lance and air medical services. Representatives from all of the participating jurisdictions determine the center's operations and procedures. An independent center is generally controlled by an entity that does not own or operate an ambulance service, but which sells dispatch services to a number of agencies or companies.

The advantage of a combined center is that a number of entities share the infrastructure costs, resulting in a per-transport cost reduction and allowing the system to install advanced computer capability.

SECTION 4

Deployment and Scheduling

Deployment is the strategy used for maneuvering ambulances and crews to reduce response times. It may be based on expected call volumes and geographic coverage requirements, or it may be a function of existing facilities. Every system uses a deployment plan of some form, whether it is in the dispatcher's head, on paper or in the computer. All services can benefit by formalizing the process of strategic unit deployment.

The simplest deployment situation involves one vehicle. If the service provides emergency response for an entire county, the ambulance might be positioned right in the middle of the county. That placement decision may seem to be the best because responses can be made to all four corners of the county in the same amount of time. Even so, geography is not the only consideration, and the centralized location may not be the best place to station the ambulance. Other factors that may be even more important include where most of the people reside and where the majority of emergency calls originate.

For example, if most of a county's residents live in a medium-sized town in the north-central part of the county, it may be better to position the ambulance at the southern edge of town. It can readily respond from this area to the population center while also responding to the rest of the county. This is the concept behind deployment planning.

Unfortunately, even this placement may not guarantee that the ambulance is located at the center that receives most of the requests for emergency help. It may be that most of the emergency responses are directed toward an interstate at the southern edge of the county or to a group of taverns on the western county line. The locations of potential emergency events should be taken into consideration when placing ambulances.

One way to determine emergency-response locations is to place colored pins for emergency calls on a large map over a certain period of time. Different colored pins can be used to distinguish different types of calls or various times of the day. After a few hundred pins, a pattern develops. By carefully identifying areas with higher concentrations of pins (calls), it is possible to make an intelligent decision about vehicle placement. The information can be shared with dispatchers, shift supervisors and CEOs to garner support for other decisions, such as whether more or fewer vehicles are needed, and so on.

Although this is the most rudimentary deployment plan for the smallest of services, it would be an improvement over what many services currently use. Many larger systems that use flexible deployment consider a number of other variables and base pin placement on days of the week and hours of the day. This helps determine, for example, where ambulances need to be placed at 10 a.m. on Tuesdays, and how many. Other possible variables that could be considered include season of the year, weather, special activities and other factors that may influence the locations of emergencies.

This process can be highly complex. Some of the larger services, with thousands of monthly calls, must resort to computer assistance for help in determining stationing options for their crews. Comprehensive flexible deployment entails moving the optimal post locations of the crews, sometimes on an hourly basis, to achieve the shortest possible response times.

The crucial issue is not what kind of deployment planning process is used, but that there is some rationale and validation for why and where ambulance resources are placed. Good management of the system helps to reduce response times as well as the total time a crew will be tied up with a particular call.

Let's look at flexible deployment on a more comprehensive basis.

A number of EMS systems have implemented comprehensive flexible deployment procedures in the wake of growing pressures to improve response times and increase their efficiency. The only way an EMS system can improve response times without additional resources is to redistribute the current resources to match the activity levels of the system.

While the overall concept is sound, there are many drawbacks with aggressive flexible deployment systems. These include a perceived need for expensive CAD systems; a faulty assumption that all calls will require one unit hour; an unnecessary toll on personnel due to frequent post-location changes; and, most importantly, the fact that posting for call demand supersedes geographic coverage, frequently resulting in unacceptable and even life-threatening response times in peripheral parts of the service area.

All EMS organizations have deployment strategies. These strategies are as diverse as the number of EMS providers and meander from one end of the spectrum to the other. Typically, dual-role fire departments base their coverage plans on geography, distributing ambulance resources among various fixed fire stations to provide the shortest response time to a particular location. The other extreme positions units based exclusively on historical demand on street corners or other locations, and continually redeploys ambulances. The most inefficient type of deployment keeps ambulances at a single central base. None of these types of deployment should be practiced by modern EMS agencies.

Flexible deployment uses specific strategies and tools developed within the constraints and objectives of the deployment plan. Traditionally, planners have placed excessive emphasis on response times, which results in a geographic coverage deficiency. There also has been a negative impact on field personnel. Although advanced techniques have been developed to address these and other constraints, many practitioners have failed to modernize their deployment plans to incorporate some of the more personnel-sensitive procedures. As with any tool or plan, misuse can lead to problems.

The concept of flexible deployment addresses the needs of four EMS groups. These include those services in which labor or management have experienced real or perceived negative consequences from the use of full-blown aggressive deployment techniques, tiered systems with ALS and BLS resources, fire departments and other services that incorporate fixed geographic posts or 24-hour units as the primary deployment method, and services that do not employ modern CAD technology.

