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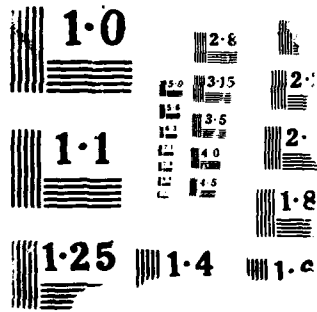
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AN EVALUATION OF
AMBULANCE SERVICES
AT THE
NAVAL REGIONAL MEDICAL CENTER
CHARLESTON, SOUTH CAROLINA

A Problem Solving Project
Submitted to the Faculty of
Baylor University
In Partial Fulfillment of the
Requirements for the Degree
of
Master of Hospital Administration

by

Lieutenant Commander Norman J. Barber, MSC, USN

August 1980

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I. INTRODUCTION

This paper presents an analysis of the current ambulance service provided by the Naval Regional Medical Center (NRMC), and formulates recommendations for improvements to the pre-hospital care system's structure and operation. In this section, conditions which prompted this study are described, a problem statement is presented, constraints and limitations on the analysis are delineated, applicable standards are identified, and the research methodologies are discussed.

Conditions Prompting the Study

Although the preponderance of ambulance runs appear to be executed in a rapid and professional manner, recently identified discrepancies may indicate the presence of potentially unsafe conditions. Specifically, some confusion has been encountered regarding ambulance dispatching policies and responsibilities. Ambulance response has been delayed, on occasion, by the dispatcher's: failure to obtain sufficient information regarding the patients location and complaint, confusion regarding the patient eligibility for services, and misinterpretation of dispatching procedures. Other delays have occurred because of the driver's unfamiliarity with: the geographic area, ambulance operation, and requirements for remaining available to the dispatcher.

Formalized programs to indoctrinate ambulance attendants and drivers are only in the rudimentary stages of development. It is possible for an attendant to possess only basic Hospital Corps School training with no practical experience in the management of medical emergencies. Further-

more, personnel assigned as drivers are often non-medical enlisted personnel who have not been trained in emergency vehicle operation and cardiopulmonary resuscitation techniques. It is noteworthy that there have been five traffic accidents involving Medical Center ambulances within a six month period.

Another example of the potential for problems within the program was identified by the Command Safety Officer. Safety inspections of ambulances disclosed the presence of sharp and blunt projecting objects in patient compartments, inadequately secured oxygen cylinders, non-securable patient litters, and other potentially hazardous conditions.

Preliminary investigation led to the opinion that many system problems were the result of ill-defined and uncoordinated policies and operating procedures. A lack of consensus regarding the scope and purpose of the ambulance program at the Medical Center has hampered several attempts at improvement over the past several months. Efforts to revise and promulgate written policies and procedures have repeatedly met with failure. Responsibility for the program seems to be split between the Chiefs of Ambulatory Care and Operating Management Services, the Head of the Emergency Room, the Director of Clinical Services, and the Director of Administrative Services. Although each of these officials have some responsibility for the system's operation, no one of them appears to be able to unilaterally affect constructive system change. The predominant reason for this lack of central authority appears to be a byproduct of divergent expectations regarding the mission and scope of the program. Expectations appear to range from providing ambulance

service for only active duty personnel on military reservations, to providing services for all beneficiaries throughout the greater Charleston area; and from providing only routine transportation services between area hospitals and acromedical evacuation flights, to providing sophisticated and comprehensive on the scene medical services.

Problem Statement

The problem was to determine the appropriate configuration for the hospital based ambulance service at the Naval Regional Medical Center, Charleston, South Carolina. The appropriate configuration is that which balances medical benefits, available resources, and customer expectations; and which specifies:

- The scope of services to be provided: defined by medical, administrative, and geographic boundaries.
- The number and locations of ambulances required to adequately support the program.
- The equipment and supplies necessary for effective mission performance.
- The personnel necessary to effectively execute mission requirements.
- The training programs required to achieve and maintain the competence of assigned personnel.

Constraints and Limitations

The study was constrained by guidelines provided by the Director of Administrative Services, and limited by the paucity of required historical data.

Constraints

Funding and staffing restrictions indicate that additional resource expenditures must (at least in the near term) be minimized. However, the ambulance program must at least provide emergency services support for active duty and civil service personnel onboard the Naval Base and Weapons Station. Additionally, provisions must be made to ensure that ambulance response times do not exceed 15 minutes; and that the program will successfully service requests satisfying system parameters 100 percent of the time at the Medical Center and 90 to 95 percent of the time at the Weapons Station.

Limitations

Accurate historical records of ambulance service were found to be incomplete. Ambulance Dispatch Data Cards and Ambulance Service Reports have not been completed for many runs. Attempts were made to reconstruct ambulance demand information from command duty logs; however, the paucity of standardized comprehensive data has significantly hampered accurate analysis of program operations. Whenever considered reasonable (and when indicated), the assumption was made that, although incomplete, sufficient data has been obtained to provide a reasonably accurate representation of true events. To the degree that these assumptions are false, conclusions drawn from the data may be inappropriate.

Applicable Standards

The appropriateness of ambulance service policies, procedures, and practices should be measured against standards developed by the Depart-

ment of Defense, Department of Transportation, and the American College of Surgeons. Additionally, since prehospital care activities should be viewed as an intricate component of the emergency medical services system,¹ the Joint Commission on the Accreditation of Hospitals Emergency Services standards should also be applied to the ambulance program where applicable. Appropriate excerpts from these standards are provided as Appendix A to facilitate discussion.

Research Methodology

Several methodologies were used to collect, record, and evaluate data regarding the current ambulance program and appropriate policies for improving its performance. First, appropriate Department of Defense, Governmental, professional, and managerial literature was reviewed and various factors influencing system performance were identified. Next, personal discussions were conducted with pertinent military and civilian officials, and the function and scope of current Medical Center and area ambulance services were identified.

Finally, available ambulance program records (Ambulance Service Reports, Training Records, Safety Inspections, Ambulance Dispatch Data Cards, and so forth) were examined and found to be incomplete and inadequate. With the assistance of Operating Management Service personnel, an attempt was made to reconstruct pertinent historical records for a twelve month period. This data forms the basis of much of the current system analysis.

Footnotes

1

Peter Rosen et al., "Prehospital Care: An Integrated Concept of Emergency Medicine," Topics in Emergency Medicine 1 (January 1980): 19-26; James O. Page, "Medical-Legal Considerations in Prehospital Care," Topics in Emergency Medicine 1 (January 1980): 55-59; Ronald D. Stewart, "Prehospital Care -- Education, Evaluation and Medical Control", Topics in Emergency Medicine 1 (January 1980): 67-82; Martin D. Keller and William R. Gemma, "Planning Community Emergency Health Care Services: Fitting Together the Fragments," in Emergency Medical Services, ed. John H. Nobles (New York: Behavioral Publications, 1973), pp. 561-76; "Emergency Medicine: How far has it Come, Where is it Going?", Medical World News, 20 March 1978, pp. 65+.

II. AMBULANCE SERVICES

This section presents an evaluation of the current ambulance program at the Naval Regional Medical Center, and a description of other area ambulance services.

The Current Program

The current program provides transportation and prehospital care as an extension of Level I emergency medical services at the Naval Regional Medical Center. Medical care delivery within the program is managed by the Emergency Room Branch of the Ambulatory Care Service, and coordinated by the Director of Clinical Services. Vehicle maintenance and operations are managed through the Transportation Branch of the Operating Management Service, and coordinated by the Director of Administrative Services.

Ambulances

The ambulance fleet is comprised of one Type I and seven Type II vehicles² stationed at medical facilities in the Charleston area: four at the Medical Center, two at the Weapons Station Branch Clinic, and one at the Naval Station Branch Clinic on the Naval Base. Of the ambulances at the Medical Center, one is maintained for primary use, one is maintained as a secondary unit for the Medical Center, one is maintained as a secondary unit for the system, and one is used exclusively for the transportation of essentially stable patients between acromedical evacuation flights and the Medical Center. Of the two ambulances at the Weapons Station, one is maintained for primary use, and the other

(the Type I, or "Crackerbox") is maintained in reserve for secondary use. The one ambulance located at the Naval Station Branch Clinic is maintained as a primary ambulance for emergency runs on the Naval Base.

Workload Analysis

The absence of a significant proportion of Ambulance Service Reports and Ambulance Dispatch Data Cards (compared with the number of runs documented in Command Logs) limited the availability of information essential for program analysis. In an attempt to overcome this lack of historical data, with the assistance of Operating Management Service personnel, information concerning ambulance runs recorded in Official Command Logs was gathered and analyzed. Such information included: the ambulance run's date of occurrence, time of dispatch, and time of return to the medical facility; the patients' location, beneficiary status, diagnosis, and disposition; and the rates of the attendant and driver. Additionally, insufficient clinical data was available to accurately determine the validity of a significant proportion of ambulance service requests. In an attempt to provide useful information regarding current programs use, assumptions were made to allow the categorization of patients by the severity of their condition. In so doing, treatment definitions adopted by the American Hospital Association³ were employed, i.e., emergent, urgent, and nonurgent. A definition for nonurgent, but necessary, ambulance services for the movement of patients was also necessary. Although the below assumptions may not apply in every case, it is the opinion of the author that sufficient conformance is present to provide a conceptual picture of current usage sufficiently accurate to form a basis for effective decision-making.

Emergent, -- An "emergent" condition requires immediate medical attention since a delay in treatment could be harmful. Such disorders are acute and potentially life threatening. The assumption was made that ambulance service requests which resulted in patient admission to a medical facility were "emergent".

Urgent, -- An "urgent" condition requires medical attention within a few hours and may present a danger to the patient if not attended. Such disorders are acute but not necessarily severe. The assumption was made that ambulance service requests which resulted in the patient being treated and released were "urgent".

Nonurgent, -- A "nonurgent" condition does not require the resources of an emergency service. Such disorders are minor or nonacute. The assumption was made that requests for ambulance service for which the patient was not transported to a medical facility were "nonurgent".

Transportation, -- Ambulance runs which were exclusively for the movement of patients between the Medical Center and area hospitals or acromedical evacuation flights were defined as "transportation".

Workload Findings

During the period from 1 April 1979 to 31 March 1980, there were a total of 1,215 ambulance runs documented. Figures 1,2, and 3 represent the distribution of these runs by type, patient status, and point of origin respectfully. Table 1 presents an Ambulance Use Matrix which indicates the total number of ambulance service runs by point of origin and patient status. Further information on the current system is provided in Appendix B to facilitate discussion.

TABLE 1

AMBULANCE USE MATRIX

	TOTAL RUNS	FROM NAVAL BASE	FROM WEAPONS STATION	FROM OFF STATION	TRANS. OF PATIENTS	OTHER	MONTHLY AVERAGES
ACTIVE DUTY PATIENTS	390	188	34	93	73	2	32.5
RETIRED PATIENTS	210	11	2	40	157	0	17.5
DEPENDENT PATIENTS	385	17	31	133	204	0	32.1
CIVIL SERVICE EMPLOYEES	74	58	3	1	10	2	6.2
CIVILIAN HUMANITARIAN PATIENTS	64	5	1	9	49	0	5.3
UNKNOWN STATUS	92	11	2	11	68	0	7.7
TOTALS	1215	290	73	287	561	4	101.3
MONTHLY AVERAGES	101.3	24.2	6.1	23.9	46.8	0.3	

