COMPREHENSIVE ASSESSMENT OF THE WAKE COUNTY EMERGENCY MEDICAL SERVICES SYSTEM

FINAL REPORT

Submitted to

Wake County
Emergency Medical Services
Raleigh, North Carolina

June 16, 1999

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Mr. Joseph Zalkin
Project Coordinator
331 S. McDowell Street
Raleigh, North Carolina 27601
(919) 856-6021

by

TriData Corporation
1000 Wilson Boulevard
30th Floor
Arlington, Virginia 22209
(703) 351-8300

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EXECUTIVE SUMMARY

The Wake County Board of County Commissioners asked TriData Corporation to conduct an in-depth study of the delivery of EMS in Wake County. Two factors prompted the commissioning of this report.

1. Wake County's population is currently growing by about 20,000 people per year. In the next few years, this growth could have a substantial impact on the county's EMS system.

2. There were complaints about inequities in the funding of various volunteer rescue squads (VRSs) in the county.

The report is a product of numerous interviews and meetings conducted over the four-month period from November 1998 to March 1999, analysis on data provided to TriData by the County, and input on the May 1999 draft report received by TriData from interested parties.

EMS System Overview

The Wake County EMS system handles over 40,000 calls per year. The County-run EMS agency, Wake County EMS (WCEMS), runs the majority of calls in the system – more than 25,000 in 1998. Ten other agencies – the volunteer rescue squads (VRSs) – respond to between 400 and 3,600 calls per year.

Demand patterns for EMS are fairly consistent with those seen elsewhere in the United States. Demand is lowest between the hours of 2 a.m. and 6 a.m. and fairly level across the days of the week.

Most (53.1 percent) of the calls in the Wake County database are basic life support (BLS) calls (e.g., broken bones, "sick" patients, minor trauma, and many medical emergencies). Advanced life support (ALS) calls (e.g., heart attacks, major trauma, and allergic reactions) comprise the remaining 46.9 percent of the Wake County call volume. This breakdown of BLS and ALS calls is typical for most EMS systems.

The Wake County EMS system responds to 69% of all calls for service in eight minutes or less, but only 57% of ALS calls in eight minutes or less. The benchmark for high-performance EMS systems is an ability to respond to 90% of ALS calls in eight minutes or less.

Trends Affecting EMS Delivery

There are a number of trends that are affecting the way EMS is delivered in the United States in general and in Wake County in particular.

The population growth in Wake County will have the largest single effect on EMS in the county. By 2005, over 610,000 people will be living in Wake County – an increase of about 20,000 people per year. The Towns of Holly Springs, Garner, Apex, Cary, and Knightdale will probably experience the heaviest growth. By 2025, all but the outermost very fringes of the county will be heavily populated.

Citizens and visitors have come to expect that EMS will be there in their time of need. Further, people have greatly inflated expectations of levels of service and patient outcomes thanks to television programs such as *Rescue 9-1-1*. This has coupled with a decline in the availability of volunteers throughout the county to create a phenomenon where residents of rural and suburban areas have increased expectations for service but the EMS system has decreased ability to provide service as it has been provided.

Other factors affect EMS agency reimbursement for care rendered. Perhaps the most important at this time is the Negotiated Rule-Making (NRM) process. The NRM will revamp the way that Medicare reimburses ambulance services. Unfortunately, the process will not be concluded for several more months. A new reimbursement scheme will be in place by January 1, 2000 (this is required by federal law). It will likely provide increase Medicare reimbursement to ambulance services in North Carolina.

EMS System Analysis

In general, the prehospital care received in Wake County appears quite good. Although the EMS system presently works, it is fragmented and could be doing a better job in meeting the needs of EMS system users. However, given the growth that the

county is currently experiencing, it is unlikely that the EMS system will be able to meet the anticipated demand the way it is currently structured. It is also probable that the quality of care could suffer in the future for two primary reasons. First, the quality of care could suffer because EMS quality assurance does not receive adequate support (in terms of having at least one person dedicated to the function). Second, the quality of care could be affected because personnel will need to operate more remotely (and therefore more independently) under the proposed new system – one that is more decentralized than at present.