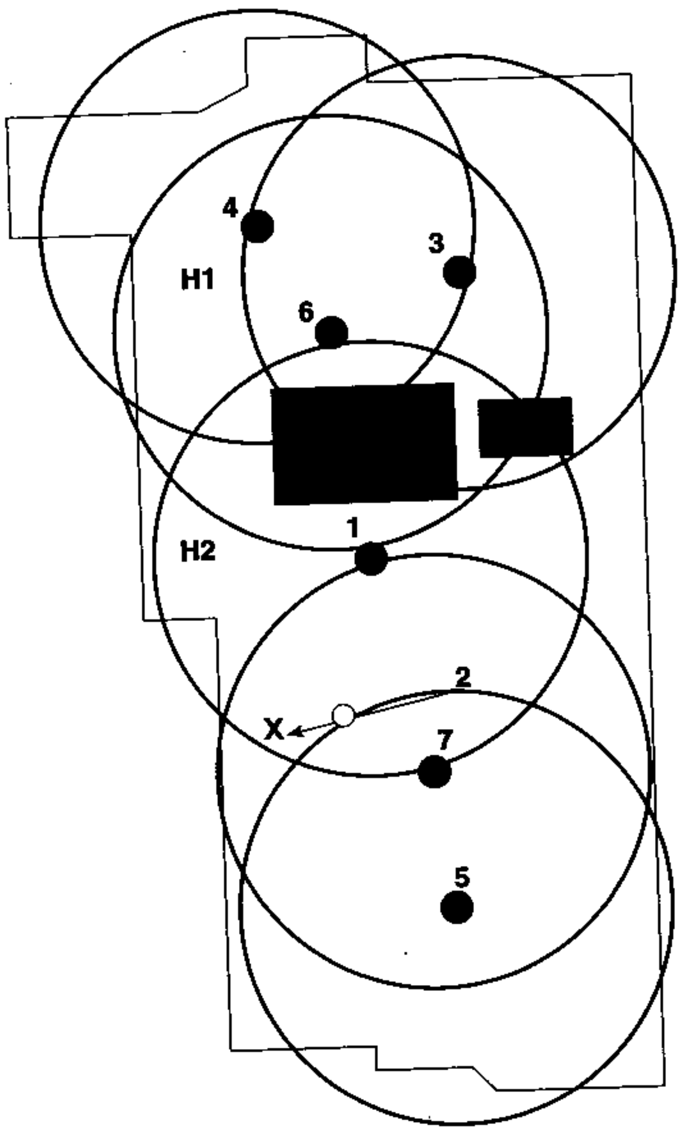
The optimal flexible deployment system is generally a compromise between the deployment strategy extremes. It places emphasis on geographic coverage, and it constrains system dynamics to prevent excessive crew movement. At the core of flexible deployment is the development of base geographic coverage. Demand coverage is added to this geographic coverage. The concept is that as long as the integrity of geographic coverage is maintained, response-time performance objectives can be achieved. This creates three different levels of intensity in the deployment plan, depending on real-time activity levels and available resources.

Initially, when activity in the system is slow, only minimal unit movements are required, and only when geographic coverage is compromised. A second level requires a moderate redistribution of resources to maintain the geographic base. Finally, when resources are not adequate to fully cover the service area, aggressive unit movement strategies are implemented. Figures 4.10, 4.11 and 4.12 demonstrate this concept.

The flexible deployment strategies presented here are designed to provide response-time equity systemwide by maintaining geographic base coverage as well as limiting the amount of required redeployment.

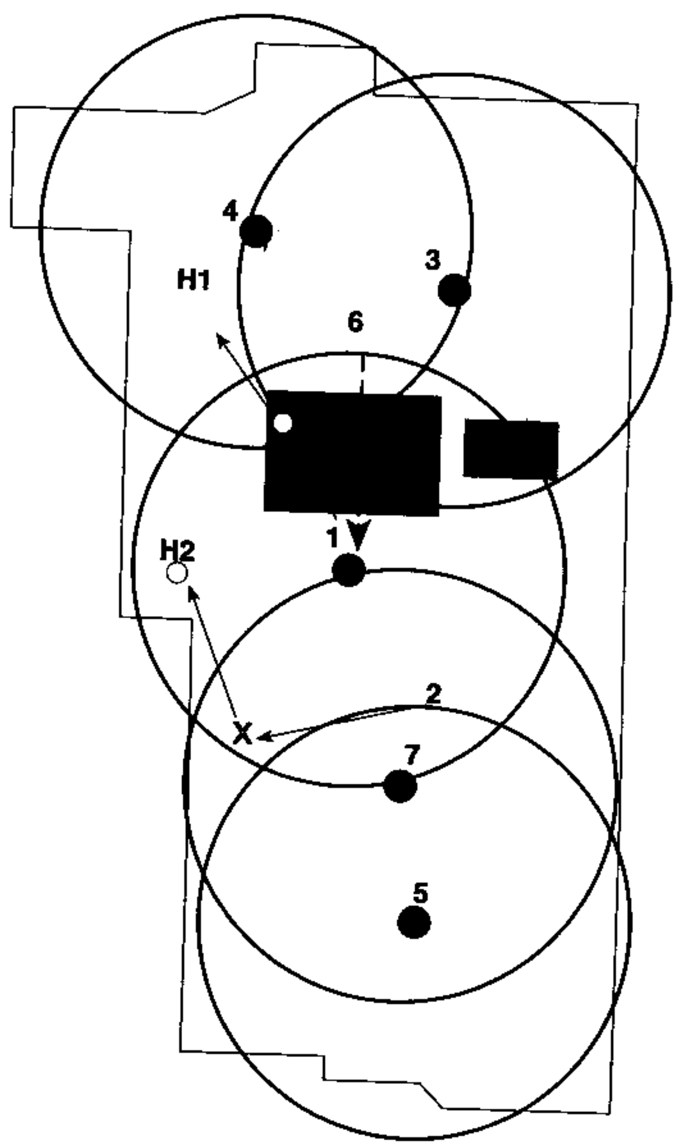
An optimal flexible deployment may require more resources than the most aggressive strategies in some systems, but it represents significant savings over deployment practices currently used by most EMS providers. It does not require

