New York City's Experience in Improving Ambulance Service

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THE shortcomings of ambulance service in the United States were the focus of the first of a series of articles on emergency medical care published by Medical World News (*1*). Among the faults cited were inadequate training of ambulance personnel, poor coordination of ambulance service with hospital services, and lack of proper equipment. Also mentioned was the cost of ambulance service, a factor that may be minimized in the enthusiasm of encouraging better service; however, costs can scarcely be overlooked in the current controversy over spiraling medical costs.

While New York City's experience in emergency ambulance operation may vary from that of other urban areas in the United States, the need to face economic reality is universal today. Although it is naive to divorce cost and quality, it is equally naive to believe that quality must always be costly. Faced with an unhappy fiscal reality, the New York City Health and Hospitals Corporation, and its predecessor, the New York City Department of Hospitals, have attempted to minimize increased ambulance costs while maximizing increased services.

Following an analysis of the operation of the existing ambulance service, a number of steps were taken to improve the service while keeping costs at a minimum.

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Background Problems

The emergency ambulance service furnished to the City of New York through the New York City Health and Hospitals Corporation has long been a subject of public criticism. A report prepared by the New York Academy of Medicine in 1967 recommended that the service become a police function, as the academy had suggested in a similar report some 40 years earlier (*2*). From time to time, other reports and newspaper articles pointed out inadequacies. In the 1965 mayoralty campaign, John Lindsay cited the need for improved ambulance service in a campaign "white paper."

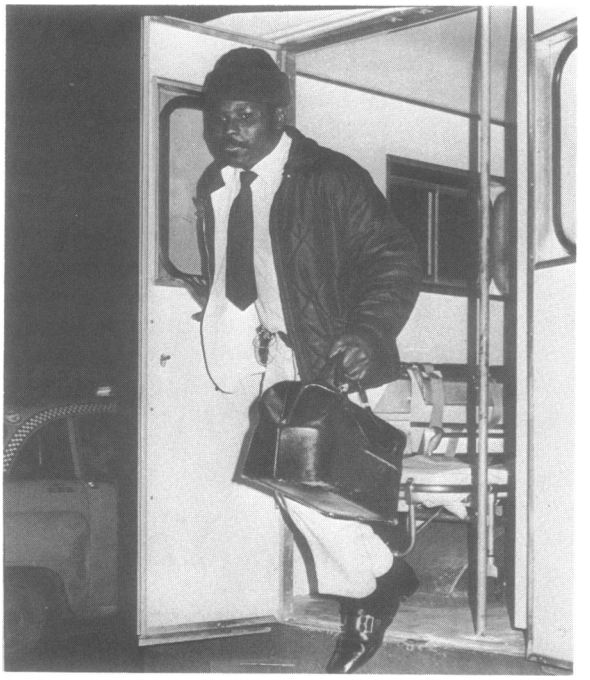
As it functioned in 1968, the ambulance serv-

ice had changed little in 20 years except for a substantial increase in the number of calls. The emergency fleet numbered 109 vehicles during the busiest of the three daily tours. Of this total, 45 vehicles were operated by 32 voluntary hospitals in the five boroughs under a contract with the city. The remaining 64 emergency vehicles operated from 15 municipal hospitals.

Although the then department of hospitals maintained a central director's office for ambulance and transportation services, control of the service rested as much, if not more, with the 47 voluntary and municipal hospitals operating ambulances. Each was responsible for training its own attendants and equipping vehicles. The quality of ambulance service in a particular area of the city was actually a manifestation of the interest of the administrator and staff of the local hospital. Central control, in actuality, seemed to be exercised by the police department, which dispatched the ambulances through its borough office and by 1968, its central communications bureau. With three separate entities (police, general hospitals, and the ambulance and transportation office) involved in ambulance control, little real control or coordination existed. The police communications bureau had the chronic chore of attempting, at the beginning of each shift, to ascertain the number of ambulances in operation.

Since assignment to ambulance duty was considered punishment for ward aides by some hospital administrators, the resultant lack of dependable attendants resulted in poor attendance and ambulances frequently being out of service. Hospitals tended to set their own training criteria for ambulance attendants and equipped their vehicles as they saw fit. Since all ambulances were hospital based, they were unevenly dispersed with respect to the location of requests for them. This situation resulted in extended runs, some as long as 5 miles through city streets.

With an annual increase of 10 percent in the number of calls, it was inevitable that complaints about delayed responses would become more frequent. By 1968, the total number of calls reached 600,000, an annual average of almost 6,000 calls per vehicle. At this rate of calls and at an average time of ½ hour per ambulance run, delays in response to calls occurred every day in many parts of the city, because not only was the ambulance closest to the location of the call busy, but so also were nearby backup ambulances. As complaints and publicity on delayed responses increased, the scope of complaints widened to the lack of equipment, poor training, and dated vehicles.



