physician's role in ambulance service

10-SECOND SUMMARY

Physicians are the most important element in the training of emergency medical technicians and must participate actively in this service. Only in this manner can the deficient ambulance service throughout the nation be improved.

By Roger D. White, MD
Rochester, Minnesota

As advances are made in the development of systems of delivery of emergency medical care—both across the nation and around the world—it becomes increasingly apparent that ambulance service must not, and cannot, be regarded as an isolated component of this system. Prehospital patient care should merge almost imperceptibly with that continued in the emergency department and intensive care unit; and this chain of emergency care delivery must have continuity if the patient is to receive the greatest benefit. For this reason, the physician must exercise his expertise in the whole spectrum of prehospital care delivered by ambulance personnel.

Furthermore, among physicians it is essential that anesthesiologists actively participate in emergency care since their daily medical practice is oriented around techniques and judgments of life-support. Indeed, acute, emergent, life-threatening crises of various origins—usually respiratory or circulatory or both—constitute much of the framework of their residency training and subsequent practice. Pioneers in this area include Safar, Nagel, Farrington and Hampton. Safar and associates'[1-3] contributions relate to both vehicle design and to training of personnel, while Nagel and associates[4] have been concerned with medical supervision of a metropolitan fire department rescue squad as well as more sophisticated areas such as advanced data communications systems. Farrington[5] developed some of the groundwork in safe patient extrication and transportation while Hampton,[6] working with the American College of Surgeons' Committee on Trauma, has long advocated improved ambulance service. It is the purpose of this presentation to outline briefly how a physician-anesthesiologist functions as medical advisor to a private ambulance service (Gold Cross Ambulance Service, Inc., Rochester, Minn.

TRAINING OF PERSONNEL

A personal interest in, and concern for, the development of each individual is fundamental. The rates at which paramedical personnel of diverse backgrounds can acquire both didactically presented material and skill in applied techniques vary. Individualization is necessary if all personnel are to reach comparable levels of knowledge and practical skill. Various types of training programs have been proposed recently. The evolution of the concept of a national registry for Emergency Medical Technicians-Ambulance (EMT-A) is one of the most promising developments. For our purposes, we are following Safar and associates'[3] guidelines in training, with appropriate modifications for specific local needs. Whatever training program one adopts, it should be flexible, yet comprehensive enough to qualify candidates by examination (both written and practical) for inclusion in the national registry.

Our activities include lectures on the latest techniques in certain areas. For example, we recently reviewed in detail current concepts in the care of victims of near-drowning. As a result, our emergency department manuals now include a directive to ED personnel by which the prehospital care of such patients by ambulance personnel should become a component of the ongoing respiratory intensive care. The result of this should be to provide optimal conditions for the prevention of irreversible hypoxia, the usual cause of death in these patients. In similar didactic sessions, we have reviewed topics such as shock of various origins, cardiopulmonary arrest and ventilatory derangements of both acute and chronic nature.

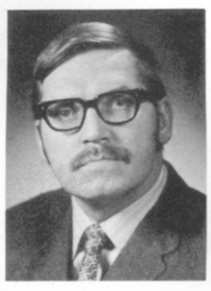
ON-THE-JOB TRAINING

Another important activity is "on-the-job" training in the operating rooms and post-anesthesia recovery rooms. Under direct guidance and supervision, our personnel are

Figure 1. Van type of ambulance. Mirror-image lettering of AMBULANCE facilitates identification of approaching vehicle via rear-view mirror.

taught life-support techniques such as airway control, signs of airway obstruction, assessment of ventilatory adequacy and inadequacy, cardiovascular monitoring techniques (including blood pressure recording, palpation of peripheral pulses, auscultation and electrocardiography) and intravenous infusion techniques. These medical technicians have the opportunity in the operating rooms to establish and maintain a patent airway and to properly ventilate a patient's lungs—an art too few ambulance personnel (and too few physicians) have mastered; an art whose neglect has resulted in the loss of innumerable lives.