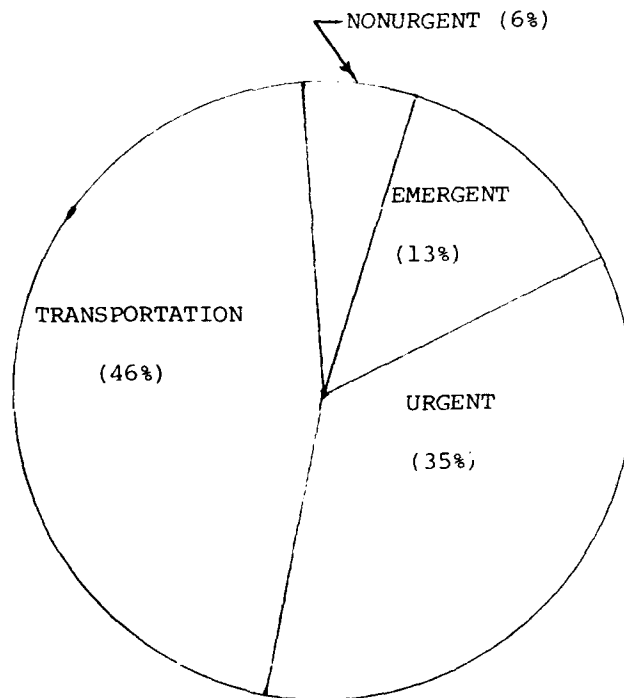


Fig 1. Distribution of Ambulance Runs by Type

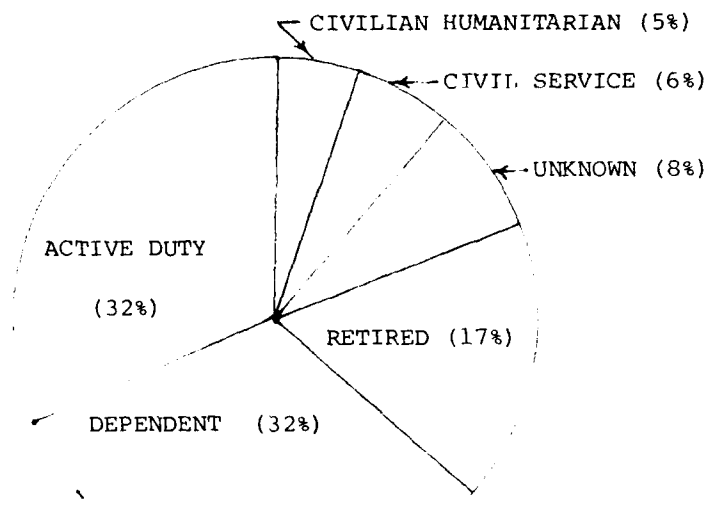


Fig 2. Distribution of Ambulance Runs by Patient Status

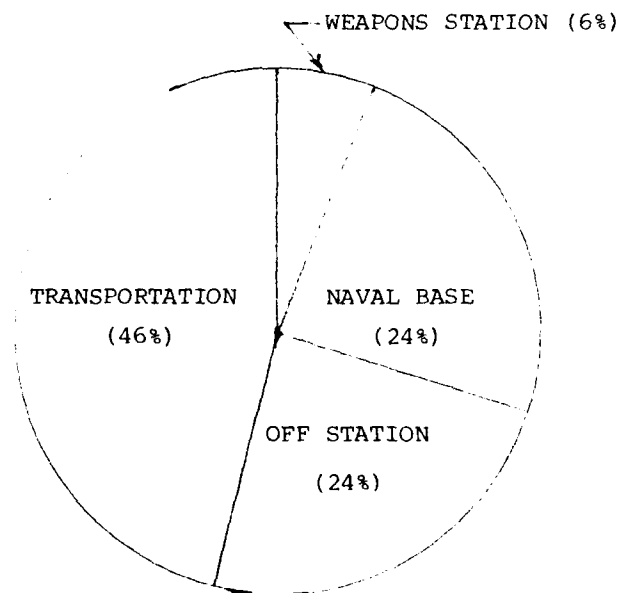


Fig 3. Distribution of Ambulance Runs by Point of Origin

Evaluation of the Current Program

The current ambulance program has been evaluated against the criteria proposed by the Director of Administrative Services and the standards established by various agencies as described in appendix A. Specific findings of this evaluation are as follows:

Areas of Compliance

Ambulances, -- The current program is in substantial compliance with all of the indicated standards. Some difficulty has been reported with the air conditioning and electrical systems in two of the ambulances; however, action has been initiated by Operating Management Service to correct these deficiencies. All of the vehicles conformed with federal specifications at the time of their procurement.

Equipment and Supplies, -- The location of equipment and supplies is standardized for all ambulances in the system to ensure their ready availability to attendants in essential compliance with the standards. All primary and secondary ambulances have two-way radios capable of clear transmission throughout the Charleston area, and communication is maintained between ambulance, Emergency Room and dispatching personnel. Ambulance equipment is tested daily, and equipment and supplies are inventoried after each run.

Personnel, -- All personnel assigned to the program are able to read, speak, and write English. The majority of the attendants have been provided necessary emergency medical training, and have demonstrated some degree of proficiency. Assigned personnel respect local fire, building, health, and traffic regulations. A record of all violations of the law

or involvement in accidents which the Medical Center becomes aware of is maintained. A program has been initiated to ensure the driver's knowledge of area street arrangements. A centralized dispatching system has been developed, and the dispatcher has been provided with appropriate communications equipment, time recording devices, and record storage space.

Education and Training, -- An Emergency Medical Technician course has been established, and a majority of the attendants have successfully participated in the program.

Policies and Procedures, -- A record of emergency care administered is normally recorded on Ambulance Service Reports. The Head of the Emergency Room Branch reviews, evaluates and critiques each emergency ambulance run with concerned staff members. Within the system, a formal program has been established to provide standby support for units on runs. The Medical Center supports the Weapons Station and Naval Base, and the Naval Base supports the Medical Center. An informal backup agreement has been implemented between the Medical Center and Charleston Emergency Medical Services. Additional support may be received from the USAF Clinic at the Charleston Air Force Base, Herbert's Ambulance Service in Charleston, and Russel's Ambulance Service in Monks Corner, Berkely County (near the Weapons Station).

Areas of Noncompliance

Equipment and Supplies, -- The ambulances within the system do not carry all of the items described as minimum requirements by the American College of Surgeons. Additionally, despite the fact that they occasionally respond to automobile accidents without the aid of rescue vehicles, they

carry none of the suggested access and extracation equipment. Table 2, indicates the minimum required equipment and supplies which are not presently carried onboard the ambulances.

TABLE 2

ESSENTIAL MINIMUM EQUIPMENT REQUIREMENTS NOT CARRIED ON MEDICAL
CENTER AMBULANCES

ITEM DESCRIPTION
Portable suction apparatus with wide-bore tubing and rigid pharyngial suction tip.
Roll of aluminum foil, 18 inches by 25 feet, steralized and wrapped.
Two sterile burn sheets.
Uncomplicated inflatable splints.
Large-size safety pins.
Shears for bandages.
Blood pressure manometer, cuff, and stethoscope.
Compartmentalized pneumatic trousers with inflation equipment.

Personnel. -- Generaly, there is no attempt made to ensure that both the attendant and driver are equally trained in emergency medical procedures. When such is the case, it is usually the result of coincidence rather than program design. Similarly, no attempt is made to ensure that personnel assigned as attendants are capable of driving the ambulance. There are no procedures currently established to certify the competence of

either attendants or drivers. Personnel assigned to ambulance duty are not screened to insure that they do not have an alcohol or drug addiction, or criminal record. Physical examination for visual acuity, field of vision, and color definition are not administered prior to duty assignment. 42 percent of the attendants have not been trained beyond their initial Hospital Corps school experience. Regardless of age, prospective drivers are not screened for maturity and driving ability prior to assignment. Many dispatchers are senior petty officers of nonmedical rates who have had little training in emergency medical considerations.

Education and Training, -- No effort is made to ensure that personnel are appropriately trained to assume their emergency care responsibilities before assignment. Such advanced training which is held is conducted primarily by a Hospital Corpsman Third Class with only occasional assistance from a physician or nurse.

Policies and Procedures, -- There are no written policies or procedures which specify the scope and conduct of patient care. Ambulance Service Reports, indicating the care administered by ambulance personnel, are not always completed, and do not become part of the patient's record. There are no formal quality control mechanisms, and many urgent cases are not critiqued with assigned personnel.

Other Area Ambulance Services

There are three other providers of ambulance service in Charleston County, in addition to the Medical Center: the Air Force Base Medical

Clinic, Charleston Country Emergency Medical Service (EMS), and Herbert's Ambulance Service.

Air Force Base Medical Clinic

The Air Force Base Medical Clinic maintains an emergency ambulance service under the direction of a Medical Corps Officer. This service is reserved almost exclusively for response to apparently emergent requests, although transportation services are occasionally provided for urgent cases between the Clinic and the Naval Regional Medical Center. This program is available to all authorized beneficiaries of Department of Defense medical services within the geographic boundaries of the service area.

Service Availability. -- The ambulance service is 100 percent staffed only during normal working hours. At other times, a duty crew is available to staff the primary ambulance only. Ambulance personnel are assigned only to duties involving emergency medical and ambulance operations.

Ambulances. -- The Clinic maintains four ambulances and four buses to perform program objectives. One Type II ambulance is maintained as the primary response vehicle for non-flight line requests for assistance, one metropolitan ambulance is used as a reserve unit should demand exceed the primary vehicle capacity, and two Type I (or "Crackerbox") ambulances are maintained for use in support of flight line operations. Two of the buses are equipped to transport litter patients, and the remaining two buses can be converted easily for litter use to support mass casualty requirements.

Location and Geographic Boundaries. -- All of the vehicles operate from the clinic geographically located on the Air Force Base (see figure 4). The service area is limited to the Air Force Base and adjacent military housing areas. The response time for emergent runs is estimated to range between two to six minutes.

Charleston County EMS

The Charleston County Emergency Medical Service is licensed by South Carolina to provide ambulance service in accordance with the standards established in Department of Health and Environmental Control Regulation Seven. The service is under the administrative control of the Charleston County Hospital and is governed by policies approved and promulgated by a physician medical advisor. Service is available only for emergent and urgent cases located within Charleston County. No routine transportation services are provided. EMS service is available to all citizens of Charleston County regardless of their ability to pay. The rate of charge is \$30.00 per call; however, if the patient is not transported to a medical facility, there is no charge for the ambulance response.

Service Availability. -- EMS ambulance service is available twenty-four hours per day, seven days a week. Ambulance personnel are assigned only EMS responsibilities.

Ambulances. -- EMS maintains eight Type II and III ambulances as primary response vehicles, with several other units maintained as reserve units to be relocated as needed. Additionally, several "emergency cars" are equipped and assigned as necessary to support EMS operations.

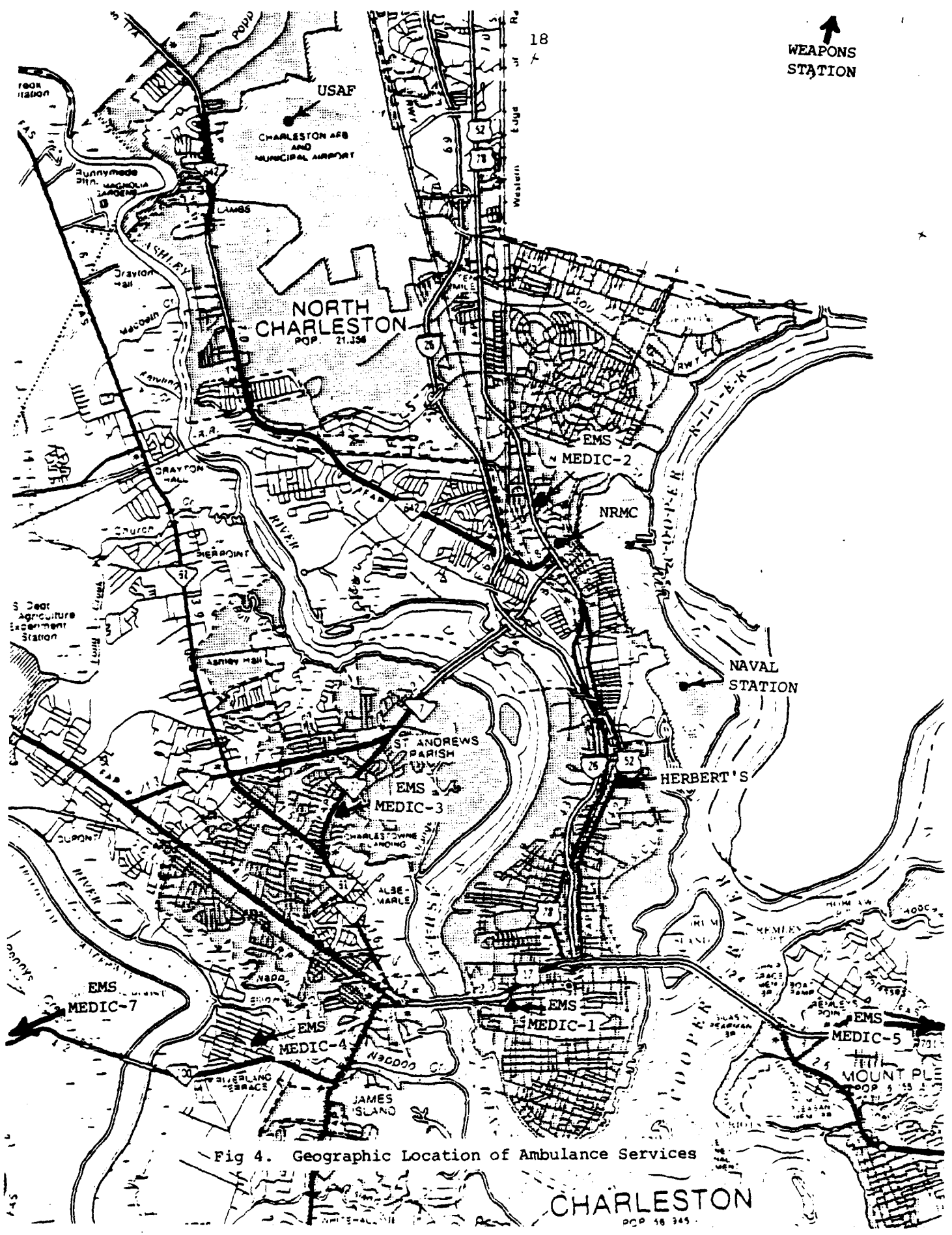


Fig 4. Geographic Location of Ambulance Services

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Location and Geographic Boundaries, -- Most of the ambulances operate from fire stations located throughout Charleston County. Figure 4 describes the location of the six units closest to the Medical Center. Each ambulance is assigned specific boundry areas; however, the service area may be extended as a back-up measure for units on emergency runs. The response time for the units is estimated to range between two to ten minutes, depending upon the distance to the patients' location.

Herbert's Ambulance Service

Herbert's Ambulance Service is a proprietary company licensed by South Carolina to provide ambulance service in accordance with the standards established in Department of Health and Environmental Control Regulation Seven. The service is under the administrative control of the company and is governed by policies approved and promulgated by a physician medical advisor. Services are available for emergent, urgent, and routine transportation cases; however, calls are screened to ensure that the requestor is able to pay for the service. The rate of charge is \$45.00 plus a mileage charge (usually about \$1.75 per mile) plus the expense of any supplies used on the patient.