Figure 4.10: Flexible Deployment One Unit on Call—Coverage Impact



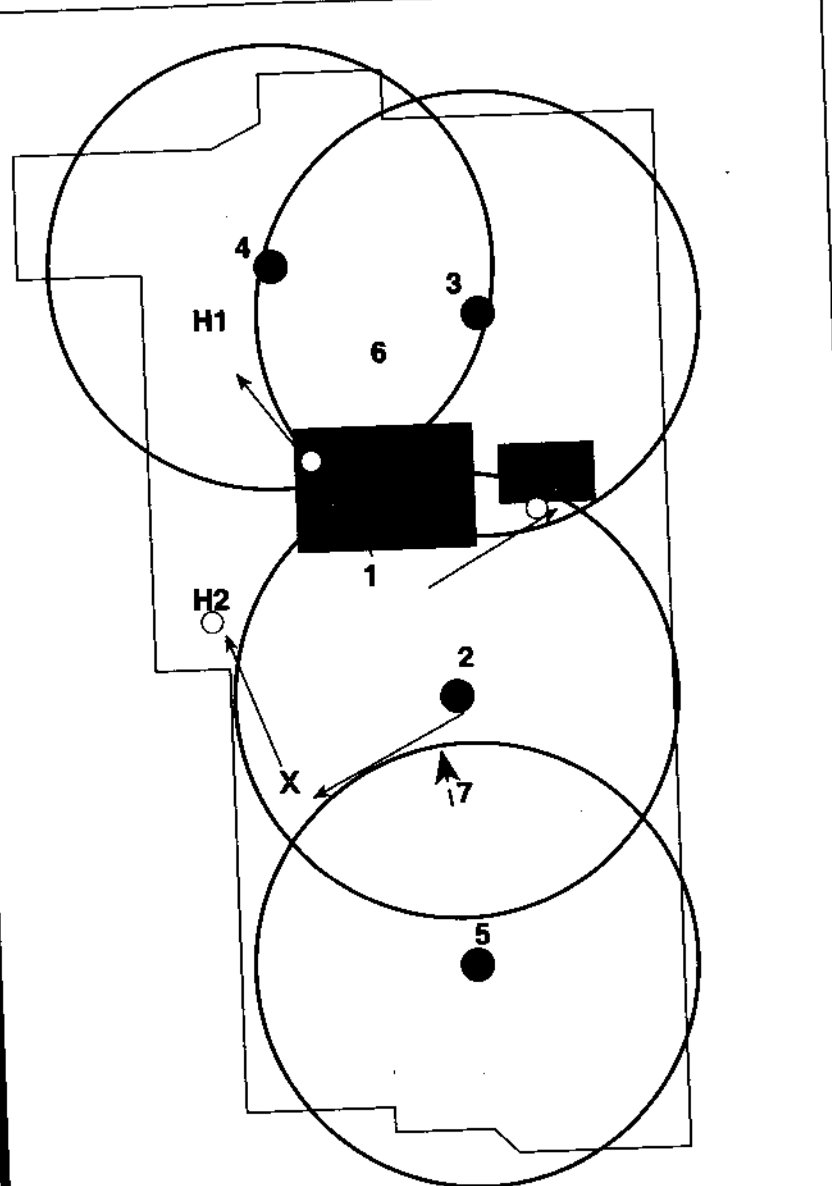
- 1 through 7 are ambulance post locations
- H1 and H2 are hospitals
- Dark shaded area—busiest section of city
- Lighter shaded area—second busiest area of city

Figure 4.11: Flexible Deployment Two Units on Call—Coverage Change



- 1 through 7 are ambulance post locations
- H1 and H2 are hospitals
- Dark shaded area—busiest section of city
- Lighter shaded area—second busiest area of city

Figure 4.12: Flexible Deployment Three Units on Call—Coverage Change



- 1 through 7 are ambulance post locations
- H1 and H2 are hospitals
- Dark shaded area—busiest section of city
- Lighter shaded area—second busiest area of city

extensive technology support but can be implemented by sophisticated CAD systems. It reduces unnecessary unit movement and provides the ability to address demand fluctuations and instances of peak load.