The management of anesthetized patients invokes some of the principles applicable to patients first encountered by ambulance personnel. For example, prompt and continuous attention to restoration and maintenance of adequate respiration and circulation. As a cardiac anesthesiologist, I emphasize cardiac monitoring, including interpretation of the electrocardiogram. I also show them the electrocardiographic appearance of ventricular fibrillation in the cardiac operating room; and then the fibrillating heart in the open chest so that they can see for themselves what a fibrillating heart looks like, and why that quivering muscle mass cannot sustain life. In this way, the gravity of ventricular fibrillation is brought home forcefully to them.



A member of ACEP and a board-certified anesthesiologist, Dr. White is currently a consultant in anesthesiology at the Mayo Clinic and Mayo Foundation. He is a member of the American Society of Anesthesiology and the International Anesthesia Research Society, and is medical advisor to a private ambulance service.

PRACTICAL CONTRIBUTIONS

The physician who takes part in the ambulance service can make several important practical contributions. Three areas are particularly important: ambulance design, supervision of intravenous therapy and establishment of an immediate, on-the-scene cardiac care program.

Ambulance Design. Designing and equipping an ambulance are important functions of the medical advisor. Safar and his colleagues[2] have emphasized this aspect of emergency care, and we have adopted many of their suggestions. The details of mobile intensive care design have been described by them, and will not be repeated here. Our current equipment design is shown in Figures 1 to 4.

The exterior of our van-type vehicle (Dodge Sportsman chassis, R and R Industries, Inc., Minneapolis, Minn.) incorporates national recommendations including the Omaha orange and white color and mirror image lettering of "AMBULANCE" across the front (Figure 1).

The patient compartment (Figures 2 and 3) provides floor-to-ceiling headroom of 150 cm (60 inches). The attendant's seat is at the head of the cot, thus positioning him for optimal life-support care. To his left is a spacious drug cabinet with sliding plexiglas doors. To the right and immediately accessible is equipment for suctioning, ventilation, and oxygen administration. Bag-valve-mask units with oxygen reservoir (Laerdal, RFB-II) are carried in all cars. We are presently also using a 3-liter standard anesthesia bag with pressure relief valve and a clear-domed mask. This is connected to an oxygen source, and the patient is then manually ventilated with 100% oxygen.

Acquisition of skill in using this ventilating equipment is derived from experience with this unit in the hospital under our supervision. The advantages to this method are that it necessitates establishment of a good airway, it provides the trained attendant with a "feel" of the patient's lung-airway system, giving him closer command of the adequacy of his ventilating efforts and it permits ventilation with 100 percent oxygen when it is so crucially (and frequently) needed.

We are also continuing to use the standard ambulance on an automotive chassis. To date, this type of vehicle has been unequalled in riding and handling characteristics. Design features of the vehicle include headroom in the patient compartment of 135.0 cm (54 inches) and an attendant's seat at the head of the cot. (Figure 4). All of these modifications in vehicle design and equipment evolved from our professional recommendations to our ambulance personnel.

Intravenous Therapy Program. This was started early in 1971. A qualified group of ambulance personnel is now available 24 hours a day in Rochester, Minnesota, to provide emergency intravenous treatment when needed. This is done by radio command control, and is supervised by physicians at all times. One objective, unknown to ambulance personnel a few years ago, is to provide patients who have circulatory failure, or impending circulatory failure, with the benefit of intravenous fluid support otherwise delayed until arrival at the hospital. Lactated Ringer's solution is used for patients who have sustained blood loss. For patients with cardiopulmonary arrest, sodium bicarbonate solution (5%) is administered when feasible, ie, when effective ventilation and external cardiac massage can be quickly established first. In this situation, a third attendant is invaluable. An additional advantage gained by opening an intravenous route in the prehospital phase is that it provides emergency department physicians with immediate access to the circulation when the patient arrives. Thus, they can begin intravenous therapy without delay. This benefit is slowly but surely being realized and appreciated.