Service Availability, -- Ambulance service is available twenty-four hours per day, seven days a week. Ambulance personnel are assigned only ambulance responsibilities.

Ambulances, -- Herbert's maintains four Type II ambulances as primary response vehicles.

Location and Geographic Boundaries, -- All of Herbert's ambulances operate from their single station in downtown Charleston (see figure 4). There are no prescribed geographic boundaries, and it is estimated that 99

percent of their runs are within an eight mile radius. However, they will contract for routine transportation runs to great distances from the Charleston area.

Ambulance Service Comparisons

Table 3 compares key elements of the four ambulance services in the Charleston area.

TABLE 3

Key Comparisons of Ambulance Services in Charleston

OPERATING STANDARD	NRMC	USAF	EMS	HERBERT'S
ALL ATTENDANTS TRAINED AS EMT'S	NO	YES	YES	YES
EMT TRAINING DONE BEFORE ASSIGNMENT	NO	NO	YES	YES
FORMAL CERTIFICATION/RECERTIFICATION PROGRAM	NO	YES	YES	YES
FORMAL CONTINUING EDUCATION PROGRAM	NO	YES	YES	YES
ALL DRIVERS EMT TRAINED	NO	YES	YES	YES
ALL DISPATCHERS EMT TRAINED	NO	YES	YES	YES
CALLS MEDICALLY SCREENED	NO	YES	NO*	YES
SATISFIES ACS MINIMUM EQUIPMENT REQUIREMENTS	NO	YES	YES	YES
EXTRICATION EQUIPMENT CARRIED (EEQ) OR RESPONDS WITH RESCUE UNIT (RU)	NO	RU	EEQ	RU
WRITTEN POLICIES AND PROCEDURES	NO	YES	NO	YES

* Calls are not screened, but patients not emergent or urgent are not transported.

Footnotes

1

As defined in Joint Commission on Accreditation of Hospitals, Accreditation Manual for Hospitals, (Chicago: JCAH, 1980) p.24.

2

As defined in General Services Administration, Federal Supply Service, Federal Specification, Ambulance, KKK-A-1822, 2 January 1974, pp 55-56. (hereafter cited as GSA, Specifications).

3

American Hospital Association, Emergency Services (Chicago: AHA, 1972) pp. vii-viii.

4

GSA, Specifications.

III. DISCUSSION

The primary goal of this project was to identify an appropriate configuration for the ambulance program which balances medical benefits, customer expectations, and available resources. This section develops a strategic plan for achieving this goal by defining the interrelationships of the ambulance program within the emergency health care system, reviewing the need for ambulance services, describing resource potentially available to the program, and examining the impact of various management perspectives upon the definition of program balance.

The Emergency Health Care System

The emergency health care system applies resources to patient care activities in an effort to improve the health status of consumers. The system is guided by organizational standards, policies, procedures, and regulations; and system performance is disclosed through reports, observation, evaluations, and complaints. The system is particularly susceptible to environmental influences exerted by technology, medical science, law, politics, tradition, and economics. Figure 5 is a graphic representation of the emergency health care system's interaction with its environment.

Before beginning to examine service needs and decision perspectives, it is necessary to understand how the ambulance program fits into the emergency health care system. Emergency health care does not begin and end in the emergency room. Rather, it involves assistance provided to individuals suffering from medical emergencies prior to, during, and

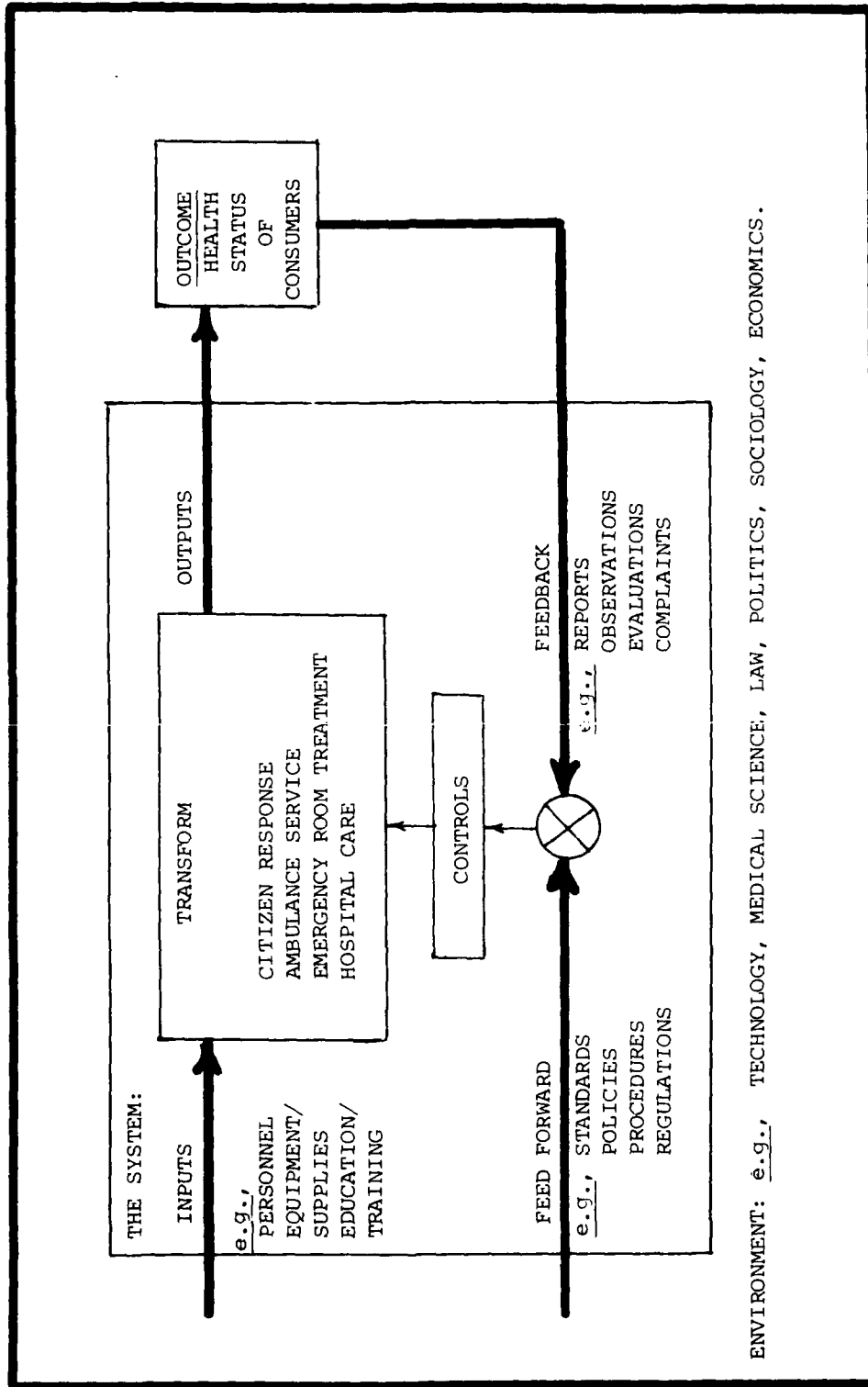


Fig 5. The Emergency Health Care System

after entry into the emergency room.¹ The system includes first aid and cardiopulmonary resuscitation provided by citizens and first responders discovering the victim,² treatment administered by ambulance attendants at the scene and in route to the hospital,³ evaluation and treatment provided in the emergency room, and definitive care provided in the hospital.⁴ The absence of any one of these components in the treatment process may have detrimental affects upon outcome quality. Figure 6 is a graphic representation of the patient flow through the system components.

The Necessity of Ambulance Service

The necessity of ambulance service is, of course, based upon the potential benefits to the patient of beginning treatment of medical emergencies as soon as possible. However, no less influential is the need for such services perceived by the consumers of health care.⁵ This section will review the need for ambulance services, based upon potential medical benefits and consumer expectations.

Medical Benefits

For years ambulance services had functioned as little more than fast taxicabs to rush victims from accident sites to hospitals where treatment of their condition could begin. During World War II, physicians began to notice that survival rates were inversely related to delays in treatment.⁶ These findings were validated with experience during the Korean and Vietnam Wars. As the responsibilities of specially trained corpsmen increased, it was demonstrated that initial field care

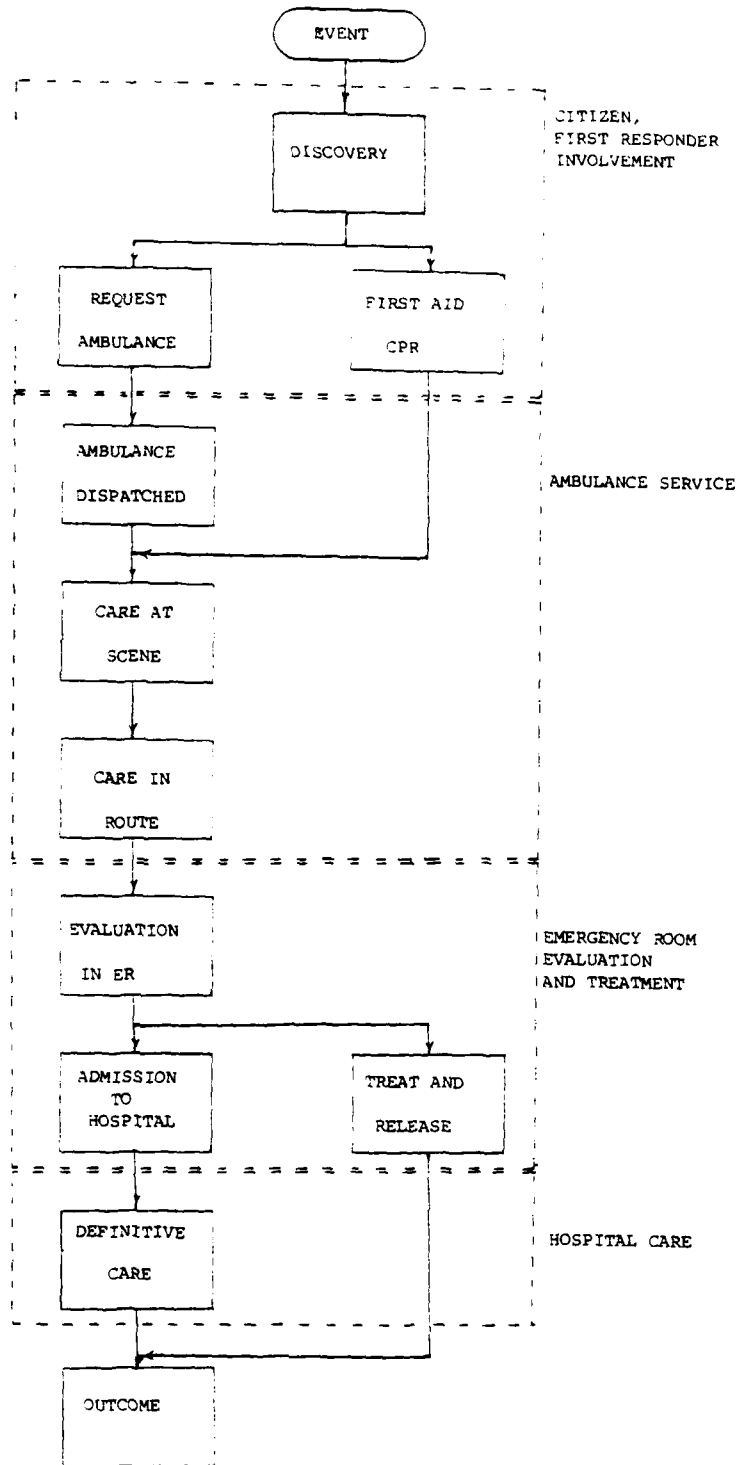


Fig 6. Patient Flow Through Emergency Health Care System Components

often made the difference between death and survival.⁷ Back in the United States, research in the late 1960's disclosed that as much as 18 percent of automobile accident deaths could have been prevented with prompt, adequate care.⁸ Today, there is widespread acceptance that mortality and morbidity are most effectively prevented and reduced if medical care is initiated at the site of the incident and continued during transport.⁹ Furthermore, recent research has stressed that, while modification to the formal system designed to provide prehospital care may improve survival statistics, further improvement is achieved when competent bystanders initiate care (CPR) while awaiting ambulance response. When recognition of the emergency is coupled with immediate assistance and rapid system notification and response, maximum outcome can be expected.¹⁰

Consumer Expectations

Consumer expectations for the ambulance program concern its accessibility, scope of services, and quality of care. A medical emergency, from the perspective of the beneficiary, may be defined as an unexpected condition for which someone perceives an immediate need for medical attention.¹¹ In this context, the major responsibility of the ambulance program is to provide access to health care services. When the beneficiary is worried or feels the need of assistance, it is expected that a first contact source is available which has the capacity to assess the problem and deal with it within reasonable time limits, or is linked to a source which can provide the necessary care. Consequently, the consumer judges accessibility by the availability and obtainability of

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the service. This expectation for service may extend beyond the range of commonly defined emergent conditions. In fact, the obtainability of immediately available medical care outside the hospital has been instilled in the minds of some consumers to the point where field medicine is considered an acceptable replacement for the traditional
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housecall.

