergency care; provides legal evidence.

Procedure

Must not take priority over victim care. Interrogate victim, relatives, bystanders; note pertinent statements of those not available later for full interrogation; collect suicide notes or related papers for legal authorities; note voluntary dying statement; search for emergency medical identification devices; safeguard weapons that may be or may have been involved in suicide or homicide.

Information desired

Medical facilities. Identification of victim; type of accident or nature of illness; location of victim when first seen; rescue measures preceding emergency care; care given at site and during transport; accidents during transport; disposition of victim's valuables.

Law. Information gained in absence of, or ancillary to needs of, officials: circumstances in suicide, homicide, or rape; animal bites; dying statements; statements of victim or others that may serve as testimony.

Health. Identification and circumstances required by coroner or medical examiner in case of death at scene or during transport; animal bites; radiation, chemical, or gas hazards.

Ambulance operator. Administrative records required by ambulance owner, including log of time intervals of accident, dispatch, arrival at scene, departure, and delivery to emergency department.

Section Three — In-Hospital Training Program

In-hospital training consists of observation, demonstration, and participation to the extent permitted by the professional staff. Instruction is designed: (1) to demonstrate the importance and benefits of optimal emergency care, efficient transport, and adequate reporting; (2) to emphasize the penalties of inadequate care or improper procedures; (3) to familiarize the student with the equipment used, staffing, operating policies, and procedures of the department; (4) to have ambulance personnel observe procedures in and develop skills in resuscitation, handling the unconscious, management of the mentally disturbed and unruly, and techniques of delivery and care of both the infant and mother; (5) to keep ambulance personnel abreast of new developments in equipment and emergency care, and (6) to have ambulance personnel engage in disaster drills.

Two consecutive hours of training are required at any one period in order to receive credit toward completion of a course in the assigned department.

Responsibility for conduct of this program should be assigned to the staff of the emergency department. Training areas include the emergency department, operating and recovery rooms, the intensive-care unit, the obstetrical department, and the psychiatric department.

Recommendations on Course of Action to Develop a Nationwide Training Program

The Committee on Emergency Medical Services recommends the following course of action toward implementation of a nationwide program for the training of ambulance personnel and other public servants responsible for the delivery of emergency care:

1. *Publication of a fully comprehensive textbook* that will fulfill requirements for the training of ambulance personnel to

the level of proficiency implied by the guidelines of this report. The text should be in such complete detail that the ambulance attendant can refer to it for answers to any questions that might arise and that it will serve as a basis for testing the knowledge and skills of candidates for certification or periodic recertification, and as a standard by those empowered to certify ambulance personnel in each state.

2. *Establishment of permanent training programs on a regional pattern* at hospitals and medical centers with personnel, equipment, and space sufficient to provide a full teaching faculty, lecture rooms, demonstration areas, hospital departments, and housing accommodations for trainees.
3. *Assignment of responsibility for conduct of training programs and certification of graduates* to a physician who would supervise a teaching faculty to include physicians, medical students, and paramedical personnel for training in specialized care procedures, certified American National Red Cross instructors for refresher training to the level of the advanced Red Cross first aid course; policemen, firemen, and experienced ambulance operators for training in emergency vehicle operation, control of the accident scene, and other duties of the attendant and driver not involving direct victim care; firemen, industrial engineers, and experienced rescue squad instructors for training in rescue procedures; attorneys and medical examiners for training in medicolegal liability; and communication experts for training in the use and maintenance of communication equipment. In addition, representatives of local government, civil defense, Red Cross, and other health-related organizations should provide instruction in coordination and cooperation with local and overlapping agencies in case of natural disasters, civil disorders, or national emergency.
4. *Appraisal of the level of proficiency of current ambulance personnel and institution of an interim program* on a nationwide basis to increase the proficiency of the untrained or partially trained to the level of the Advanced First Aid Course of the American National Red Cross, or its equivalent, and the course in cardiopulmonary resuscitation prescribed by the American Heart Association. Successful

completion of these courses should be a minimal requirement of all who now serve as ambulance personnel and as a prerequisite to the course of training recommended in this report.

5. *Implementation of a national training program.* A number of steps are necessary to the establishment of permanent regional training center programs: (1) preparation of the textbook described in Recommendation 1; (2) on completion of the textbook, testing of methods of instruction by conduct of pilot programs at selected centers; and (3) translation of experience gained through pilot programs into a formal program that prescribes the number of hours and sites of didactic and practical instruction, training aids, references, the format of an instructor's manual and of lesson plans, and methods of testing learning capacity and skills.

Meantime, statewide surveys should be initiated to determine the number of ambulance personnel and others to be trained and the number and sites of training centers required for advanced and periodic refresher courses.

The Ambulance Attendant of the Future

Although the levels of proficiency to be attained by the course of instruction recommended in this report are goals that can be reached in most areas of the country within a reasonable time, the greatest potential for the saving of life and reduction of preventable disability at the scene of accidental injury or onset of life-threatening illness will not be realized until ambulance personnel are qualified to carry out measures now applied by lay assistants in emergency departments or by medical corpsmen in combat areas. They should be qualified to carry out, independently or with guidance and supervision provided by physicians through voice communication, such procedures as the giving of medication by hypodermic or intravenous routes, transfusion, decompression of tension pneumothorax, tracheal intubation, tracheotomy or cricothyrotomy, defibrillation, mechanical external cardiac compression, and control of hemorrhage.

To attain these goals, accredited hospital training programs must be established that will produce professional ambulance attendants and emergency department assistants of the caliber

of certified x-ray, laboratory, physical therapy, and other medical technicians for whom courses of instruction are accredited by the AMA Council on Medical Education. The ambulance attendant must be fully engaged in emergency care in an established career pattern that provides attractive compensation, prestige, and recognition deserving of his services as a member of the emergency care team. If the needs for ambulance services are such that he is not fully occupied, he should be an employee of a hospital where efficiency, interest, and progress will be maintained by service as an assistant in the emergency department, intensive-care unit, operating room, or other area in which injured or acutely ill patients are treated. This situation is especially applicable in small communities and rural areas, in which ambulance calls are infrequent, but where seventy percent of fatalities from vehicle accidents occur. Where the ambulance attendant is employed by the hospital, ambulances should be stationed and dispatched from the emergency department. Regional communication facilities must be so coordinated that ambulance or helicopter services can be provided to communities without hospitals or isolated areas where proper ambulances or qualified attendants are not available.

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