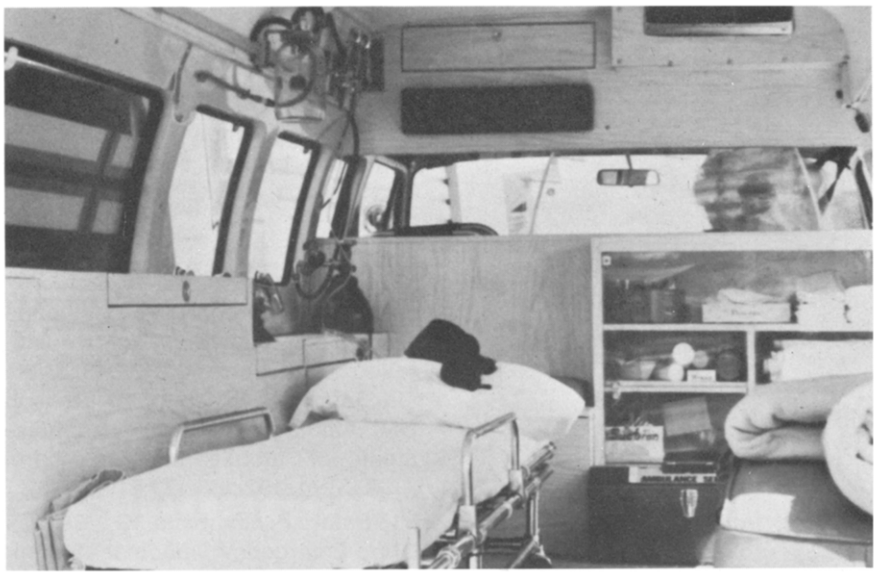


Figure 2. Interior of ambulance. Note high headroom and overall spaciousness.

Immedate Cardiac Care Program. Plans are currently underway (with Dr. Paul O'Donovan, Section of Cardiology, Mayo Clinic and Mayo Foundation) for estab-

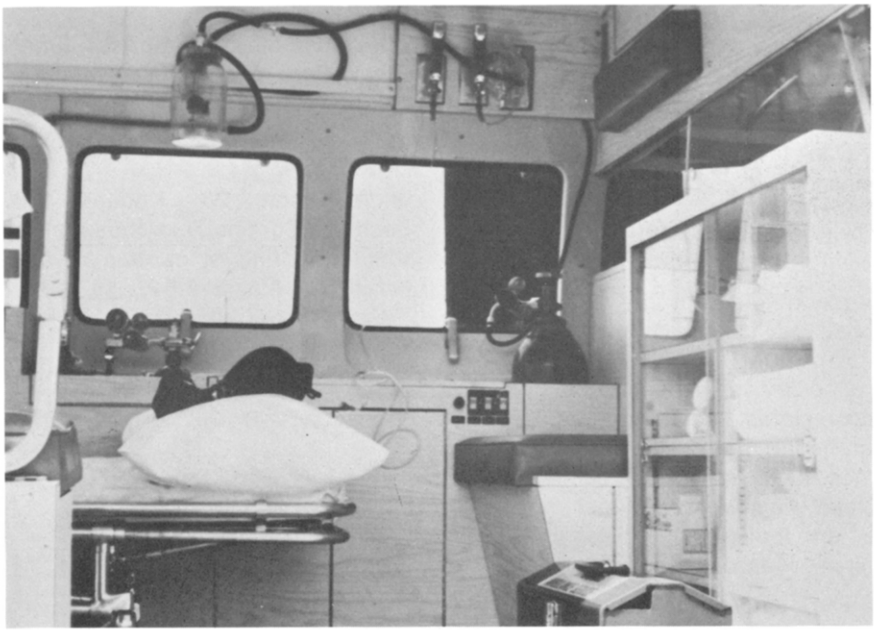


Figure 3. Interior of ambulance: attendant's area. Note positioning of attendant's seat, oxygen cylinders (one large and two small cylinders), oxygen flowmeters (one directly connected to ventilating unit), suction equipment, and medicine cabinet.