The diversity of demands upon ambulance services has increased the scope of emergency medical care. In addition to providing the traditional service in response to heart attacks and automobile accidents, ambulance personnel are often expected to provide support to aged beneficiaries, alcoholics, psychiatric patients, potential suicides, and
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rape victims.

Over the past few years the pressures upon hospitals, medical societies, and public officials to improve the quality of emergency health care services has been unceasing. Newspaper editorials and magazine articles have reflected increasing public concern over the apparent lack of standards and consistent policies governing emergency care facilities and personnel. Additionally, the inconsistencies between stated policy and actual practice have alienated some of the effected house staff. Such occurrences demonstrate the possible consequences to the hospital's reputation and fortune if it fails to meet community ex-
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pectations of quality emergency medical care.

Potentially Available Resources

Regardless of the need and appropriateness of ambulance requests, the lack of sufficient resources may hinder the ability of the program

to initiate proper management of the problem. However, care should be taken to ensure that barriers to access are not unnecessarily erected because of the definition of functions or the inadequacy of service networks.¹⁶ Consequently, all potentially available resources should be considered in planning for program improvement. Such resources include not only the personnel, equipment, and money available at the Medical Center, but also the services which may be obtained from local military and civilian organizations.

It is anticipated that the resources presently used by the program will continue to be available in the foreseeable future, e.g., ambulances, personnel, education and training facilities, medical expertise, and so forth (see appendix B). Similarly, the informal ambulance service support arrangement between the Medical Center and Charleston County EMS is expected to remain available.

Although not presently utilized within the program, other resources in the area are potentially available. For example, the Naval Base and Weapons Station have numerous firemen and base police who are often the first responders to events which require ambulance services. Such personnel may function within the first link of the emergency health care system, and their activities could provide support for the ambulance program.¹⁷ Other potentially available resources include the ambulance service provided by the USAF Clinic and Herbert's, educational programs for EMS personnel conducted at Trident Technical College, and independent duty Hospital Corpsmen assigned to the Medical Center and to ships homeported in the Charleston area.

The Impact of Management Perspective

Decisions regarding the appropriate purpose and scope of ambulance programs are often based upon highly complex and emotional issues. What care should be provided? Who should benefit? What resources should be committed? Who should exercise program control? Each of the currently involved officials based their conceptions of proper mission upon individual criteria or rationale for the problem's solution. The significance of this is that one officials' rationality may be another officials' irrationality or lack of realism. It signifies that a given balance between medical benefits, consumer expectations, and available resources is "appropriate" or "inappropriate" only in relation to the norms and processes employed, not in any universal or abstract sense.¹⁸

To understand the impact of dominant reasoning upon decisions, various management perspectives were examined, i.e., technical, economic, legal, social, and political.

Technical Rationality

Individuals who primarily base decisions upon one or more of the sciences applied through related technologies exercise a technical rationality. Decision criteria may be in the form of professional and technical standards relating to methods and processes. Often these standards are augmented by social ideas (ethics, humanitarian values, and so forth). Such decision criteria may conflict profoundly with alternative perspectives, and challenges are most acutely seen when decisions by "non-professionals" threaten to compromise or replace dominant values.¹⁹

For example, some physicians have concluded that ambulance personnel should provide a wide range of competent medical service to individuals with emergent conditions. Consequently, standards have been established by the American College of Surgeons (see Appendix A), and the quantity and quality of prehospital medical care has increased over the years. Additionally, numerous specialized emergency medical care vehicles (mobile ICU's, CCU's, and so forth) have been developed to provide more definitive care at the scene of life endangering illnesses and injuries. However, since such speciality care vehicles represent a high equipment investment and have only a limited scope of response,²⁰ many program managers prefer the standard, more versatile ambulance. The resulting inconsistency between expectations and program design may precipitate organizational tension and physician complaints regarding²¹ the "inadequacy" of care.

Economic Rationality

Individuals who primarily base decisions upon the relationship between resource consumption and mission accomplishment exercise an economic rationality. Through the use of methods such as cost-benefit, cost-effectiveness, and cost-efficiency analysis, decisions are made regarding what services will be available and how they will be provided. The prime decision criteria used with this perspective is based upon absolute or relative²² optimization or maximization.

Managers operating from this perspective attempt to manipulate structural and operational policies to appropriately influence program costs.

Decisions are based upon expectations regarding the impact of proposed changes in relation to expenditures, opportunity costs, and so forth.²³ For example, the manager may determine that prehospital support for the Naval Base should be provided by ambulance services directly from the Medical Center, and the resources currently used redirected to optimize program performance, reduce operating costs, and improve outcomes.

Legal Rationality

Individuals who primarily base decisions upon the rights and responsibilities of people, organizations, and governments exercise a legal rationality. Decisions are not merely based upon what laws may permit or forbid, but also upon what legal standards may be required in the formulation, adoption, and implementation of health plans. Such individuals attempt to evaluate the facts of a situation in comparison with the norms of law, often using precedent cases and decisions to provide much of the decision criteria.²⁴

For example, analysis of precedent making court decisions indicates that, by establishing emergency medical facilities and services known to the public, the hospital assumes liability if such services are not provided uniformly. The law does not sanction any degree of care below that generally prevailing for other medical services, and standards formulated by the medical profession are potentially applicable²⁵ by the courts.

Consequently, the manager operating from this perspective would ensure that the public was informed of all program limitations and that the ambulance service conformed as much as possible to prevailing community standards.

Social Rationality

Individuals who primarily base decision upon criteria regarding the roles and relationships of involved personnel, at least as much as that regarding health status benefits, exercise a social rationality. Health plans must pass scrutiny regarding the role changes which would be imposed on the formal and informal organizations, consumers, and providers. Such scrutiny runs through the entire planning process from obtaining information, to setting goals, to formulating policy alternatives.²⁶

For example, as emergency medical services evolved, third parties (e.g., fire, police, and private companies) were often tasked with providing medical care to patients outside the hospital. Rather subtly, responsibility for prehospital care passed from medical and paramedical personnel to bureaucrats, administrators, and other non-medical officials.²⁷ The manager operating from a social rationality would be attuned to such subtleties, and base decisions upon developing organization influences.

Political Rationality

Individuals who primarily base decisions upon the distribution of power, rights, benefits, and duties among interest groups exercises political rationality. Power, whether formal authority or informal influence, is the basis of the political system. Decisions regarding power

usually take the form of determinations regarding the rules by which other decision are made, e.g., who may participate. This is significant, since who decides determines what is decided.

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The high visibility of emergency services and the ease with which people relate such services to their perceived needs makes political decisions inevitable. There is a growing conflict between the conception of patients and those of providers regarding appropriate services. Access to medical care is an important example of a basic dilemma which involves the relative roles of consumers and providers in establishing priorities. The manager operating from a political rationality may decide that the scope and configuration of the ambulance program should be expanded in the light of its high visibility and interest to consumer power groups; or that medical personnel and consumers should be excluded from the decision process, so that decisions will be administratively appropriate.

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IV. CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions regarding the appropriate scope of services to be provided by the program, as defined by medical, administrative, and geographic boundaries. Additionally, recommendations are proposed, based upon the presented scope of services, regarding ambulance, equipment and supply, personnel, and training requirements necessary for program effectiveness.

Scope of Services

The primary task of this project was to resolve obvious conflicts between the perspective of program officials regarding the appropriate balance of medical benefits, customer expectations, and available resources. The scope of services which achieves optimal balance between these elements was determined through identification of the outputs required to achieve program objectives, the activities necessary to produce outputs, the resources required to perform activities, and the feedback necessary to monitor resource consumption, activity performance, output production, and objective/goal achievement. Although the process of conforming the ideal ambulance program's parameters to realistic resource constraints produced a large number of alternative system designs, this study only presents the program configuration considered to be the optimal feasible solution.

Medical Boundries

Medical boundries primarily concern the level of care provided by the

program. The priorities of prehospital care are to provide medical interventions which can safely be taught and are appropriate to field management, and to provide safe transportation of patients to medical facilities for definitive care. ¹ Due to the urban nature of the Charleston area and the probable close proximity of patients to the Medical Center, necessary prehospital care services can justifiably be limited to basic life support functions. This conclusion is supported by the structure of other area ambulance services which are predominantly staffed by basic life-support technicians (EMT-A). Such technicians perform tasks associated with patient assessment, airway management, ventilation, cardiopulmonary resuscitation, pulmonary resuscitation, hemorrhage control, shock therapy, bandaging, splinting, and other first aid measures.

Administrative Boundries

Administrative boundries primarily concern decisions regarding service availability, system structure, and program controls. The Medical Center is charged with providing clinical and hospitalization support to active duty members of the uniformed service, and to other authorized beneficiaries to the extent that it does not interfere with the care of active duty members. ² Additionally, the Medical Center is required to provide essential ambulance and medical support to Civil Service personnel working onboard Naval activities. Analysis of historical data indicates that the majority of emergent and urgent ambulance services have been received by active duty and civil service members in accordance with established policy; and that only 24 percent of ambulance requests originate from off-station, strongly indicating that the majority of requests are directly Service

connected. In the light of consumer expectations (described above) and a climate of eroding medical benefits perceived by many beneficiaries, these findings suggests that modification of beneficiary eligibility for ambulance services is neither necessary nor desirable.

Although program beneficiary eligibility should not be ammended, significant structural changes to the emergency health care system seem to be indicated. Studies of survival rates for patients in full cardiac arrest indicate that the probability of successful resuscitation is greatest if the first response unit initiates resuscitation within four minutes after collapse.³ Other emergent illnesses and injuries often require a similar response time for patient survival; however, an ambulance program which could ensure response times of one to three minutes (allowing time for system notification) would not be economically feasible. A two-tiered response system should be implemented to comply with such immediate aid requirements. In such a system, fire or police personnel provide first responder care followed with more sophisticated support administered by ambulance attendants.⁴ Research indicates that the probability of recovery is greatly improved when CPR is administered immediately after discovery, and the rate of complications associated with lay CPR is exceptionally low. Consequently, it must be concluded that optimal emergent services cannot be provided without the support of a first responder network.⁵

Another structural change which would result in system improvement involves medical screening of all ambulance service requests. There should be an appropriate initial contact point for the program capable of making the judgements necessary to fit the problem to the services available.⁶ Ambulance service systems are subjected to demands for

assistance with a wide range of psychological and sociological problems. Frequently, patients require an opportunity to discuss problems with health professionals more than they need any particular treatment. Ambulance programs which provide services upon demand, regardless of appropriateness, experience a larger proportion of dry runs (false alarm or patient with nonurgent condition) than programs in which the dispatcher must be satisfied that a medical emergency actually exists.⁷

The final structural change involves the implementation of formal supporting arrangements with other area ambulance services. It is probable that the costs associated with having an ambulance available to respond to 100 percent of requests will prohibit goal attainments. However, coordination with other area ambulance services should provide a satisfactory method of maintaining ambulance availability without substantial resource investment. Discussions with various Medical Center officials indicate concern over potential government liability if ambulance requests were referred to other area services, or placed to one of the services by Medical Center personnel in the interest of reducing response time. This concern primarily is over liability for service fees, and for negligent acts committed by employees of the responding ambulance service. Consultation with the Legal Services Office at the Naval Base disclosed that the Medical Center would be liable for all fees associated with services for active duty members; but, if the patient is a non-active duty beneficiary, the Medical Center would incur no liability for payment regardless of who placed the call to the ambulance service (of course, eligible beneficiaries could file for appropriate CHAMPUS reimbursement). The second concern expressed by officials involves the potential liability for

negligent acts committed by a "borrowed servant". It may be reasonable to conclude that ambulance personnel, regardless of actual employment, are borrowed servants at all times they are engaged in prehospital life support as an outreach function of the hospital. ⁸ However, again consultation with the Legal Service Office disclosed that, although there is a possibility of the Medical Center being named as a co-defendant, no liability should be incurred if services are requested in the best interest of the patient from organizations known to comply with community standards. Both Charleston County and Herbert's Ambulance Service comply with state and community standards for ambulance services.

The final administrative boundary concerns structural and operational controls, i.e., assignment of responsibility, conformance to established service standards, promulgation of written policies and procedures, direction of field activities, and acquisition of performance feedback. One of the conditions which precipitated this study was the apparent inability of a single individual to affect system improvement. This situation is not unusual. The difficulty of assigning overall program responsibility often results in fragmentation of the system into loosely related components under the separate control of various interest groups. ⁹

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However, as Page observes:

"Is it better to let everyone pretend to be in charge and share the burden when the ineluctable lawsuit arrives? Or is it preferable to accept the responsibility fully, and have the opportunity to manage and minimize risk?"

Therefore, the first step necessary to improve performance is the assignment of program responsibility to an individual who has acceptability and authority to enter into all system components. The ideal candidate is a thoroughly competent physician with a full-time commitment to emergency

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medicine. The most appropriate choice would be the Head, Emergency Room Branch, Ambulatory Care Service.

The next administrative boundry relating to program control concerns the standards for ambulance and emergency medical services delineated in Appendix A. The majority of these minimal standards (specifically, those of the American College of Surgeons) were written into the South Carolina Department of Health and Environmental Control Regulation Seven which governs the operation of all area non-federal ambulance services. Some Medical Center officials have observed that federal agencies are not required to operate in accordance with state regulations or suggested standards promulgated by non-federal societies. However, consultation with the Legal Service Office indicates that liability would nonetheless result from damages sustained by non-active duty beneficiaries from the Medical Center's failure to comply with community standards. Consequently, the ambulance program must be operated in accordance with federal regulations and community standards for ambulance services.

