

*Ambulance service is one element of medical care which has not received the attention it deserves. There is a clear public interest at stake in this service and the author discusses the various phases of the problem, with emphasis on the role of the public health agency in the provision of ambulance and emergency care services.*

## **AMBULANCES AND EMERGENCY MEDICAL CARE**

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**T**HE availability of effective emergency medical care and of safe and expeditious transportation to the nearest capable physician or hospital for definitive treatment is an absolute necessity for every citizen. Anything less than this could effectively cancel out for the patient the great technical strides we have made in definitive surgical and medical treatment. No intelligent discussion about the serious epidemic of motor vehicle accidents we are experiencing, and what public health administrators should do about it, can take place without some recognition of the community need for these emergency care and transportation services. As with so many things in public health practice, however, it is extremely important to approach the provision of ambulance services and adequate emergency care with a certain humility, curiosity, and concern to determine what problems there are, if any; what is being done about them and who is doing it, if anything; and what might be done further, if it seems appropriate.

### **Areas of Study**

Since the subject is a very broad one, it will not be possible in this brief space for me to examine in depth the

many detailed facets of the problem. I would like, however, to discuss with you five general subject areas:

1. The kinds of injuries and illnesses which require ambulance transportation and emergency care and the general need for more epidemiologic information.
2. The present general pattern of ambulance and emergency service organizations and something of their numbers, characteristics, and distribution.
3. The geographic and logistic problems which underlie the adequate provision of emergency care and ambulance transportation which are intimately related to subsequent solutions.
4. The economic problem which underlies the provision of these services, a problem which seems particularly serious to private operators, but which indeed must be resolved.
5. Suggestions as to the role of the public health agency in helping to see to it that the community has available adequate emergency medical care services, including good ambulance transportation.

In order for us to examine existing services to determine their quality and if any inadequacies exist, we must first examine what kinds of injuries and illnesses there are which require emergency care and transportation by ambulance companies. There have been very few detailed studies of this sort, even though vast amounts of data are available in the office files of responsible ambulance companies across the coun-

try. We are just now beginning to identify the number, type, and severity of those accidental injuries and other emergency situations which have occurred and to relate them to community needs.

Such a detailed research study is presently being concluded in San Francisco by the Division of Accident Prevention of the U. S. Public Health Service. Also, a preliminary look at some of this information in Seattle in 1958<sup>1</sup> revealed the types of calls and found, for example, that 10 per cent were due to nervous diseases, 11 per cent to alcoholism, and 32 per cent to traffic accidents. Some runs had been charged to heart conditions, suffocations, and suicides, but a startling 25 per cent remained which was due to unknown causes. No information was reported in this study, however, on types or severity of injury when due to a traffic accident.

A study<sup>2</sup> carried out by our unit during the summer of 1963 compared urban and rural traffic fatalities with particular regard to the precise areas of the body injured and the degree of injury, and then placed them on a gross prognostic scale of salvageability, based on clinical experience. For example, death from external hemorrhage was considered as probably salvageable, while that from brain laceration was considered probably not salvageable. Autopsy records were not systematically available in this study, but could be in similar future studies. We are presently embarking upon a more extensive study of the same type to identify varying patterns of ambulance services and their workloads in California.

Another recent study<sup>3</sup> over a six-month period for the purpose of determining the value and hazards of speeding ambulances showed us the specific medical conditions which ambulance drivers felt were critical for speed, compared with a subsequent evaluation by the attending physician.

Far too few such studies have been done, and most of our information on the effectiveness of services and equipment to meet the patients' problems has only been educated guesses. We actually do not know enough yet to clearly identify what problems there are and precisely where.

### Types of Organizations

Recognizing that basic epidemiologic data are essential information, we may next look into the second area of interest, the present pattern of existing ambulance and emergency care organizations. Who are the people now handling the problem; where are they located; how are their organizations run; what kind of training and equipment are provided? The report<sup>4</sup> by Dr. O. P. Hampton, Jr., for the Subcommittee for Transportation of the Injured is a particularly interesting study of ambulances and operations, and is to be commended.

There are five general patterns of ambulance unit ownership and organization. The first of these is the private company operated for profit. In California, over half of the approximately 450 units are so established. Nationally, morticians more frequently operate ambulances than any other group. This has not been the case in recent years in California where there has been a decreasing trend of mortician ownership. Across the nation, generally, there is an inverse relationship between the community size and the proportion of ambulance services provided by morticians.