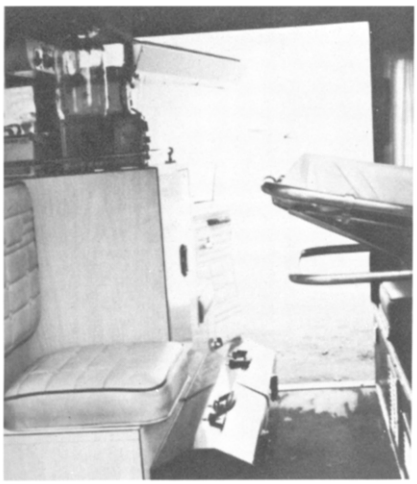


Figure 4. Interior of standard ambulance on automotive chassis. High headroom is main feature. Note attendant's seat at head of cot, suction unit, portable ECG oscilloscope and direct write on top of medicine cabinet, and floor design incorporating aisleway.

lishment of ambulance-to-hospital electrocardiographic telemetry. This will permit physician supervision of on-the-scene cardiac drug administration and defibrillation.[4,8] The value of skill in intravenous technique is self-evident here.

These varied contributions of the interested physician have thus helped to create ambulances that are in fact mobile intensive care units.

CONCLUSIONS

I believe that it is critical at the present time that the activities of these advanced paramedical technicians be supervised and controlled by physicians because in most states, including ours, specific legal directives along these lines have not been spelled out. Close liaison with legal counsel is an indispensable requisite of these kinds of activities.

The ambulance attendant can develop into a qualified Emergency Medical Technician-Ambulance only if he has the active support of an interested and qualified physician. Advancement of the level of care rendered by these personnel in the prehospital phase depends entirely on the extent to which we as physicians involve ourselves in their training. One approach, tailored and modified to local needs, is described in this article. □

BIBLIOGRAPHY

1. Safar P, Brose RA: Ambulance design and equipment for resuscitation. *Arch Surg* 90:343-348, 1965.

2. Safar P, Esposito G, Benson DM: Ambulance design and equipment for mobile intensive care. *Arch Surg* 102:163-171, 1971.

3. Safar P, Esposito G, Benson DM: Emergency medical technicians as allied health professionals. *Anesth Analg* 51:27-34, 1972.

4. Nagel EL, et al: Telemetry-medical command in coronary and other mobile emergency care systems. *JAMA* 214:332-338, 1970.

5. Farrington JD: Transportation of the injured. *Postgrad Med* 48:-139-144, 1970.

6. Hampton OP Jr: Present status of ambulance service in the United States. *Bull Am Coll Surg* 50:177-179, 1965.

7. Committee on Injuries: *Emergency Care and Transportation of the Sick and Injured.* Chicago, American Academy of Orthopaedic Surgeons, 1971, p 226.

8. Anderson GJ, Knoebel SB, Fisch C: Continous prehospitalization monitoring of cardiac rhythm. *Am Heart J* 82:642-646, 1971.

ACKNOWLEDGEMENT

The on-going support and sincere interest of Edward P. Didier, MD, Department of Anesthesiology, and the assistance of Gold Cross Ambulance Service, Inc., John R. Perkins, director, in preparation of the photographs is gratefully acknowledged.

For reprints of this acticle write Dr. White at the Section of Publications, Mayo Clinic, Rochester, Minn 55901.

CRISIS *From Page 28*

to handle medical data, to monitor patients on a wide scale, to disseminate new medical advances quickly and efficiently and to evaluate what man is doing outside the hospital (particularly to his environment) are still struggling through the nineteenth century and have had little exposure to twentieth century technology. It is imperative that medical planners and the health industry not become so engrossed in leaving the nineteenth century and belatedly entering the twentieth that they overlook the fact that the twenty-first century is less than three decades away. □

For reprints of this article write Dr. Looney at the LAC/USC Medical Center, 1200 N State St, Los Angeles, Calif 90033.

SECTION RESOLUTION

Your support is needed for the resolution to establish a Section on Emergency Medicine which will be considered at the AMA House of Delegates meeting November 26-29. For additional details, see page 55.