Although community standards do not require the publication of written policies and procedures, two factors indicate that their development is necessary. First, if it is agreed that the ambulance program is an extension of the hospital's emergency medical services, ¹² written policies and procedures described in Appendix A are required by JCAH standards. Second, the creation of treatment protocols are necessary to provide baseline definitions of expected field activities, and to inform attending ¹³ physicians of field treatment parameters.

In addition to the guidance provided in treatment protocols, it is often necessary for the physician to direct field activities in progress

at the scene. Communication between the physician and ambulance attendants is essential for a responsible prehospital care program. For example, direct communication may be necessary for guidance in managing life or limb threatening conditions, patients refusing to be taken to the hospital, or unusual cases for which adequate protocols have not been developed.¹⁴ Although all of the primary ambulances are equipped with two-way radios, communications with the Medical Center is not readily available when attendants leave the vehicle to care for the patient. The acquisition of portable radios capable of maintaining the link between the attendant in the field and the physician in the Emergency Room would facilitate the maintenance of appropriate patient care.

The final element of program control to be addressed concerns the acquisition of feedback necessary to monitor resource consumption, activity performance, output production, and objective/goal achievement. For example, feedback regarding resource consumption may be gained through reports concerning ambulance response times, supply usages, equipment replacements and training programs. Activity performance feedback may be obtained from such sources as reports concerning the types of ambulance runs conducted (i.e., emergent, urgent, nonurgent), the effectiveness of screening procedures, success/failure rates of treatment attempts (e.g., intubation, intravenous injections, and cardiac resuscitation), and critiques of attendant field performances. Feedback regarding output production may be obtained from such sources as reports on the volume of calls received and their point of origin. Finally, feedback regarding the level of goal achievement may be obtained from statistics regarding patient survival rates.¹⁵ No formal method currently exists to collect the majority of this

data, and that data which is collected (e.g., ambulance response times, and ambulance service reports) are completed sporadically and rarely monitored. Once program improvements are made, collection of such feedback is essential to ensure that the program performs as intended.

Geographic Boundries

The geographic boundries upon services are generally dictated by the criterion response time. The ambulance response time is the period from when the request is received until the ambulance arrives at the scene of the incident. This time includes any delays in dispatching and the time required to travel to the patient. All points which can be reached within the criterion response time constitute the criterion service area. All calls from within this area will be answered in never more than the maximum time permitted. Since the criterion service area is based upon travel times and not on distances from ambulance locations, it is shaped by variations in local traffic and road conditions. However, an approximation of the criterion service area can be made most easily by assuming an average speed for the ambulance and computing the maximum distance which can be reached within the criterion response time.

In calculating the service area for the criterion response time of 15 minutes proposed by the Director of Administrative Services, three assumptions were made. Based upon an analysis of sample ambulance runs, it was assumed that (1) the proposed organizational changes will result in a maximum dispatching delay of four minutes (including the time required to screen the call, brief attendants, and man the ambulance), (2) a maximum of an additional three minutes will be required to negotiate turns and

locate the patient at the scene, and (3) the ambulance will travel at an average of 30 miles per hour during the most difficult traffic conditions. Under these assumptions an ambulance can respond within the criterion time to an incident four miles or less from the base location. Figure 7 indicates the criterion service area for the Medical Center. Analysis of historical data indicates that 45 percent of off station requests and 64 percent of all non-transportation requests are generated from within this boundary. Although the Naval Base complex also falls within this boundary, the Weapons Station is too distant to allow adequate coverage from the Medical Center.

The Weapons Station is located approximately ten miles north-north west of the Medical Center. Ambulances are presently located at the Weapons Station Branch Clinic to reduce the response time for calls originating on the Weapons Station and in adjacent housing areas. However, the Branch Clinic is located in a housing area about three miles from the Weapons Station's main gate, and calculations indicate that an ambulance would have to travel at an average speed of 60 miles per hour to reach all points in the designated service area within the criterion response time. This problem is further compounded for calls originating from the Polaris Missile Facility Annex, since mandatory security inspections would delay ambulance response by an additional ten minutes or more. Regardless of the probable response time, the service area designated for Weapons Station ambulances must be supported by the program. Resolution of this problem is discussed below.

Resource Requirements

This section presents recommendations concerning resource requirements

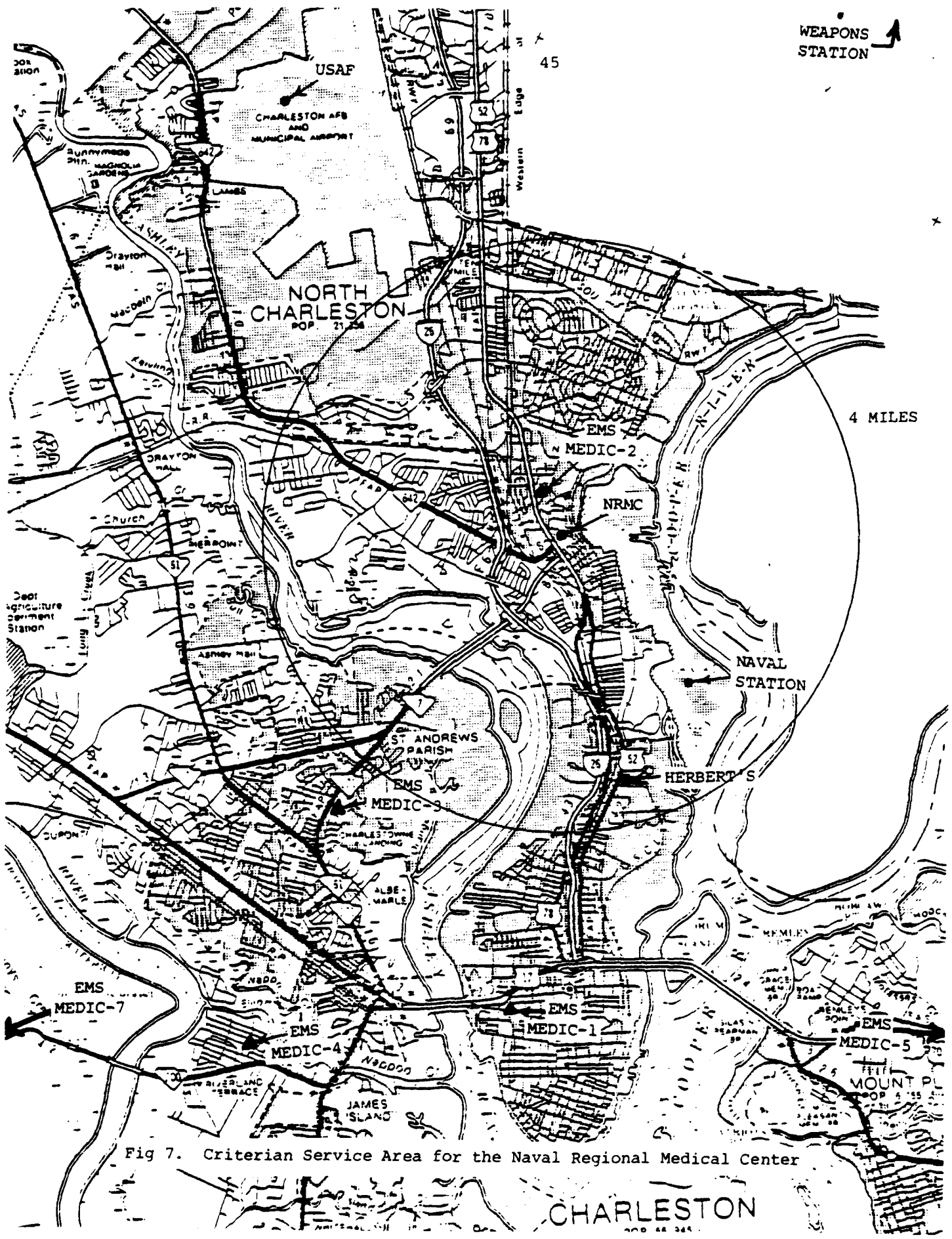


Fig 7. Criterian Service Area for the Naval Regional Medical Center

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for proper program performance.

Number and Locations of Ambulances

The above discussion regarding geographic boundries for the program essentially described the proposed locations for ambulance service sites, i.e., the Medical Center and the Weapons Station. Since the Naval Base is entirely enclosed by the Medical Center's criterion response area, separate maintenance of an ambulance at the Naval Station Branch Clinic is unnecessary from a purely economic perspective. Consolidation of ambulance resources for this area at the Medical Center will result in greater efficiency of capital investment, and conservation of scarce human resources.

One of the measures of program capability is the percentage of occasions when an ambulance is available to answer a call. The more frequently ambulances are expected to be available, the greater the load on the program and the larger the number of ambulances necessary to meet program goals. The price of a high probability that an ambulance is always available to respond to an emergency is that additional ambulances may have to be manned to service calls when the primary ambulance is busy. The number of ambulances needed is dependent upon the number of calls received and the duration of service time (i.e., the elapsed time from when an ambulance is dispatched until it is once again available to answer another call). Since the average service time for the program is 41 minutes and the criteria of 100 percent availability has been established, service size has been based upon the assumption that each ambulance can only respond to one call per hour. Although this assumption is not absolutely valid, it should be sufficiently accurate within the program structure to identify reasonable resource requirements.

Call frequency has been determined from the data compiled by Operating Management Service personnel. Requests for emergency ambulance service arrive irregularly, but with a statistically discernable pattern which closely approximates a Poisson distribution.¹⁷ Poisson distribution describes events in which the probability of involvement for any individual member of the population is very low, and specific conditions of independence and equal likelihood for all members of the population are met. Since there are daily and seasonal variations in the frequency of emergency calls, the number of vehicles required has been based upon the number of calls per hour over the busiest period of the day during the busiest season of the year. Consequently, the estimate should identify the number of ambulances necessary to handle probable peak emergency loads,¹⁸ Since the call rate was expected to be appreciably different after normal working hours, the number of manned ambulances required were also calculated for this time period.

Analysis of demand for the period 1 April 1979 to 31 March 1980 indicated that the program averaged 0.1387 calls per hour for the year, and that this average increased to 0.3461 calls per hour during the peak demand period. Table 4 indicates the calculated probabilities for demand during any given hour in the normal work day based upon peak demand. The probabilities seem to indicate that for all practical purposes, the maintenance of three vehicles would ensure availability of an ambulance at all times. During the twelve month period, simultaneous runs occurred with two ambulances on 101 occasions and with three ambulances on nine occasions. Documentation further indicated that demand never required more than three ambulances to be on the road at one time. Additionally, the majority of simultaneous

TABLE 4

PROJECTED PROBABILITIES OF DEMAND
DURING NORMAL WORKING HOURS

NUMBER OF CALLS/HOUR	PROBABILITY	PROBABILITY CALLS WILL NOT EXCEED THIS NUMBER/HOUR
0	.7074	.7074
1	.2448	.9522
2	.0424	.9946
3	.0049	.9995
4+	.0005	1.0000

TABLE 5

PROJECTED PROBABILITIES OF DEMAND
AFTER NORMAL WORKING HOURS

NUMBER OF CALLS/HOUR	PROBABILITY	PROBABILITY CALLS WILL NOT EXCEED THIS NUMBER/HOUR
0	.8992	.8992
1	.0956	.9948
2	.0051	.9999
3+	.0001	1.0000

runs involved routine patient transportation services. An ambulance was dispatched in response to emergency calls on only seven occasions when other vehicles were making runs, and only once were two ambulances responding to emergency requests simultaneously.

Specific analysis for the Weapons Station was not performed due to the small proportion of program demand documented for this area. In the twelve month period, only 73 runs were recorded from the Weapons Station (an average of 0.0083 runs per hour). However, program demands after normal working hours were analyzed.

The program averaged 0.1063 calls per hour during peak loads after normal working hours. Table 5 indicates the calculated probabilities for demand during any given hour after normal working hours. The probability seems to indicate that, for all practical purposes, the maintenance of two vehicles after working hours would ensure availability of an ambulance at all times. During the twelve month period simultaneous runs occurred after hours with two ambulances on 28 occasions and with three ambulances on one occasion. Again, simultaneous runs predominantly involved routine patient transportation services. An ambulance was dispatched in response to emergency calls on only three occasions when another vehicle was making a run, and there is no indication of two or more simultaneous emergency runs after hours.

Table 6 summarizes the recommended allocation of ambulance vehicles for the program. Peak workload configurations indicate that the Medical Center should maintain two ambulances for primary response to emergency calls at all times, and one additional vehicle for patient transportation services during normal working hours. The Weapons Station should maintain

one ambulance as a primary response vehicle at all times, due to its remoteness from the Medical Center. Additionally, this vehicle should be the Type 1 ambulance presently maintained at the Weapons Station. This ambulance has relatively low milage, and is well suited to emergency response under all terrain conditions present in the Weapons Station service area. One of the excess vehicles should be retained in reserve to provide rotation for routine preventive maintenance, and the others declared excess in accordance with current Navy Directives.