Ambulance technician leaves ambulance at scene of call

Steps Taken

In 1968, the then commissioner of hospitals, Joseph Terenzio, appointed a full-time director to develop realistic plans for improving ambulance service. At first the lack of additional financing appeared in fact, if not in theory, to preclude any improvement but, after close scrutiny of operations by department of hospitals' personnel, what seemed impossible initially turned out to have at least a partial possibility of success. In 1968 the Office of the Deputy Mayor of the City of New York issued a report on the ambulance service including recommendations for improvement (*3*). A prominent recommendation was the further geographic dispersal of ambulances—begun as a pilot project by the department of hospitals the year before.

The first step taken toward improvement was to centralize control of the municipal hospitals' ambulances. Control and direction became the sole responsibility of the formally organized emergency medical services. This move permitted overall policy direction and standardization of training and equipment. It also meant that area-

Table 1. Effect on number of calls per ambulance after transfer of 13 ambulances

Shift	Number ambulances assigned	Average number calls per shift	Average number runs per ambulance
Before transfer:			
12 p.m.– 8 a.m.....	88	310	3.5
8 a.m.– 4 p.m.....	105	530	5.0
4 p.m.–12 p.m.....	109	660	6.1
After transfer:			
12 p.m.– 8 a.m.....	75	310	4.1
8 a.m.– 4 p.m.....	105	530	5.0
4 p.m.–12 p.m.....	122	660	5.4

wide planning could begin without depending on the individual interests of a hospital.

Most important, the mission of providing emergency ambulance service became the function of a single agency rather than a group of hospital administrators beset with the multiple problems of operating a hospital. Centralization also permitted markedly increased flexibility in field supervision, a quality which had been lacking under the decentralized system. Centralization was achieved without any increase in budget allocation.

Redeploying Resources

The second step was an examination of the volume of calls which seemed to be constant; that is, there did not appear to be a practical method of reducing the number. Conversely, there was no possibility of increasing the total number of ambulances because of financial constraints.

A study of New York City's ambulance service in 1966 by Dimendberg (*4*) revealed a distribution pattern of calls that subsequent study by the emergency medical services confirmed. Particularly noticeable in this pattern was the marked difference in the number of calls between the midnight to 8 a.m. shift and the 4 p.m. till midnight shift.

Table 1 shows that the number of calls on the 4 p.m. to 12 p.m. shift was more than double the number on the after midnight shift. With each ambulance averaging more than six runs a shift, it was not surprising that backups occurred; that is, all ambulances in a given area would be on runs at the same time with the result that ensuing calls could not be readily answered.

The objective, therefore, was to reduce the workload on the 4 p.m. to 12 p.m. shift in order to increase the availability of ambulances and therefore cut down on the backlog of calls. Thirteen ambulances were changed from the midnight shift to the 4 p.m. to 12 p.m. shift. The result was a decrease of 0.7 of a call per vehicle (table 1). At the same time the average number of runs per vehicle on the midnight shift increased a like amount.

While this transfer may seem to be a "rob Peter to pay Paul" maneuver, table 2 shows that some benefit is gained because of the difference in call rate. Theoretically, the ambulances newly assigned to the 4 p.m. to midnight shift will be twice as heavily used as they were on the midnight to 8 a.m. shift because of the larger volume of calls received. While the change effected cannot be termed dramatic, it nevertheless achieves the objective of better use of resources.

Ideally the number of runs per ambulance per shift should be equal on all shifts; however, it was felt necessary to maintain a minimum of 75 ambulances on the midnight shift to cover the still relatively busy period from midnight till approximately 2 a.m. A second reason was to maintain a minimum level of ambulances in the event of a disaster.

Dispersal of Ambulances

Similar reasoning was used in redeploying ambulances by geographic location. Ambulance districts were redrawn in order to create districts that would generate four to five runs per shift

Table 2. Potential utilization following transfer of 13 ambulances

Shift	Net change in number of assigned ambulances	Potential number of runs lost or gained [1]	Average number of calls per minute	Theoretical number of calls lost or gained
12 p.m.– 8 a.m.....	−13	−208	0.65	−135
4 p.m.–12 p.m.....	+13	+208	1.38	+287

[1] Using an average duration of ½ hour per run, an ambulance can potentially make 16 runs in an 8-hour shift (16 X 13 = 208).

per ambulance. A further innovation undertaken to increase the availability of ambulances was to establish other stations in areas not near hospitals —with the objective, of course, of reaching patients quickly. In the first application of computer simulation to the operation of an ambulance system, Savas demonstrated the efficiency of the outpost idea in saving time (*5*). His studies gave impetus to the dispersal of ambulances in New York City, resulting in setting up 17 outpost stations at this time. In the enthusiasm to implement the outpost program a number of sites were selected which operationally were not successful because of inadequate facilities for the ambulance and crew.