Determining Post Locations

A flexible deployment strategy can facilitate minimum response times with optimum resource allocation. It can enhance productivity without increasing workloads to stressful levels. And it can provide a better balance between systemwide response-time objectives and geographic coverage requirements than most systems now have.

The greatest barrier to efficiency is the need to dispatch vehicles from point to point in response to events that occur randomly and at different times. Even with advanced CAD technology compiling call patterns, it is difficult to predict where the next call will come from.

Zone Defense

A flexible deployment plan provides a basis for maximizing response resources and minimizing post reassignments. It is a zone defense—ensuring coverage of a defined geographic area at all times and augmenting this basic grid with additional units to meet anticipated call demand.

A fundamental goal of flexible deployment is to ensure that the service area has adequate units available to provide geographic coverage for any next-call assumption, so that response-time goals for individual calls can be achieved with the highest possible frequency. To accomplish this, three basic components of a deployment strategy emerge: assurance of geographic coverage, providing demand coverage, and post-reassignment strategies.

Geographic coverage

Geographic posts must be identified to provide base-line spatial coverage of the service area. These posts may be co-located with a "demand" unit, or they may stand alone. Geo post coverage under a normal deployment scenario would be handled by what is considered a "cool" unit, that is, one which has a lower probability of responding than a demand unit. Geo posts are important in covering lower-density portions of the service area that may be underserved. An appropriately placed geo post may mean the difference between a seven- to 10-minute response or an unacceptable 15- to 20-plus-minute response to a fringe zone.

Evaluation and input from communications center personnel are needed to provide optimal geo coverage. Additional post locations other than those provided as station candidates may need to be evaluated and implemented.

Demand coverage

Demand posts are designed to place units in areas of highest predicted demand. This can significantly reduce the movement of posts. Demand posts are located in a fairly dense pattern to improve response times, speed up unit availability and reduce post moves if geo posts are maintaining the overall integrity of the system coverage.

Reassignment Strategies

Individual post-allocation plans are designed to maintain geo coverage and meet system demand under normal circumstances. If hospitals are consistently used as demand posts, or occasionally as geo posts, the system should maintain an adequate level of coverage at these posts as units become available.

In most cases, domino-style move ups (many units making incremental post-to-post moves to extend coverage) are not needed. Under normal practice, a unit that calls in as available should first be assigned to a non-covered geo post. The unit then should be assigned to the nearest post or, finally, to a demand post. The closest unit always responds to emergencies. Any time a geo unit is placed in service, coverage must be re-established with either an inactive demand unit or the first available unit completing an assignment.

On the other hand, if a demand unit is activated, there is rarely a need to reassign a unit to that post.

Post coverages, whether demand or geo, are not static zones, but instead represent the response range a unit can cover at a specific moment in time. Flexible deployment reflects the contraction and expansion of these ranges as system characteristics and demand fluctuate.

Post-selection Process

Because of the importance of geographic coverage, mapping is an essential tool. However, many CAD systems employ gridded map bases that divide the service area into neat little "chunks" that are ineffective in determining post locations. A service area cannot be maintained as if travel speeds and modes of egress were equal in all directions. To truly determine the distances and obstacles within an area, input must be obtained from communications center and field personnel.

In addition, a reliable analysis of call-pattern data is essential to devising a demand post-locating strategy. This data, in combination with an algorithm to estimate travel times throughout the topologically varied service area, provides a basis for identifying multiple post-location alternatives.

The deployment plan will be devised on the basis of geo and demand post locations and anticipated call volumes. Once defined, the post locations should be field tested and adjusted as necessary.

The Deployment Plan

While all EMS organizations have some kind of deployment plan, most have not fully studied or applied strategies that make the best use of available resources. The range of deployment possibilities varies considerably from the most static (all ambulances located and dispatched out of a single location) to the most dynamic (ambulances constantly moving or roving throughout the service area). The best system for deployment lies between these two extremes and is based on the activity levels of the EMS system and the total resources available to respond and provide coverage.

These are the basic concepts behind developing effective, flexible deployment systems. It is impossible to provide adequate information to cover all of the techniques and methods available to establish a complex deployment plan. That activity requires a multi-day training program and deserves an entire textbook.

Deployment planning requires understanding a number of factors, including response-time measurement, utilization, productivity and scheduling.

Response-time measurement

The most important measure of an EMS organization's performance is its emergency-response time. While clinical performance is essential, it is not as commonly understood or as easily measured as response times. The key issue for most patients and the public is: how long does it take to get an ambulance after making the call for help? This interval must be measured in every EMS system.

While the measurement of response times appears to be straightforward, this is not the case. Many measurements are offered as response times, but fail to designate the standards under which the times were measured. There are three different response times that should be monitored: system response time, service response time and unit response time.