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TABLE 6

RECOMMENDED ALLOCATION OF AMBULANCES

LOCATION	NO. OF STAFFED AMBULANCES		CURRENT ALLOCATION	CURRENT EXCESS
	NORMAL WORKING HOURS	AFTER NORMAL HOURS		
MEDICAL CENTER	3	2	4	1
NAVAL STATION	-	-	1	1
WEAPONS STATION	1	1	2	1
TOTALS	4	3	7	3

There are two potential problems with the above recommended distribution of ambulances: the excessive response time required for some areas of the Weapons Station, and the slight probability that demand may exceed the number of available ambulances. Implementation of the two-tiered

response system, discussed under Administrative Boundries above, would significantly ease the problems associated with prolonged response time. Berkely County, South Carolina relies heavily upon police and fire personnel, as first responders, to administer emergency services pending the arrival of ambulances dispatched from remote locations. This system has often been successful in providing rapid, essential care to patients with emergent conditions.

Problems associated with the slight probability that demand may exceed available resources should be prevented by implementation of the formal supporting arrangements with other area ambulance services previously discusses. If an emergency request is received on the rare occasion when all program ambulances are unavailable, the call can be referred directly to the area ambulance service in best position to provide prompt service. This arrangement will prevent maintenance of ambulances which are rarely, if ever, used to support program operations.

Equipment and Supplies Required

All program ambulances should be furnished with at least the minimum equipment and supplies specified by the American College of Surgeons (see Table 7) for two reasons: (1) the Medical Center may be held liable for dammaques sustained by patients resulting from the failure to conform with community standards, and (2) Naval ambulances which are not carring patients, or proceeding under orders to pick up patients, are expected to honor requests by local police officers or other persons for assistance with accidents or emergencies. Consequently, ambulances which are only used for routine patient transportation services may be diverted for emergency

use at any time. The potential liability for operating an ambulance incapable of providing the customary services of ambulances significantly exceeds the costs of furnishing essential equipment and supplies uniformly. Additionally, the uniform stocking of all ambulances provides greater flexibility for the program to cope with unexpected mechanical problems.

Provision of extracation equipment is not recommended because of its susceptibility to high rates of pilferage (see Table 8). However, action must be taken to ensure that a rescue vehicle responds concurrently with
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ambulances dispatched to crash sites.

Finally, the Head of the Emergency Room Branch should be tasked with the responsibility for ensuring performance of required equipment/supply
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tests and inventories.

Personnel Requirements

Personnel requirements for the program are based upon service size and the applicable ambulance service standards delineated in Appendix A.

First Responders. -- Action should be initiated as soon as possible to develop and implement a first responder network at the Weapons Station and Naval Base. As previously discussed, the existence of a first responder network within the emergency health care system provides a potential solution to the problem of timely, low cost prehospital services. Such individuals can be available to administer cardiopulmonary resuscitation and/or required first aid more rapidly than program ambulance personnel,
23
thereby increasing the potential for patient survival. In fact, research has indicated that survival rates for patients receiving CPR from first responders is greater than for patients not receiving CPR until arrival of

24
an ambulance crew. The ideal individuals to be trained as first responders are the security, police, and fire personnel working at the Weapons Station and Naval Base. Their relatively repeated exposure to health threats and other emergency situations makes it likely that they would be easily trainable and capable of effective response.²⁵

Ambulance Attendants and Drivers, -- In addition to conforming with the standards delineated in Appendix A, all attendants and drivers should be qualified basic emergency medical technicians (EMT-A) in accordance with the community standards reflected in Table 3. When not actually on ambulance runs, they should be assigned to related duties in the Emergency Room. An equally qualified driver and attendant should be assigned to all ambulance runs, regardless of the urgency, since the ambulance may be diverted to provide emergency aid and assistance. Peak workload statistics indicate that the Medical Center requires six individuals during normal working hours and four individuals after hours to act as attendants and drivers. The Weapons Station requires the availability of an attendant and driver at all times. The ideal source for these personnel is the Emergency Room staff. However, insufficient billets exists to satisfy all requirements. It is recommended that each ambulance dispatched be provided with an attendant from the Emergency Room Staff and an EMT-A qualified driver from the Nursing Service (normal working hours) or duty section (after normal working hours). Furthermore, Nursing Service and duty section personnel should be assigned ambulance duties at sufficient intervals to ensure development and retention of required prehospital care skills.

Dispatchers. -- In support of the previous recommendation for screening requests, ambulance dispatching functions should be transferred to the Emergency Room. The assignment of ambulance personnel to the Emergency Room during idle time, implementation of medical screening for all ambulance calls, and reassignment of dispatching authority to the Emergency Room physician/nurse should improve the retention of EMT skills, minimize the number of dry runs, and reduce the time necessary to dispatch ambulances.

Control. -- The Head of the Emergency Room Branch should have significant and ratified authority to mandate competence from all personnel delivering emergency medical services. When competence is marginal, this physician should have the responsibility of developing and conducting required training programs. When incompetence is beyond correction, this physician should have the authority to remove people from both prehospital and in-hospital activities, whether assigned full-time or in the duty section. 26

Training Requirements

To ensure the delivery of competent emergency medical services, initial and continuing education activities must be directed to personnel in all elements of the program. 27

First Responders. -- Development of a first responder network will require the indoctrination and training of security, police, and fire department personnel from the Naval Base and Weapons Station in basic CPR and first aid techniques. The Medical Center does not have sufficient facilities or resources to conduct the necessary training activities within the foreseeable future. However, adequate programs are provided in the local area by the American Red Cross and Trident Technical College, and

special time and location arrangements can be made to facilitate the rapid indoctrination of the subject personnel.

Ambulance Attendants and Drivers, -- The standards delineated in Appendix A (and community practices) indicate that attendants and drivers should be equally trained as EMT-A basic emergency medical technicians. It is recommended that the Medical Center comply with these standards, and that the necessary training be provided prior to the assignment of personnel to ambulance duties. The recently developed EMT Course at the Medical Center is considered satisfactory for this purpose. It is acknowledged that many EMT skills are taught in Hospital Corps School. However, significant aspects of prehospital care are not addressed in this basic training, and there is some evidence that a lack of exposure to the full scope of prehospital care activities may be detrimental to patient care. ²⁸ Furthermore, simple exposure to emergency medical concepts does not ensure competency to administer appropriate care. A formal program for the certification, and periodic recertification, of skill achievement should be developed to provide this assurance. Recertification should be based upon the maintenance of skills through participation in such continuing education processes as regular case critiques, formal didactic sessions, ²⁹ and self study programs.

Dispatchers, -- Although the physicians/nurses assigned dispatching duties will have the appropriate medical background to facilitate screening of requests, adequate indoctrination into the responsibilities of the position is necessary. Dispatchers should be trained in the type of medical information which is required to properly respond to a call, the

supportive arrangements necessary for some cases (e.g., police, fire, or rescue personnel), and the proper operation and use of communications equipment.

30

Control. -- The Head of the Emergency Room Branch should be assigned primary responsibility for development and execution of the training program. This physician should have the authority to terminate trainees who fail to develop adequate skills, knowledge, techniques, and attitudes. This authority should extend to continuing education programs, and the termination of personnel who develop performance or attitude problems on the job.

31

Footnotes

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21

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22

U.S. Department of Defense, Department of the Navy, Naval Regional Medical Center, Charleston, S.C., Instruction 11240.2 Emergency Ambulances and Transportation Services; Standard Operating Procedures, 1 February 1973, with change one, dated 20 September 1979, p.2.

23

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"Emergency Medicine", MWN, p.68.

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APPENDIX A

STANDARDS FOR THE OPERATION OF AMBULANCE SERVICES

STANDARDS FOR THE OPERATION OF AMBULANCE SERVICES

The following are excerpts from standards for ambulance and emergency services established by the Federal Government, the American College of Surgeons, and the Joint Commission on the Accreditation of Hospitals.

Ambulances

1

The Vehicle

Ambulances should provide:

- Easy loading, privacy, and confort.
- Adequate space for equipment and patient care activities.
- Separate driver and patient compartments.
- Good illumination and temperature control in the patient area.

2,3

Operation

Ambulances on emergency calls should:

- Obey, under most circumstances, the laws regulating speed, and the traffic signs and signals which apply to ordinary non-emergency traffic.
- Place primary emphasis on the safety of passengers and pedestrians and the avoidance of collisions, should violations of some traffic laws become justified.

Equipment and Supplies

4

Minimum requirements

Table 7 delineates the minimum items essential for the attendant to provide adequate care to critically ill and injured patients at the scene and in transit to medical facilities. Table 8 itemizes additional access

TABLE 7

MINIMUM EQUIPMENT

1. Portable suction apparatus with wide-bore tubing and rigid pharyngeal suction tip.
2. Hand-operated bag-mask ventilation unit with adult, child, and infant size masks. Clear masks are preferable. Valves must operate in cold weather, and unit must be capable of use with oxygen supply.
3. Oropharyngeal airways in adult, child, and infant sizes.
4. Mouth-to-mouth artificial ventilation airways for adults and children.
5. Portable oxygen equipment with adequate tubing and semi-open, valveless, transparent masks in adult, child, and infant sizes.
6. Mouth gaqs, either commercial or made of three tongue blades taped together and padded.
7. Universal dressings, approximately 10 inches by 36 inches, compactly folded and packaged in a convenient size.
8. Sterile gauze pads, 4 inches by 4 inches.
9. Soft-roller self-adhering bandages, 6 inches by 5 yards.
10. Roll of aluminum foil, 18 inches by 25 feet, sterilized and wrapped.
11. Two rolls of plain adhesive tape, 3 inches wide.
12. Two sterile burn sheets.
13. Hinged half-ring lower extremity traction splint (ring 9 inches in diameter, overall length of splint 43 inches) with commercial limb-support slings, padded ankle hitch, and traction strap.
14. Uncomplicated inflatable splints.
15. Short and long spine boards with accessories. (Does not include the chin strap previously shown).

TABLE 7

CONTINUED

16. Triangular bandages.
17. Large-size safety pins.
18. Shears for bandages.
19. Sterile Obstetrical kit.
20. Poison kit.
21. Blood pressure manometer, cuff, and stethoscope.
22. Compartmentalized pneumatic trousers with inflation equipment.
23. Two-way radio allowing direct communication between the EMT and the emergency department of the hospital.

SOURCE: Committee on Trauma, American College of Surgeons, Essential Equipment for Ambulances, Chicago: ACS, 1977.

TABLE 8

ADDITIONAL EQUIPMENT FOR EXTRICATION

1. Triangular reflectors or battery-operated flares.
2. One wrench, 12 inches, with adjustable open end.
3. One screw driver, 12 inches, with regular blade.
4. One screw driver, 12 inches, Phillips type.
5. One hacksaw with 12-inch wire (carbide) blades.
6. One pair of pliers, 10 inch vise-grip.
7. One 5 pound hammer with 15 inch handle.
8. One fire axe butt with 24 inch handle.
9. One 24 inch wrecking bar (bar and two preceding items can either be separate or combined as a forcible-entry tool).
10. One crowbar, 51 inches, with pinch point.
11. One bolt cutter with 1½ inch jaw opening.
12. One portable power jack and spreader tool.
13. One shovel, 49 inches, with pointed blade.
14. One double-action tin snip (minimum of 8 inches).
15. Two manila ropes, each 50 feet long and ¾ of an inch in diameter.
16. Hard hat.
17. Safety goggles.

A heavy duty come-along (two ton) is recommended, particularly in areas where it would not otherwise be readily available. In addition to rated cable, the ambulance should carry 15 foot of rated chain with one grab hook and one running hook.

SOURCE: Committee on Trauma, American College of Surgeons, Essential Equipment for Ambulances, Chicago: ACS, 1977.

and extracation equipment which should be carried in the ambulance, if it responds to automobile accidents without the assistance of a rescue vehicle.

5

Location

The location of equipment and supplies shall be directed by the relative importance of their ready availability to attendants:

- Those necessary for airway care, artifical ventilation, oxygenation, and suction shall be within reach of the attendant at the head of the primary litter.

- Those for cardiac resuscitation, control of external hemorrhage, administration of intravenous agents, and the monitoring of blood pressure shall be readily available at the side of the litter, when provided.

Communications

6

All ambulances will be equiped with two-way radios. Such radios should be capable of:

- Clear transmission and reception over not less than 20 miles.

- Maintaining communications between the ambulance, the Emergency

8

Room, and the dispatcher.

9

Testing/Investory

The equipment in each ambulance shall be tested daily, and an inventory of equipment and supplies will be conducted after each run.

Personnel

10

Ambulance

At least two persons should be assigned to each emergency ambulance.

Each of these persons should be:

- Equally trained as emergency medical technicians.
- Certified by a licensing authority regarding their ability to drive and competence in emergency care.
- Certified by competent authority regarding their non-addiction to alcohol or drugs and lack of criminal records.
- Able to read, speak, and write English.
- Examined to varify visual acuity of at least 20/40 without corrective lenses, a field of vision of at least 70^o in the horazontal meridian in each eye, and the ability to recognize the colors red, green and amber.
- Periodically reexamined.
- Certified in advanced first aid by the American Red Cross, or have equivalent training.
- Trained and have demonstrated proficiency in all phases of emergency care and protective extracation.
- Aware of, and comply with, local fire, building, health, and traffic regulations.
- Familiar with current area disaster plans.
- Subject to the maintenance of records of all violations of the law or involvement in accidents.