The private voluntary organization is the second major type of ambulance service and is, in fact, probably the oldest, beginning with the medieval misericordia units in Italy. In small communities, volunteer firemen, service clubs, and other groups have attempted to fill a pressing community need.

The third type of organization is the private ambulance service attached to an industry. Certain industries, usually large ones, which have high injury risks or are geographically isolated, frequently provide ambulances for their own personnel. Lumber companies are a fairly typical example. Electric utility companies sometimes have available cardiac defibrillators with especially trained crews who can use them. In some communities, arrangements have been made for the company ambulance to answer community emergencies.

The fourth type of organization is the hospital-based ambulance service, and this is probably the one most familiar—at least in recollection—to health officers and practicing physicians, for many of us rode these ambulances as interns or residents. This pattern is becoming rare now, probably because of the shortages of house staff and the greater need for the staff within the hospital as the end result of the technological revolution in medicine. The emergency room is now more commonly the first contact by the medical staff with the injured or acutely ill patient.

The fifth category of organization is the public ambulance service, usually municipally operated. About 15 per cent of the ambulance organizations in California are run by a unit of government, an example being the service located in the City and County of San Francisco, where it is attached to the Department of Public Health. Many municipal ambulance services are operated by the police department, and I wish to point out the great interest in this field on the part of the police, particularly the highway officers. An interesting paper<sup>5</sup> on this subject was given by Sergeant Burke of the Pomona, Calif., Police Department. In many communities, the responsibility for resuscitation and respirator services rests with the fire department, however else the remaining emergency care and

transportation services may be organized.

To summarize briefly, then, throughout the United States there are several thousand ambulance organizations. The best-equipped and staffed units are generally found in the larger metropolitan areas. Rural areas and small communities are usually poorly served, if at all, by such services.

### Ambulance Services Evaluated

Closely related to the availability and distribution of ambulance services are the kinds of ambulance personnel, their characteristics and training, and the necessary kinds of equipment. Of all the personnel problems confronting ambulance operators, recruitment holds a high priority since wages are exceedingly low and the hours are long. Turnover of personnel as a result is high among private operators, but is less so in publicly operated services where civil service systems assure more substantial salaries and encourage continuity of employment.

The background and training of ambulance personnel rarely assure the operator that appropriate skills and attitudes will be brought to the job. Those who have previously had some police or fire experience may have a better general background in first aid and the handling of emergencies than someone hired directly off the street. Men who have received first-aid or corpsmen training in one of the armed services may find their way into ambulance work. But persons with such backgrounds are not numerous.

The holding of a standard first-aid certificate from the Red Cross or its equivalent is the minimum qualification an ambulance driver or attendant should have. In California an advanced certificate from the Red Cross or U. S. Bureau of Mines has been required unless, of course, the attendant is a physician or registered nurse. Since the ad-

vanced first-aid course was designed for the general population, it is obvious that special requirements of ambulance transport and attendant emergency care may not be met. The course is deficient in several areas including obstetric problems, mechanisms of extrication from a demolished vehicle, caring for those with severe trauma over several hours, and emergency communications procedures.

Many individuals, groups, and agencies have been concerned with training in first aid for ambulance personnel, and outlines of courses, standard textbooks, and other material are available from a number of places.<sup>6-10</sup>

The California Ambulance Association has established a pilot program for driver training with the Los Angeles County Civil Service Commission to deal with the handling of emergency vehicles under adverse and unusual circumstances. Similar additional programs are very much needed since driving these vehicles requires special understanding and skills.

The paucity of available ambulance personnel, both attendants and operators, on the job has been a serious personnel problem. A solo operator cannot become sick or be absent from his area of operation. A single man in an ambulance obviously cannot handle many, if not most, emergency situations with which he may be confronted. But both situations exist too frequently.