Armed with this experience, we have established more rigid criteria in selecting outpost sites. The majority of the present outposts are located at department of health facilities where rental or building costs are not a factor.

Screening by Nurses

Temporal and spatial reallocations of existing resources have been important means of reducing ambulance response time. More important, however, in the availability of ambulances is the ratio:

$$\frac{\text{Number of calls}}{\text{Number of ambulances}}$$

The larger the denominator or the smaller the numerator, the greater the availability, and hence less delay in waiting for or finding an ambulance. In New York City these two factors are more important than traveling distance or time. The denominator is solely a cost item; increase in number equals increase in cost, and therefore it was dismissed as a likely possibility.

Reducing the number of calls (decreasing the numerator), although discussed by hospital and city administrator planners in 1968, did not receive full attention until 1970 partially because of the political implications. Reducing calls meant denying service, and a public accustomed to such service might well react adversely. But the need for action led to an experiment in the last 3 months of 1970 that, on first inspection, appeared to offer a realistic hope of increasing the availability of ambulances.

Registered nurses were assigned to answer the central ambulance-police telephone number 911 with the objective of screening ambulance requests of questionable need. Within a few weeks

Screening nurse at central ambulance communications center

of the project's inception, the three assigned nurses were screening out 75 to 80 calls during the daytime shift alone and, in the great majority of calls, without upsetting the caller. On the contrary, many who telephoned seemed relieved to be able to talk with a professional and were more than willing to take other means of transportation to a hospital. All callers who demanded an ambulance despite the nurses' screening had their requests honored pending a decision on completion of the project.

Although their salaries are a cost item, the three nurses have been able to do work equivalent to 15 ambulances. Assuming an ambulance makes 5 runs per shift, 75 ÷ 5 equals 15, or the services of 15 ambulances per shift. Put another way, the nurses have placed another 15 ambulances in service at about 5 percent of the normal cost of operation. At a time when the cost of operating an emergency ambulance in New York is almost $100,000 per vehicle per year, alternatives to placing added vehicles in service to meet escalating demands are a necessity if an emergency service is to be maintained.

In the spring of 1972 the emergency medical

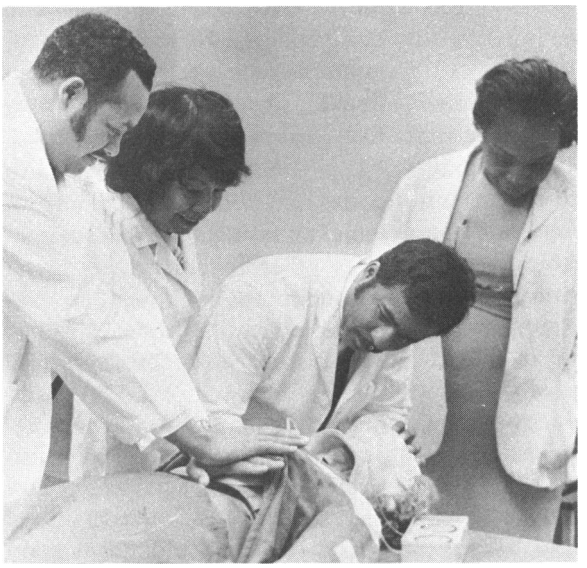
services will begin operations in its own ambulance dispatch center. While still relying on the emergency telephone number 911 to receive calls, the new center will be separate from the police department, and will be manned by ambulance personnel. Based on the results of the call screening project, registered nurses will be assigned to the center to answer call requests if the need for an emergency ambulance is questionable.

Training

There can be no doubt that rapidity of response is essential on many calls. Proper care rendered to the patient by the ambulance crew is even more essential. Proper care is dependent on adequate training.

One of the first responsibilities assumed by the emergency medical service after its inception was the training of ambulance attendants. Initially the training course consisted of 160 hours equally divided between classroom activity and riding as an observer on an emergency ambulance. Eighty hours have since been added, with half of this time spent in an emergency room and the remainder in a hospital obstetrical department. No charge is made by the hospitals involved in the teaching services. Since emergency medical service employees must be paid while training, there is a cost factor, but it is our feeling that economy that accrues from decreasing training is false economy.

While entry training has been augmented, it has become obvious that intermittent refresher training is needed. Since there is no possibility of hiring additional personnel to cover those receiving refresher training, a program is being developed to hold short refresher sessions for four or five ambulance crews at a time. The crews will be called from different parts of the city so as not to deplete any area of coverage. Training between runs was attempted but found to be of little value because of the frequent interruptions to answer calls. Removing ambulances from service for short periods of time for training purposes is, admittedly, a compromise with respect to increasing ambulance availability, but a compromise that would appear to be justified.