Drivers

Ambulance drivers should be at least 21 years of age; however, liberalization of this policy to 18 years of age is allowed when it places undue hardship upon available personnel. When assigning personnel under the

age of 21 as ambulance drivers, particular emphasis must be placed upon
 both the maturity and driving ability of each individual. Additionally,
 certification of the driver's knowledge of area street arrangements is
 recommended.

13

Dispatcher

Personnel assigned as dispatchers should have:

- A centralized dispatching office with adequate communications equipment, time recording devices, and record storage space.
- At least as much training as the personnel staffing ambulances to improve the quality and quantity of information received and transmitted regarding the patients' illness or injury.

Education and Training

All personnel shall be prepared for their emergency care responsibilities through appropriate education and training programs. Additionally, such training shall be:

- Of sufficient duration and substance to cover all patient care responsibilities related to each individual's level of participation in the program.
 14,15
- Conducted by a medical staff member who credentials ambulance personnel for activities they are authorized to perform.
 16
- Conducted prior to the assignment of personnel to emergency medical service duties.
 17

Policies and Procedures

18

Written Requirements

Emergency patient care shall be guided by written policies and procedures. Such written guidelines must be:

- Approved by the medical staff and hospital administration.
- Reviewed at least annually.
- Revised as necessary.
- Dated to indicate the date of the last revision.
- Enforced.

Some specific areas to be addressed in writing are:

- The initial management of patients with burns, hand injuries, head injuries, fractures, multiple injuries, poisonings, animal bites, gunshot and stab wounds, and other acute problems.
- The management of patients under the influence of drugs or alcohol, or who are emotionally ill or become difficult to manage.
- Precautions to be taken in preventing the occurrence of accidents to unconscious or irrational patients.
- The management of pediatric emergencies.
- The use of standing orders.
- Precautions to be followed in the event of equipment failure.
- Pertinent safety practices.
- Infection control measures.

19,20

Medical Records

A record of all emergency care administered shall be maintained and incorporated into the patients' hospital record.

21,22

Quality Control

The quality and appropriateness of patient care activities shall be continually reviewed, evaluated, and assured through the establishment of a quality control mechanism.

23

Coordination

Standby emergency ambulance service should be established and coordinated with other operators of services in adjacent areas.

Footnotes

1

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APPENDIX B

THE CURRENT AMBULANCE PROGRAM

THE CURRENT AMBULANCE PROGRAM

This appendix provides detailed information relating to the scope and operation of the current ambulance program.

General Policies

The ambulance program is guided by a local directive issued in February 1973, and with the exception of the enclosure on South Carolina Traffic Laws, has not been revised since its issuance. The directive provides guidelines for cooperation with civil authorities, procedures for obtaining emergency ambulance service, policies regarding requirements for the presence of an attendant, general comments regarding the training and qualifications of driver and attendants, and requirements¹ for the periodic inspection of vehicles.

Scope of Care Provided

Primary ambulances are intended to respond to any call for emergency medical prehospital care. This care is intended to ease the suffering of the patient and provide rapid, safe transportation to the NRMC Emergency Room for more definitive care. The attendants at the scene may communicate with a physician in the Emergency Room via two-way radio, and when so directed may administer intravenous fluids and a limited number of drugs. Secondary ambulances are intended to provide a reserve capability which provides for a more basic level of response when the primary vehicle is on another call, or merely serves as a mode for the movement of stabilized patients between the NRMC and area hospitals.

Beneficiaries, -- The full scope of ambulance service available is provided to all groups of authorized beneficiaries, e.g. active duty military, retired military, dependents, and civil service employees injured on the job. Figure 8 presents two pie graphs which describe the distribution of ambulance service based upon patient category. Table 9 lists the monthly number of ambulance runs by patient status.

TABLE 9

AMBULANCE RUNS BY PATIENT STATUS

MONTH	ACTIVE DUTY	RETIRED	DEPEN- DENT	CIVIL SERVICE EMPLOYEE	CIVILIAN HUMANI- TARIAN	UNKNOWN STATUS	TOTAL AMBULANCE RUNS
APR 79	9	14	20	3	2	23	71
MAY	12	10	20	5	2	9	58
JUN	12	16	24	3	4	0	59
JUL	31	44	57	1	3	0	136
AUG	22	26	24	3	5	16	96
SEP	33	17	17	0	6	7	80
OCT	31	11	30	4	6	13	95
NOV	48	19	43	11	8	9	138
DEC	32	20	43	9	7	2	113
JAN 80	51	13	44	12	5	3	128
FEB	60	10	34	15	9	5	133
MAR	49	10	29	8	7	5	108
TOTALS	390	210	385	74	64	92	1215

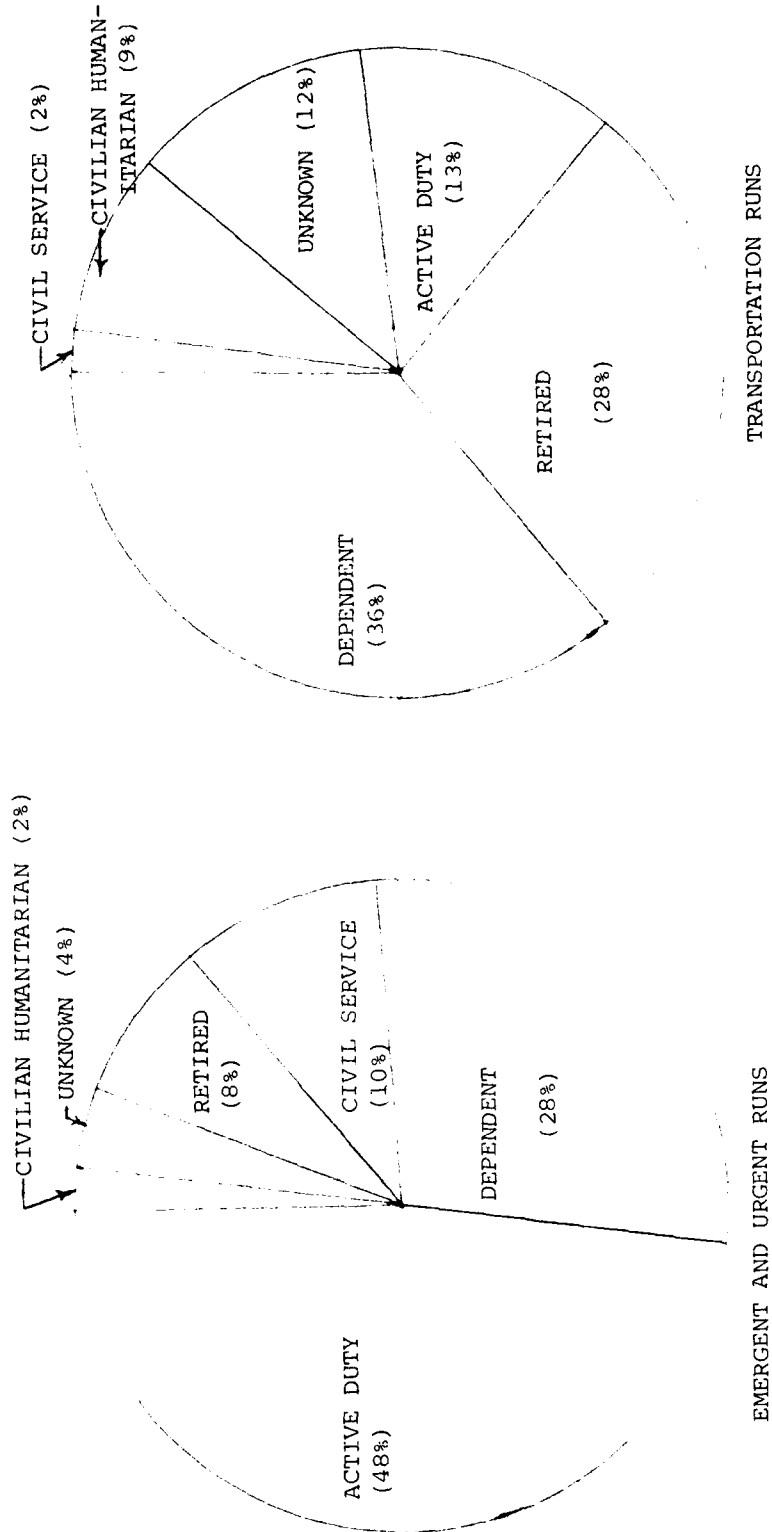


Fig 8. Distribution of Ambulance Service by Patient Category

Dispatching of Ambulances. -- The dispatching of ambulances is primarily the responsibility of the Chief of the Day. This position may be staffed by senior enlisted personnel of medical or non-medical rates. No formalized instruction regarding dispatching policies and procedures is provided. However, general guidelines are available, and it is stressed that an ambulance should be provided if there is doubt regarding the true need for emergency services.

Geographic Boundries. -- There are no written guidelines which limit geographic boundries for the ambulance program. Analysis has indicated that ambulances have been dispatched on transportation runs as far away as Columbia and Beaufort, South Carolina; and on alledgedly emergency runs in excess of twenty miles. Figure 9, is a representation of the distance from which off station requests for ambulance service originate.

Ambulance Response Time. -- Ambulance "response time" is the total time it takes from the moment the request for service is received until the ambulance is on the scene and the attendants reach the patient. This time can be conviently separated into two components: "dispatch time", the time which elapses from the receipt of the call until the ambulance leaves the hospital or branch clinic; and "travel time", the time it takes for the ambulance to travel from its current location until it reaches the patient. To calculate these times for the NRMCC, a sample of 50 ambulance runs were randomly drawn from available Ambulance Dispatch Data Cards. These cards record the time the call is received, and the times that the ambulance leaves the NRMCC or Branch Clinic, arrives at the scene, leaves the scene, and arrives at the appropriate medical facility. Analysis

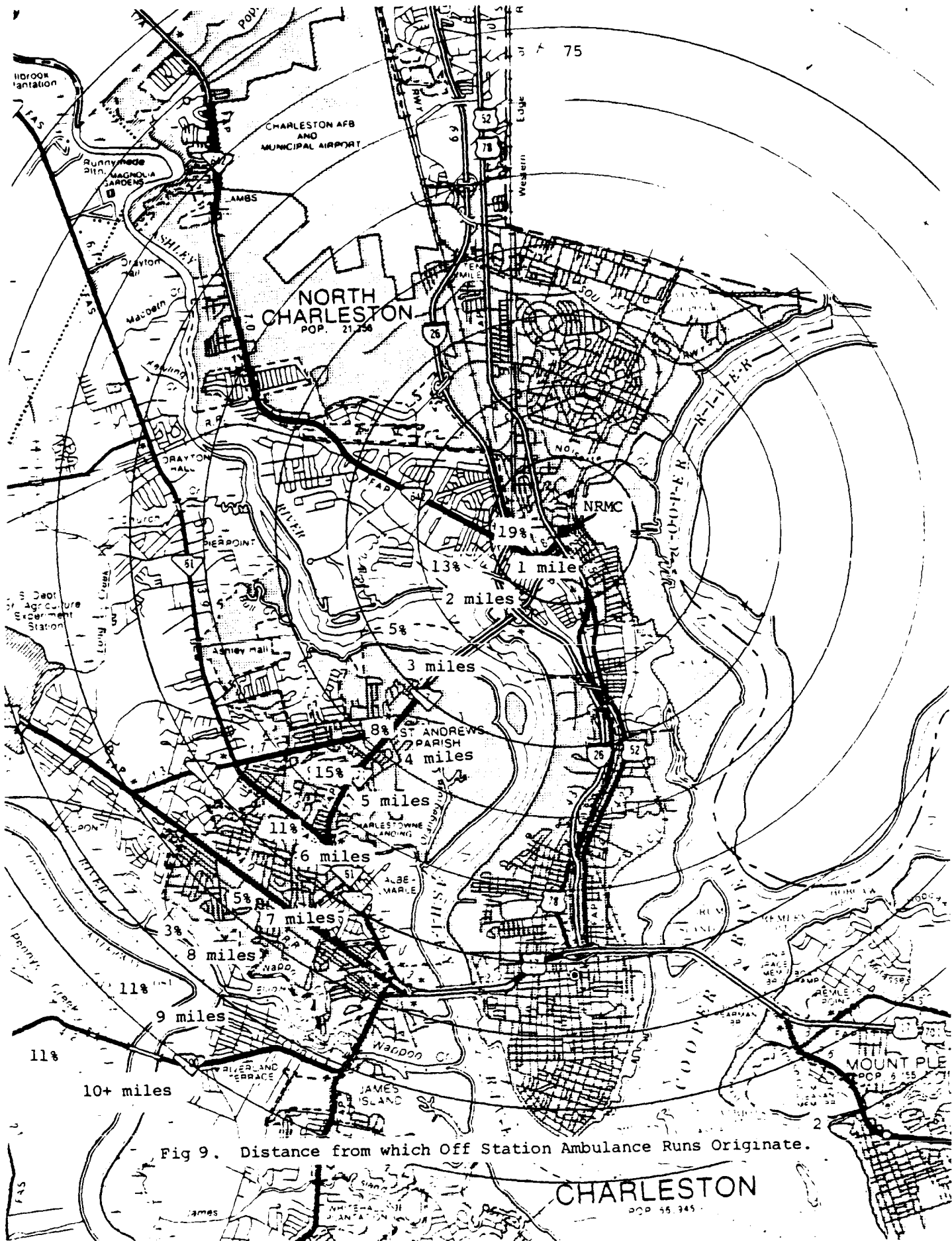


Fig 9. Distance from which Off Station Ambulance Runs Originate.