Let us look briefly next into the problems of adequate equipment. This is where too many begin their thinking about ambulance operations. The vehicle itself; its necessary array of splints, bandages, oxygen, and so on; the appropriate rescue apparatus; and numbers and kinds of stretchers constitute a large investment. The evaluation of the equipment in terms of physiologic need, i.e., what piece can best meet what need, has often been done poorly. The vehicles themselves, which may cost

from \$5,000 up to \$15,000, have not been designed with the studied requirements of the patient's transportation specifically in mind—as you would know if you have tried to place an injured person in one, or have had to carry more than one emergency case at a time. Minimum lists<sup>6,8,9,11</sup> of equipment are available which I shall not go into here.

### Logistic Problems

This brings us to the third general area of concern, namely, the geographic and logistic problems which underlie the provision of adequate emergency care and transportation. Unlike most other health problems which are generally localized in direct relation to fixed populations, by their very nature traffic accidents may occur anywhere and frequently do occur in remote areas or areas of low population density and services. Our study of urban and rural traffic fatalities to which I have already referred<sup>2</sup> showed that one and one-half times as many people were injured per 1,000 population in traffic accidents in rural counties (under 50,000 population) as contrasted with urban counties (over 500,000 population), and that people injured in rural counties were almost four times as likely to die of their injuries as those injured in urban counties. These findings were noted despite the fact that accidents occurring in rural areas tended to be single vehicle accidents which resulted in less severe injuries, while those in urban areas tended to be multiple vehicle accidents resulting in more serious injuries.

In some instances, we have learned of accidents in which it required three hours to get the injured persons to the nearest hospital. One such accident, occurring as it did in a hot desert area, added the problem of dehydration and overheating to those associated with multiple trauma and blood loss. Often the extrication of the injured person

from a wrecked automobile requires much greater skill and equipment due to irregular terrain and lack of urban facilities when the wreck is found in remote rural areas, if it is found. Immediately one begins to ask the question as to what happens when a heavily traveled highway goes through a remote county? A case in point is that of Mariposa County, Calif., with a 1961 population of 5,200 persons and with one of the main highways leading to Yosemite National Park, part of which occupies the eastern third of the county. This county had a traffic fatality rate of 2.30 per 1,000 population as contrasted with a rate of 0.09 per 1,000 in Los Angeles with a 1961 population of 6,238,000, a difference in fatality rates which was 25 times.<sup>12</sup>

### Economic Barriers

Our fourth general subject area is that related to the economics of providing emergency care and ambulance services. Those of you who are familiar with nursing homes will know some of the kinds of problems encountered by ambulance operators who are in a health-related business for profit, a business not previously regulated. These operators may resist meeting standards which might be costly, but at the same time have a sincere interest in providing good care to the patients they carry.

Since only the minority of ambulances are publicly operated, patterns of financial arrangements become particularly important. Despite the many papers which have criticized the poor quality of ambulance services, it is important to realize that just existing as an ambulance operation can become an overriding consideration. Actually, if providing ambulance services does not prove to be economically feasible, not only will there be poor service, but there may be none at all.

Methods of fee charging and fee collection I will not discuss in detail, but Caldwell<sup>13</sup> found in his study that payment for nonaccident services was forthcoming in 77 per cent of cases, but only 48 per cent of those services associated with accidents were paid. This is also true in California. The greatest economic problem is found in isolated rural areas, the same areas where payment for such services would be most difficult to collect, in the event of an accident.

There are a number of subscription programs of payment which will be interesting to watch; you may have some in your community. In California, about a dozen ambulance companies have set up prepaid service programs. Trial and error has served as the basis for fee setting, as there are no relevant actuarial data.

The greatest resistance we have encountered in the registration and licensure program in California for ambulance companies has come from the marginal operators, particularly of the voluntary type, who insist they simply cannot maintain minimum standards—including the provision of at least two attendants on an ambulance—and maintain economic solvency.

I cannot overstate the importance attached to these economic problems. Many ambulance operators are so caught up in them that they may lose sight of their broader goals. In a recent issue of AID—"Journal of the Ambulance Association of America,"<sup>14</sup> the manager of an Idaho company stated:

"In AID, we continually read articles written by doctors who have all kinds of ideas of what an ambulance should be and how the service should be operated. This, in our opinion, is not what the Ambulance Association of America was originated for. Rather, it should stress problems that are a daily hazard of every ambulance operator, mainly collections, emergency room ethics, equipment costs and general operation so that the operator can serve his community at a profit and

give the type of service to which the general public is entitled.

"One of the really important problems to all ambulance owners is the matter of collecting for work done."