The system-response time is the only time that is truly important to the patient. It represents the interval from when the call for help is answered by dispatch until an appropriately staffed and transport-capable ambulance arrives at the patient's location.

The service-response time is measured from the time that the EMS service actually receives the request for response from the dispatch center until the unit arrives at the scene. In many communities, initial call reception and evaluation is not provided by the responding ambulance service. Thus, the service should only be responsible for the time it takes to arrive at the scene after notification of the call from another agency.

The unit-response time is the period of time from when the ambulance crew is notified to respond until it arrives at the emergency scene.

EMS systems may report any of the above as its response time. Therefore, it is important to understand which of the ...

tions exist in response-time measurements, particularly in determining when the clock is stopped. An EMS system may stop the clock upon the arrival of the first responding unit, regardless of its level-of-care or transport capability. For example, many volunteer ambulance services send some of their personnel directly to the scene while another person responds with the ambulance. Response times may be terminated with the arrival of any of the following: the first responder, the ALS caregiver without transport capability, the first BLS ambulance (even if an ALS unit is ultimately required) or the transport-capable ALS unit.

These variations allow for faulty representations of response times and make performance comparisons among systems impossible. The true measure of an EMS system's response-time performance is based solely on the patient's needs. It should be measured from the time that a request for help is first received until the appropriate transporting ambulance arrives at the patient's location.

Although other time intervals are important, such as the first responder agency's response time, the EMS system's performance should be based on the full response time required to fully implement the appropriate resources to meet the patient's needs.

Much discussion has centered on how an EMS system's response times should be measured and reported. The most common reporting method is average response times. A service may report that its average response time to emergencies is six minutes. Statistically, this provides an incomplete picture of the system's performance and may present a false picture of what is actually occurring. A good average response time for a service may indicate only that the service places its ambulances in areas of highest demand, therefore generating short response times to patients in those areas, while other less busy areas have extended response times.

To address this weakness, modern EMS services have made two changes in the way they measure response times. First, response times are monitored by zone, and, second, response times are reported on a percentile basis.

Equitable response times should occur throughout the EMS system's service area. While it is impossible for most systems to have equal response-time performance to areas of high demand and those sparsely populated areas with low demand, there should be defined performance requirements among all areas. Performance should then be measured on a systemwide and zone basis.

As indicated, average response times do not reflect an accurate picture. EMS systems now measure response times based on percent compliance to a specified goal. This measurement method is also referred to as fractile or percentile response times. It defines a certain percentage of calls that are responded to within a set period of time. For example, 90 percent of the calls are responded to within 10 minutes. This method provides a much more accurate representation of EMS system-performance levels.

Many services subdivide the types of calls to ascertain performance levels and to allocate resources to the most important events. Subdivisions include emergency and non-emergency, ALS and BLS. The more sophisticated services also differentiate between life-threatening and nonlife-threatening emergency calls.

Percentage-compliance measurement is most effective when specified levels of performance are defined. Examples of common standards of performance include: 90 percent of life-threatening calls responded to within eight minutes, 90 percent of nonlife-threatening emergencies responded to within 12 minutes, or 95 percent of emergency calls responded to within 10 minutes.

Every EMS system is unique. While these response-time standards are often quoted, they cannot be implemented in all systems. The response-time standards for an individual system should be based on its geography, demand levels and available resources.

Other factors that make comparison of response-time standards difficult is that some systems measure response times only in whole minutes, so that what is called an eight-minute response time may in fact be 8:59. Other systems measure only the service response time. Some EMS systems may use a variety of protocols to define life-threatening, nonlife-threatening, emergency and non-emergency calls. These differences make comparisons difficult and may, in fact, understate or overstate an EMS system's actual performance.

Utilization and Productivity

Operational engineering techniques are being adapted and developed for the management of EMS systems. The first step in this process is to define the product that is being produced by ambulance services. In a factory setting, this is simple to determine, since tangible items are manufactured. The cost of producing an individual item can be ascertained easily, and the impact of implementing efficiencies can be quantified.

This is more difficult to determine in EMS. An EMS system actually produces two products: patient transport and coverage. "Coverage" refers to the fact that an EMS system must maintain adequate resources to provide transport availability even when calls do not occur.

The number of transports completed by a service should be measured. Once this is determined, it is possible to calculate the cost per transport as well as other factors that help the service to improve operations.

Coverage is best measured in hours of time that an ambulance is staffed (on duty), ready to respond or already involved in an assignment. These are called unit-hours. The largest expense incurred by an emergency service is the cost of having units available to respond, regardless of the actual number of calls. The greatest cost of a fire department is not the actual expense of putting out fires, but the cost of maintaining readiness and on-duty personnel in the event that a fire does occur. This is also true of ambulance services.