Nurse instructor with ambulance technician trainees

Vehicles

Salaries of personnel account for 90 percent of the cost of operating New York City's Emergency Medical Services. Reallocating ambulances by shift and location and screening calls are attempts to use personnel effectively and reduce the need to add more personnel. The 10 percent of costs for equipment deserves further mention.

Spiraling costs have had much to do with the appearance of several ambulance models in recent years, but there still exists what could perhaps be described as a national fetish for having "the best," the sleek, heavy, and expensive vehicle. New York's ambulances, although derisively referred to as bread vans, meet their designed objectives at one-half or one-third the cost of the more expensive models. Three patients can easily be handled in the vehicle's larger patient compartment, which also permits easy entry and movement within for crew and patients. Also important in selecting these vehicles are maintenance and repair costs, which are proportionately lower than for the more expensive models.

Summary and Conclusions

It has become fashionable in recent years to call in outside consultant systems analysts to provide management with recommendations for more efficient operation. While this approach has the advantage of an objective view by professionals, it is costly. Also, it is often difficult for an outside consultant to grasp the subjective elements of an operation, and it is these that determine how a system actually works. While the contributions of the consultant must not be overlooked, operating managers should not be afraid to examine

their systems closely and effect realistic changes, major and minor, that will result in the most efficient and practical use of their resources. The ever increasing cost of providing health services mandates this attitude.

The New York City Health and Hospitals Corporation adopted this approach with the knowledge that getting additional funds to improve service was unlikely. Control and administration of the ambulance service were centralized, and ambulances were redeployed temporally and geographically without additional cost. Having nurses screen calls does incur some expense as does training of ambulance technicians, but the cost benefit would appear to be great. In order to keep costs down, vehicles are selected on the basis of function rather than style and appearance.

These changes have been made after examination of the ambulance system by existing staff of the emergency medical service and, to a lesser extent, on the studies and recommendations of the deputy mayor's office.

What has been done in New York may not be fully applicable to other cities or towns. What can be of benefit is the approach to providing an ambulance service that is adequate both qualitatively and quantitatively at minimum expense.

REFERENCES

(*1*) The crisis in emergency care. Med World News 11: 24–32, Dec. 4, 1970.

(*2*) Ambulance service in New York City. Report by the Committee on Public Health, the New York Academy of Medicine. Bull NY Acad Med 43: 336–345, April 1967.

(*3*) City of New York Emergency Ambulance Service, report by the Office of the Mayor. Office of Administration, March 1968.

(*4*) Dimendberg, D. C.: An analysis of the ambulance service of the department of hospitals. Department of Hospitals, City of New York, November 1967.

(*5*) Savas, E. S.: Simulation and cost-effectiveness analysis of New York's Emergency Ambulance Services. Management Sci 15: B608–B628, August 1969.

HOLLOWAY, RONALD M. (Emergency Medical Services, New York City Health and Hospitals Corporation): *New York City's experience in improving ambulance service. Balancing costs with services. Health Services Reports, Vol. 87, May 1972, pp. 445–450.*

National concern about the quality of emergency ambulance service has been reflected in New York City. The need for improvement was recognized by the New York City Health and Hospitals Corporation and the Deputy Mayor's Office of the City of New York as was the need to effect improvements without significant expenditure of money due to a continuing fiscal crisis.

Examination of the existing ambulance system by the hospital corporation's emergency medical service staff, coupled with recommendations made by the deputy mayor's office, revealed that a number of improvements could be made at no cost. These included centralized control and administration of the emergency ambulance service and the redeployment of ambulances geographically and temporally to better meet call demand.

Training of ambulance attendants was also standardized and expanded into a 240-hour entry training course. In an experiment, registered nurses were used to screen questionable requests for ambulances made to the emergency telephone number 911. The nurses were able to identify a significant number of calls not requiring an emergency ambulance, resulting in a decrease in ambulance runs. In effect, their screening freed additional ambulances for urgent runs.

While training of attendants and the use of nurses for screening calls are cost items, the cost benefits that result are well worth the expense. Economy has also been achieved by purchasing ambulance vehicles that are functionally sound, but far less costly than the more stylish models.

The continuing rise in medical costs and the fiscal plight of many cities mandate that alternatives other than increased fiscal expenditures be found to improve services. Experience gained with respect to effecting improved services in New York City's ambulance system indicates that resources can be used more effectively without significant cost increases. While the details of ambulance operation will vary from city to city, the need to maximize resources should not vary.