The economic problems can be summarized briefly by noting that rural ambulance finances are hampered by there being too few patients or population at risk to support even one ambulance, and that urban ambulance finances are a problem frequently because there may be too many companies in competition to provide any single one with an adequate economic base of operation. Add to this the additional burden and economic waste inherent in excessively frequent turnover of personnel which is due primarily to very low wages, but which then leads to further costs for constant rehiring and retraining of ambulance personnel.

### **Role of the Public Health Agency**

Let us now consider the fifth and last general area: What is the role of the public health agency in the study and provision of ambulance and emergency care services? Listed below are eight points which deserve attention:

1. Let me stress again the seriously needed epidemiologic skills uniquely available in the public health agency. Even without generating new data, the appropriate use of existing ambulance records, the careful collection of information about ambulance runs and services will greatly increase our knowledge of precisely what kinds of injuries and illnesses require emergency care and transportation, where the gaps are, and where to direct our action.

2. Avoid premature judgments with regard to the type of ambulance and emergency care service you will support. Evaluate carefully the advantages of the privately operated as well as publicly operated services. Become familiar with the Ambulance Association of

America and learn whether the ambulance companies in your area are members. Understand the values of the private ambulance service, but at the same time recognize its limitations and inherent problems. Learn more about publicly operated ambulance systems and identify their strengths and weaknesses.

3. The setting of standards and the writing and passing of regulations may come to be one of your important responsibilities, but do not start with a preconceived code or set of regulations. A great deal of preparation, including the effective involvement of those to be regulated, must precede enactment of regulations. Incidentally, the Ambulance Association of America supports intelligent standards as an appropriate means of upgrading ambulance services. Many regulations are available for study, and I would suggest only two: (a) the Model Ordinance Regulating Ambulance Services, prepared by three national groups,<sup>15</sup> and (b) those to which I have already referred,<sup>11</sup> prepared by the California Highway Patrol with the assistance of the California Department of Public Health, even though the latter regulations are deficient in requiring only one man on an ambulance. The question has been asked if, indeed, even two men on an ambulance are sufficient.<sup>16</sup>

4. Since rural and isolated areas will be in serious difficulty attempting to meet even minimum ambulance standards, economic subsidies will have to be considered early. In urban areas, contracts with private ambulance companies for the care and transport of the wards of the local government, such as social welfare cases, often provide for economic subsidy. Some people do not like the term "subsidy" or what it represents, but it is becoming ever clearer that it is to the selfish interest of urban dwellers to assist in the support of rural ambulance and emergency med-

ical care services where injuries may subsequently occur in a recreation or traffic accident. It is interesting to note in passing that communities have accepted the underwriting of the initial costs of the community hospital, private or voluntary, but they have not generally provided similar support to its essential auxiliary, the ambulance service.

5. The police are very much interested in effective ambulance services. In traffic accidents, the highway police frequently precede the ambulance to the scene. Police training programs in first aid and the handling of emergency medical conditions are an example of this. Any public health agency contemplating action in this field should work closely with the police department at all times.

6. Equipment and supplies are extremely important, and it is essential that the public health agency be familiar with what is needed, what is available, what is a luxury, and what is junk. Health personnel, particularly public health physicians and nurses, are particularly suited to assist in evaluating equipment lists. If the health agency has an adequate occupational health program, the knowledge of equipment and supplies will certainly be available in the agency.

7. There are many existing training programs in emergency medical care or first aid provided by local medical societies, ambulance operators, police departments, hospitals, and the Red Cross. The public health agency could best assist these training endeavors by evaluating what is available, where the needs are, what should be taught, and to act as a catalyst and coordinator for the community in training. If the ambulance services are encountering rapid turnover, regularly occurring training classes provided through the health agency may be necessary.

8. The last suggestion, and perhaps the most important, is the assistance the

public health agency can provide to the medical community and to the hospitals in helping them recognize, measure, and resolve the problems of emergency medical care services and transportation. In most communities the public health administrator will find receptive and interested surgeons who, through the American College of Surgeons' Trauma Committees, have become very much aware that action is needed. Here, indeed, is a program where clinical and public health interests interrelate. It is one in which there is a distinct need to coordinate emergency medical services of all kinds and in all locations in the community, not just in relation to the ambulance.