By determining number of transports and unit hours available, it is possible to describe and measure ambulance service utilization and productivity. As with other industries, utilization is a measure of the total amount of available resources (unit hours, in the case of EMS) in comparison with the amount of resources used in the production of a product. Therefore, an ambulance that is on-duty 24 hours per day for one week would produce 168 unit hours (24 x 7). If that ambulance transported 56 patients a week, and each transport took an average of 1.5 hours, the ambulance would have used 84 hours of the available unit hours. Thus, ambulance utilization would be .5 (84 ÷ 168), which means that the ambulance is actually engaged on calls 50 percent of the time.

Productivity measures the number of transports produced per unit-hour. In the example above, the service's productivity is calculated by dividing the number of patient transports by the number of unit hours. In this case, the productivity of the 24-hour ambulance would be .33 transports per unit hour (56 transports ÷ 168 unit hours). The inverse of this calculation shows that the ambulance accomplishes a patient transport, on average, once every three hours.

Some systems include other types of work in their utilization calculations. For example, the time spent on calls that do not result in a transport or the time involved in redeployment may be added to the time actually spent on transport calls since these, too, utilize valuable hours.

These measures are important for a service that wants to improve efficiency. Efficiency can be increased by reducing the amount of time required to complete calls or the amount of time needed for redeployment. This utilization improvement may allow the service to reduce the total number of hours required to maintain coverage, or it may free more hours to accomplish transports, resulting in improved productivity.

Developing Work Schedules

Scheduling personnel provides an interesting challenge for the manager. How this task is handled has a profound effect on the total system. Personnel scheduling directly affects response times, patient care and the financial success of the entire system.

For example, if enough crews are not available to meet the demands of the system, response times will be unacceptably long. Crews that are expected to perform at high levels for long periods of time will be unable to deliver optimum patient care. Having too many people scheduled, or having too much overtime, jeopardizes the service's financial well-being. It is for these reasons that schedules must be carefully planned and developed and must not be a "fill-in-the-hole"

EMS scheduling cannot be viewed in the traditional staffing manner. Creative and innovative ideas must be included to increase efficiency and effectiveness. The people who have chosen EMS as a career do not expect the traditional 40-hour work week, which for many services is not a workable option. A combination of 24-hour, 12-hour, 10-hour, eight-hour and part-time peak-load shifts may be necessary within the same service to provide adequate coverage.

Every manager would like to have surplus crews available. Financial reality, however, makes this concept unlikely. To create an efficient and cost-effective staffing pattern, it is necessary to first identify the minimum amount of staffing required and then determine the maximum the organization can afford. Figure 4.13, "Unit-Hour Analysis," illustrates this.

Figure 4.13: Unit-Hour Analysis

The following steps will enable you to calculate the number of unit hours your service provides each week. It will also calculate the utilization (transports per unit hour). The cost of providing a single unit-hour is also determined as the final step. Use the same one-month period for performing all of the calculations below.

1. Calculate the number of hours all ambulances are staffed and on duty for each week. (For example, one ambulance on duty 24 hours a day, seven days a week will equate to 168 unit hours. 24 hours x 7 days = 168 unit hours. An ambulance staffed 8 hours, 5 days per week would provide 40 unit hours. 8 hours x 5 days = 40 unit hours.) Total all ambulance hours provided by your service.

   Total unit hours for one week = (A) ______ unit hours.

2. Determine the average number of transports per week. To do this, take the average number of transports (not requests) for the month and divide by the number of weeks. (This will not be an even number. For example, a month with 31 days will have 4 3/7 weeks.)

   Average transports per week = (B) ______ transports per week.

3. To calculate the unit-hour utilization, divide the number of transports per week (B) by the number of unit hours (A).

   Unit-hour utilization = (B) ÷ (A) = ______ transports per unit hour.

4. Determine your expenses per week by dividing total expenses for the month by the number of weeks. The number of weeks should be identical to those in #2. (Total expenses for the month ÷ number of weeks.)

   Total expenses for a week = (C) $ ______ per week.

5. Calculate the total service cost per unit hour. To determine this, divide the total expenses for one week by the number of unit hours per week. (Total expenses per week (C) ÷ Total unit hours (A).)

   Cost per unit hour = (C) ÷ (A) = $ ______ per unit hour.

It is necessary for a manager to learn and understand what goes into scheduling and the effect each staffing option has on the operations and finances of the organization. The primary factors that should be considered in developing staffing levels are the amount of coverage necessary in a particular geographic service area and the fluctuating demand. Available resources must be matched as closely as possible to the demands of the EMS system.

Many managers think in 24-hour units; if more ambulances are necessary, then another unit should be staffed 24 hours per day. Only the smallest services should have the 24-hour ambulance staffing pattern as their primary scheduling mechanism, since this thinking does not take into account the substantially fewer requests at 3 a.m. than at 5 p.m. Calls are not evenly spaced over a 24-hour period. More ambulances are generally needed during peak periods and fewer units during quiet early-morning hours.

Innovative and alternative staffing structures are important in this industry. Call load, number of employees and employee-salary levels must all be considered in making staffing decisions. To demonstrate alternatives, it is helpful to review how a staffing plan can be developed.