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indicates that the dispatch time ranges from one to fifty minutes for an average of 5.9 minutes, and the travel time ranges from one to forty minutes for an average of 9.4 minutes. Therefore, the available data indicates that the average ambulance response time for the program is 15.3 minutes -- approximately equal to the standard set by the Director of Administrative Services. It should be noted, however, that this information is based upon a sample drawn from available Data Cards. The proper recording of information on these cards is not monitored, and several weeks elapsed during which the data was not recorded, or only done so sporadically. Consequently, the available sample may not be a representative picture of the actual situation; however it is the best estimate available.

Equipment and Supplies

Table 10 is a photostatic copy of the current Inventory of Ambulance Equipment checklist, as amended. Table 11, lists the contents of the Life Support Box, and Table 12, lists the contents of the Trauma Box. These supplies are carried on all emergency ambulance runs for use by the attendants and/or other competent medical authority at the scene.

Personnel

Ambulance Attendants. -- Regardless of medical status, command policy directs that an attendant must accompany every patient in an ambulance. Analysis indicates that the majority of attendants are Hospitalmen (E-3) or Hospital Corpsmen Third Class (E-4); however physicians and/or nurses have accompanied patients when necessary. Figure 10, indicates, the distribution of attendants by rate for emergent and urgent transportation type runs.

TABLE 10

INVENTORY OF AMBULANCE EQUIPMENT

LOCATION/ QTY	ITEM	LOCATION/ QTY	ITEM
<u>SHELF 1</u>		<u>SHELF 7</u>	
1	Rashaln Cervical Device	2	Long Armboards
<u>SHELF 2</u>		<u>SHELF 8</u>	
<u>SHELF 3</u>		1	Adult Ambu
6	12 Ply 4x4	1	Pedi. Ambu
1 Box	4-4 Topper	1	Large Adult Mask
4	5x9s	1	Small Adult Mask
6	Kline	1	Childs Mask
4	Kerlex	1	Infant Mask
2	4" Ace	1 Box	Kleenex
2	6" Ace	<u>SHELF 9</u>	
<u>SHELF 4</u>		2	14fr Suction Cath
1	Trash Bag	1	18fr Suction Cath
2	O B Kit	1	6-10fr Suction Cath
2	Sterile Gloves	5	Masks
1	Suction Pistol	1	Tensil Suction
1	Urinal	2	50cc Irrigating Syringes
1	Foley Cath Kit	2	18fr N.G. Tubes
<u>SECTION BETWEEN CABINETS</u>			Scoop Stretcher (if carried)
2	Sodium Chloride for irrigation		Long Spine Board
	Suction ready for use with tip on.		Short Spine Board
	Oxygen ready for use with tank OFF		Emergency Stretcher
			MED Box (sealed. If not Inven)
			Trauma Box (Inventory Daily)
			TANK Pressures K _____ psi
			D-1 _____ psi
			D-2 _____ psi
NOTE: SHELF 5 AND 6 MAY BE COMBINED OR UNITS TO INSURE ALL SUPPLIES ARE IN THE SAME GENERAL AREAS.		<u>UNDER SQUAD BENCH</u>	
<u>SHELF 5</u>		1	Barre Traction
1	Bulb Syringe	1	Thomas Half Ring
1	Amphyl Spray		54" Splint
6	Drinking Cups		76" Splint
1	Charcoal		Fracture Pack (complete with 2 legs, 2 arms, 1 shoulder, 1 cradle).
8	Med Cups	2	11 lb. Sandbags
2	Ipecac	1 Set	Restraints
<u>SHELF 6</u>		2	Medium Cervical Collars
1	Venti-Mask	2	Large Cervical Collars
2	Nasal Cannula		
2	Non-Rebreather Masks		
2	Oxygen Tubing		
2	Emesis Basins		

TABLE 11

CONTENTS OF LIFE SUPPORT BOX

<u>QTY</u>	<u>ITEM</u>	<u>QTY</u>	<u>ITEM</u>
3	Sodium Bicarb	1	Betadine Oint.
2	Atropine	1	0.9% Saline
2	Xylocaine 100 mg.	1	Ringers
1	Xylocaine 1Gm	1	D5W
2	Epinephrine 1: 10,000	2	IV Set Ups
1	D 50	2	Arm Boards
3	Calcium Chloride	2	Kling Bandages
	Assorted Angiocaths	2	4 X 4
	Assorted Blood Tubes		Adhesive Tape
2	20cc Syringes		Esophageal Obturator
1	10cc Syringe		Ambu Bag
2	Vacutainer Needles		
1	Vacutainer Holder		
	Assorted Airways		
1	Dextrostix		
2	Ipecac		
1	Ammonia Inhalant		
	Medcups		
	Alcohol Prep Pads		
	Betadine Prep Pads		

TABLE 12

CONTENTS OF TRAUMA BOX

ITEM

Flashlight

Sterile H₂O

Slings

Surgipads

Quick Cold

Bulb Syringe

Arm Boards

Vaseline Gauze

Topper 4 X 4

Kling Bandages

Band Aids

Adhesive Tape

Tongue Blades

Eye Patches

There is no requirement for certification before assignment as attendants.

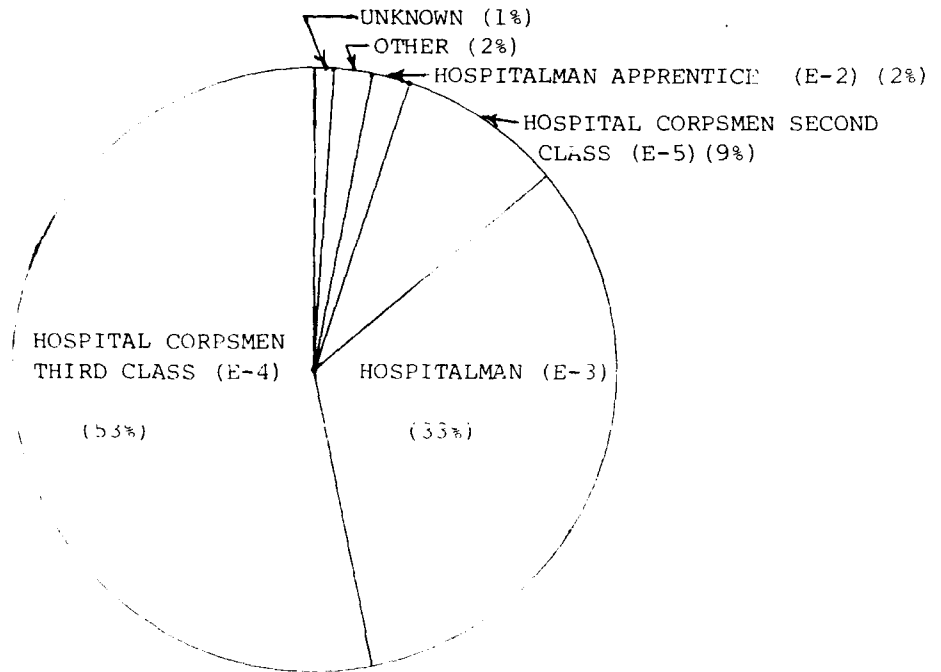


Fig 10. Distribution of Ambulance Attendants by Rate -- Emergent and Urgent Runs

Drivers. -- Figure 11, describes the distribution of personnel assigned as ambulance drivers by rate for emergent and urgent type runs. There are no requirements for the drivers to be qualified in first aid or cardiopulmonary resuscitation techniques. There is no formal certification process for personnel prior to assignment as ambulance drivers.

Education and Training

Emergency Medical Technician Course. -- Recently the Ambulatory Care Service began to provide personnel assigned to the Emergency Room and as



TOTAL EMERGENT AND URGENT RUNS

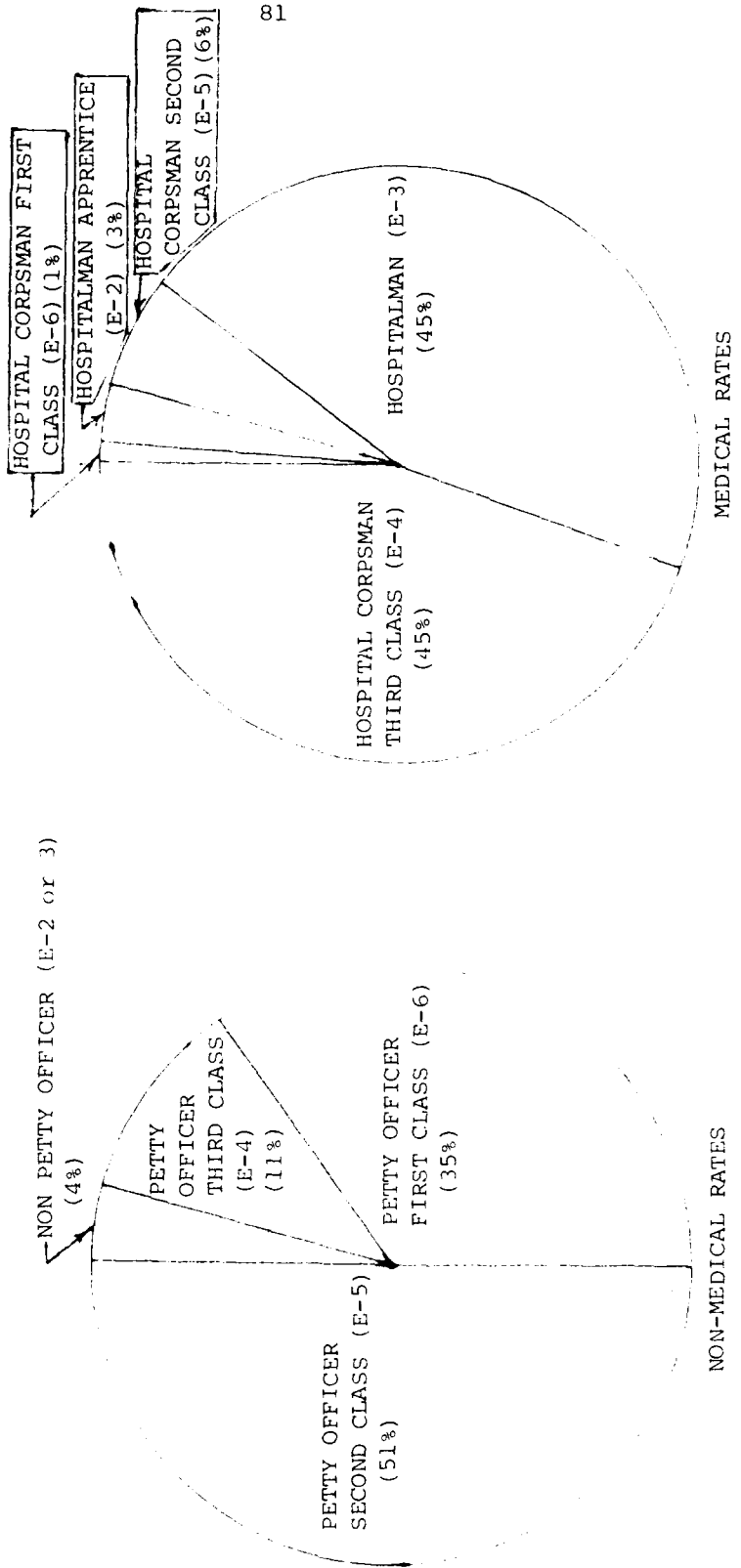


Fig 11. Distribution of Drivers by Rate -- Emergent and Urgent Runs

ambulance attendants instruction in emergency medical techniques. The course is loosely designed along the lines of that recommended by the American College of Surgeons, with allowance for previous Hospital Corps School training. The course lasts seven days and provides 66 hours and 40 minutes of class time. The course is predominately taught by a Hospital Corpsman Third Class (E-4) with occasional assistance by the Head of the Emergency Room and Emergency Room Charge Nurses. Data provided by the Administrative Support Service indicates that 58 percent of the personnel assigned as ambulance attendants have successfully completed the NRMC Emergency Medical Technician course.

Ambulance Driver Indoctrination Course. -- All personnel assigned to drive ambulances are tested and issued government vehicle operation licenses at the Naval Station. After this license is obtained, the personnel are required to drive an ambulance through an obstacle course, and then they are assigned to duties as ambulance drivers. Additionally, the Operating Management Service has recently established an indoctrination course to familiarize ambulance drivers with their responsibilities and driving conditions in the Charleston area. Statistics regarding this program indicate that less than one percent of the personnel assigned to such duties have completed the course.

Continuing Education. -- Although there is no formal continuing education program currently directed to ambulance drivers and attendants, the Head of the Emergency Room attempts to critique every emergency run with the staff members involved.

Footnotes

1

U.S. Department of Defense, Department of the Navy, Naval Regional Medical Center, Charleston, S.C., Instruction 11240.2 Emergency Ambulance and Transportation Services; Standard Operating Procedures, 1 February 1973 with change one, dated 20 September 1979.

2

The percentage of off station ambulance runs were calculated for each distance by plotting the origin of 239 such requests by active duty, retired, and dependent beneficiaries. This represents 90 percent of such requests from these groups, and 83 percent of the total number of off station runs. The remainder of the runs were not plotted because of the absence of required street addresses, or because they were for categories of patients not normally afforded this service, e.g., civilian humanitarian and civil service personnel not injured on the job.

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