In conclusion, I wish to encourage interest in this seriously overlooked part of medical care, a part which is primarily privately operated at present, but where there is a clear public interest at stake. Through appropriate action by the public health agency brought to bear in nonthreatening ways, rapid strides can take place to improve the ambulance and emergency medical care services available to our people.

#### REFERENCES

1. Lehman, S. P., and Hollingsworth, K. H. Ambulance Service in Seattle. *Pub. Health Rep.* 75,2:343-351 (Apr.), 1960.
2. Waller, Julian A.; Curran, Robert; and Noyes, Frank. Urban and Rural Traffic Fatalities in California. *California Med.* (Oct.), 1964, pp. 272-276.
3. West, Irma; Kleinman, Goldy; Taylor, E. B.; Majors, A.; and Mitchell, Howard W. Speeding Ambulance Survey—A Preliminary Report. *AID—Journal of the Ambulance Association of America* (Sept.-Oct.), 1964.
4. Hampton, Oscar P., Jr. Transportation of the Injured, A Report. *American College of Surgeons Bull.* (Jan.-Feb.), 1960, pp. 1-5.
5. Burke, Donald P. The Police and the Ambulance. (Unpublished paper presented February 12, 1963.)
6. Safety Education Section, First Aid Manual. Olympia, Wash.: Department of Labor and Industries (Sept.), 1963.
7. The American National Red Cross. *First Aid Textbook*. Garden City, N. Y.: Doubleday (4th ed.), 1957 (or later).
8. Flint, Thomas, Jr. *Emergency Treatment and Management* (2nd ed.). Philadelphia, Pa.: Saunders, 1958.
9. Bureau of Naval Personnel. *Standard First Aid Training Course*. Gov. Ptg. Office (NAVPERS 100181-A) (revised), 1962.

10. Ohio Trade and Industrial Education Service. Emergency Rescue Squad Manual. Columbus, Ohio: Division of Vocational Education, State Department of Education, 1962.
11. California Highway Patrol. Regulation of Equipment and Ambulances. Ref. 3:81:18. Sacramento, Calif.: Department of the California Highway Patrol (Sept. 4), 1962.
12. Curran, Bob, and Noyes, Frank R. A Comparison of Urban and Rural Traffic Fatalities. (Unpublished Summer Project Rep.) (Aug.), 1963.
13. Caldwell, L. A. Ambulance Services and Traffic Casualties. *Med. Rev.* (Mar.), 1961, pp. 172-182.
14. Letter to the Editor. *AID—Journal of the Ambulance Association of America* (Sept.-Oct.), 1964, p. 5.
15. A Model Ordinance Regulating Ambulance Services. Prepared as a Joint Action Program of American College of Surgeons, American Association for the Surgery of Trauma, and the National Safety Council (Apr. 3), 1963. (Available in reproduced form from the USPHS Division of Accident Prevention.)
16. Letter to the Editor. *Ambulance Crews: Are Two Pairs of Hands Enough?* *M. Officer* 110,25:383 (Dec. 20), 1963.

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## Pest Control Symposium Announced

The National Academy of Sciences—National Research Council will sponsor a public symposium on Scientific Aspects of Pest Control, January 31-February 3, 1966, in Washington, D. C.

The symposium program is intended to provide a comprehensive review of the present status of pest control in modern life. It will encompass the methods of pest control—biological, chemical, and genetic—presently in use, their development and regulation, and the multiplicity of ways in which pest control measures interact with the physical environment, with plant and animal life, and with man. Special emphasis will be given to the advances, problems, and future needs in pest control research.

Attendance will be open to persons involved in every aspect of pest control, including scientists from federal and state agencies, colleges and universities, and industrial organizations, as well as conservation specialists, legislators, administrators, regulatory personnel, and interested laymen.

The U. S. Department of Agriculture, acting on behalf of the Department of Health, Education, and Welfare, Department of Interior, and other interested agencies of the federal government, requested the National Academy of Sciences—National Research Council to conduct the four-day program, which will be held in the auditorium of the Department of State.

A registration fee of \$5 has been set to cover the cost of the published proceedings of the symposium. For further information write: Agricultural Board, NAS-NRC, 2101 Constitution Avenue, N.W., Washington, D. C. 20418.