Ambulance Scheduling for Small Services

Small services may have to develop staffing plans based on the minimum number of vehicles required to function; many services with limited call volume cannot afford to staff more than two vehicles. However, there can be little accommodation for demand fluctuations if demand does not indicate a need for three units, and if the service does not feel that adequate protection can be achieved by only one ambulance. The following paragraphs describe the planning process for a small ambulance service.

To evaluate staffing options, a new definition needs to be introduced. The straight-time equivalent (STE) is the number of hours worked converted to straight-time pay. This provides a means of measuring salary costs by a single unit. In the 24-hours-on/48-hours-off shift pattern, each person works an average of 56 hours per week. Forty of those hours will be straight time and 16 will be overtime (time and a half). The straight-time equivalent for these employees will be 64 hours per week (40 hours + [1.5 x 16 hours]).

Calculating the annual salary (excluding unscheduled overtime) involves multiplying the STE hours by the individual's hourly pay rate. This makes it possible to easily calculate and compare various shift-scheduling options.

A variety of shift patterns may be considered for staffing a small service's two 24-hour ambulance units. Many factors will impact decisions about shift patterns, including the type of business done by the service, other personnel responsibilities, personnel availability and the service's financial resources. Common staffing patterns for a 24-hour ambulance include shift lengths of eight, 10, 12, 14, 16 or 24 hours, or a combination of shift lengths. Figure 4.14 provides examples of some shift patterns that may be considered for ambulance staffing. The length of shift required is determined along with the average number of hours to be worked per week. The chart helps to identify potential shift schedules that can be used to establish a work schedule.

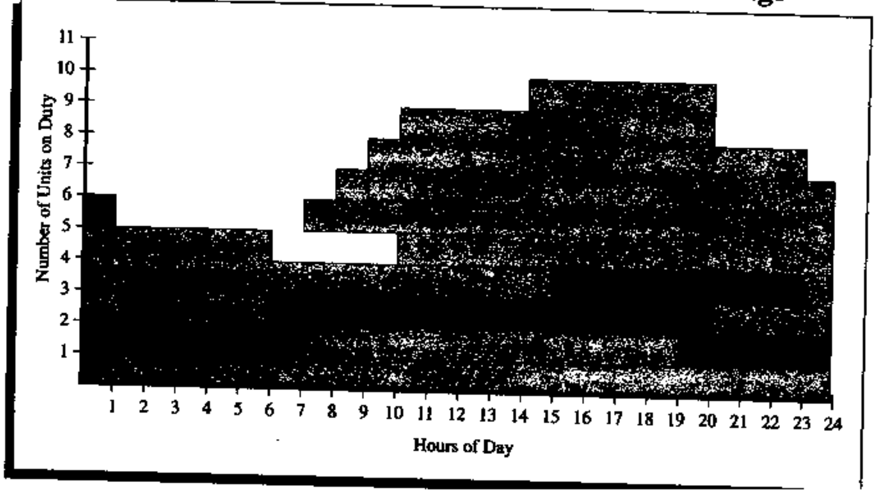
Scheduling for Larger Services

Larger services must incorporate more comprehensive schedule-development techniques. The larger service is able to take advantage of opportunities to increase productivity and achieve a closer match between available resources and demand for services. The methodology for establishing shifts is much different than that for a small EMS service, since the large service first identifies the number of transports to be accomplished rather than the number of ambulances that have to be on duty.

Let's analyze a service that expects 10,000 annual transports. The first step is to establish the desired productivity ratio, which is the number of transports accomplished per unit hour. If the service desires a productivity ratio of .2 transports per unit hour, it will be necessary to staff ambulances for 50,000 hours per year (10,000 transports ÷ .2 transports per unit hour). The service would need to deploy approximately 962 unit hours each week.

These 962 hours should not be distributed evenly; if they were, the EMS agency would staff five ambulances for 24 hours a day with 122 hours remaining for peak staffing. A more logical approach includes identifying the minimum staff-

Figure 4.14: Shift Patterns to Provide Variable Coverage



ing level required to provide adequate geographic coverage. For example, if three units can provide complete geographic coverage, this level can be established as the minimum number of units that should be on duty at any given time. This would consume 504 hours per week (3 units x 168 hours). This approach allows flexibility in distributing the remaining 458 hours per week (962 hours - 504 hours).

The distribution of these remaining hours should be based on demand levels experienced within the system during the various hours and days of the week. Additional ambulances would be staffed when needed.

Sophisticated analysis is often needed to determine how these unit hours should be deployed. A comprehensive analysis may include determining the minimum, average and maximum number of transports and conducting a statistical analysis of the standard deviation (a measure of the difference between the maximum and minimum number of patient transports) to identify the number of units required to meet the demand 95 percent of the time for each hour and day of the week. Armed with this type of information, a trained manager can achieve high levels of productivity and meet established response-time targets.

The information collected from this process defines how many ambulances need to be staffed each hour of the week. Scheduling of personnel in this type of system will require high levels of creativity. Often a wide variety of shift lengths and starting times will be necessary. Unit hours often will have to be added or reduced to achieve a realistic work schedule.

A final consideration in personnel scheduling is shift changes. As a rule, shift changes should be staggered so personnel do not go on or off duty at the same time. This will help maintain a continuous level of coverage when crews change. It will also reduce the amount of overtime resulting from crews being held over on a call while oncoming crews are waiting for their unit to return from assignment.

Miscellaneous Scheduling

Wage and hour regulations: In 1985, the U.S. Supreme Court struck down an earlier decision that had excluded government agencies from adhering to many of the federal wage and hour regulations. This means that all organizations, public and private, must adhere to the wage and hour regulations regarding workweeks, overtime pay, salaried employees, and so on. Since these regulations continue to change, it is wise to monitor wage and hour requirements to ensure compliance with the law.

One point worth noting is that there are provisions in these regulations concerning 24-hour shifts. These provisions allow the employer to avoid paying employees for a full 24 hours if that employee can be guaranteed a specific number of uninterrupted rest hours. Though used by many services to control personnel costs, such a policy should be avoided; most employees dislike being at work and not getting paid for all of their hours. Also, the recordkeeping involved to document compliance is difficult. Therefore, it may be easier to use a lower hourly rate on 24-hour shifts, and pay employees for all hours on duty. If employees are needed to work overtime, or needed for out-of-town trips, special-event coverage or any other reason, the time-and-a-half amount paid will be lower than the amount paid for rest time.

Another concern specifically applies to volunteer agencies. If a volunteer agency compensates its personnel for more than expenses (for example, $2 per hour when called to duty), these volunteers may be considered employees and subject to minimum-wage compensation. A service that fails to recognize this issue could be subjected to hundreds of thousands of dollars in back wages. A similar problem arises when an employee volunteers time to the organization with which he or she is employed. This employee may be eligible for overtime compensation for those volunteer hours.

Matching staff to call load: Two things are important to keep in mind when preparing a schedule: when the calls occur and the number of calls. With flexible deployment, the emphasis is on *where* to place the vehicles. But, it is just as important to determine how *many* vehicles are needed. If there is a peak period for emergency and non-emergency runs, it may be necessary to add additional crews to achieve prompt response times. Many services, therefore, add additional crews to handle peak loads. But the only way to accurately determine a service's unique staffing needs is to prepare comprehensive reports on when and where ambulances have been needed. Only then will there be enough information to make valid decisions.

The number of calls per shift is also important. Even though extended shifts have some advantages, they can have some serious disadvantages. A crew cannot be expected to respond on 20 separate ambulance calls during a 24-hour period and not experience fatigue, which could result in poor patient care. Because of all the variables involved, there is no specific number of runs that a 24-hour team should be able to handle. Some of these variables include the ratio of emergency to routine calls, the average length of the calls, the times at which the calls occur and the seriousness of the incidents. All of these variables affect the fatigue levels of the caregivers. A single crew might be able to handle 15 routine transfers without experiencing decreased energy levels. On the other hand, two or three serious vehicle accidents may significantly decrease the same crew's ability to function adequately.

Reserve production capacity: The field of emergency medical transportation is unpredictable. Therefore, services have to provide a reserve pool of vehicles and personnel to meet unexpected demands. There are a number of ways to meet these demands.

Some services require off-duty personnel to carry pagers or to leave telephone numbers where they can be reached if extra help is needed. This is an effective way of ensuring that experienced personnel are available to staff additional units. Unfortunately, it also decreases the individual's free time. Free time is important when on-duty shifts are long and stressful. If on-call is used, staff members should be paid a premium for being available. If called in, they should receive additional time-and-a-half pay for their work.

A reserve-personnel program also provides staffing for a needed unit. These reserve members are not full-time personnel. They are volunteer or paid personnel who are trained and able to staff vehicles on an as-needed basis. Continuing education, ride-along requirements and careful orientation are needed to make these people a valuable asset, and police departments have used this type of program for years with great success. This program also provides a pool from which to draw future employees.

A less frequently used approach to additional staffing is to cross-train other personnel in the organization. Managers often have large amounts of street experience, and other personnel, including billing and secretarial staff, can be trained to EMT levels to provide almost immediate production capacity if needed.

SECTION 5

Operations Manuals, Policies and Procedures

In an ideal world, an EMS manager could write an organizational policy that simply stated, "Do your best! When in doubt, err on the patient's or customer's behalf." Unfortunately, it is not an ideal world, and more definitive guidelines are required.

Personnel policies and operational procedures in EMS organizations can be sources of confusion and conflict, or they can be useful reference tools. These documents come in three distinct varieties: non-existent; vague manuals designed to be kept on the shelf and referred to only once each decade; or vibrant, updated explanations of what the organization expects of itself and its employees. If the latter of these documents does not exist, it needs to be created. If it exists but is not current, it needs to be updated.

Procedure manuals are a helpful tool for an effective organization. They vide information in comprehensive, written form about decisions that have been