The EMS system needs to be converted from its fragmented state to one in which the provision of care is "seamless" from the patient's standpoint. Rescue district lines must be erased (except for fundraising and incident command purposes). Dispatch needs to be coordinated on a countywide basis, using the principle of sending the closest *appropriate* resource. A two-tiered response system should be implemented to more closely match EMS resources to the level of care demanded. In addition, EMS resources that are presently tightly clustered in the population centers will need to be spread out in the future to effect better coverage of underpopulated areas that are now not well covered.

The technology underlying the command and control of the system needs to be upgraded and made uniform throughout the county. A new computer-assisted dispatch system is needed. It should be coupled to an automatic vehicle location system and an in-vehicle navigation system. This may well require reworking the fundamental communications infrastructure – something that has already been recommended by other consulting firms with special expertise in communications.

Improvements in data collection and management are needed – both to increase the usability of the management data that are collected and to increase revenues from patient bills. The key to improvement of data collection and management is to enter data into the record-keeping system during the patient contact. This should be facilitated by automating the ambulance call report system. An automated ambulance call report system should be tied to a sophisticated quality assurance system and should produce a subset of data that can be downloaded to an outside billing vendor. The billing function should be transferred from the County Revenue Department to a vendor that specializes in EMS billing, as this will greatly increase the revenues recovered by the EMS system.

Additional personnel are needed in the form of a quality assurance coordinator, a volunteer coordinator, and a full-time EMS Medical Director. These functions are now done on a part-time or ad hoc basis, but they really require full-time attention for optimal performance. Additionally, hiring a quality assurance coordinator will free up personnel from the WCEMS training division so that they can focus solely on training activities. Since the availability of training is a sore point for volunteers, this may help alleviate problems that the members of the volunteer rescue squads have with the EMS system. Appointment of a volunteer coordinator will also assist with training problems and with recruitment and retention of volunteers.

EMS System Structure

The EMS system should move to provide decentralized, two-tiered (ALS and BLS) response. Other possible configurations appear unworkable because they are too expensive or operationally unfeasible for the long-run.

As the County's population grows, more units may need to be added; however, at this point there are sufficient numbers of EMS resources in the County. They simply need to be used more efficiently than they are at present. The current call volume does not justify either adding more units or using only paramedic-level units. It is important to match the resources to the demand to prevent wasteful use of critical, sophisticated medical resources (i.e., ALS units) on lower-priority calls. This is best done with the combination of emergency medical dispatching (to determine the exact nature of the emergency with a very high degree of reliability) and two-tiered response (to send BLS units on BLS calls and ALS units on ALS calls).

EMS System Financing

The EMS subscription program provides much-needed revenues to the volunteer rescue squads. The main failing of the program is that collections from subscribers are extremely low. Conversion to an outside billing service should solve this problem. The EMS subscription program should also be supported by a well-publicized membership recruitment campaign and an intensive public education to reduce unnecessary usage of the EMS system.

The $40 per hour stand-by fee charged is too low. This should be raised to $60 per hour immediately, so as to cover the unit-hour cost of the resource. A fee for extrication services performed by volunteer rescue squads (not fire departments) should be implemented to offset the extra costs of providing that service.

The County Commission should consider instituting development impact fees to offset the costs of providing EMS to newly developed areas of the county or newly built sub-divisions in currently populated areas.

Finally, an equitable means of subsidizing the volunteer rescue squads should be developed through a consensus process. This formula should attempt to uncouple the subsidy from the number of calls a rescue squad runs because having such a linkage may serve as an impediment to creating a "seamless" response system.

Recommendations and Implementation Plans

Summary recommendations and both five-and 10-year implementation plans are provided in separate sections at the end of the report.

I. INTRODUCTION

This report documents the current status of the emergency medical service (EMS) system in Wake County, North Carolina and offers suggestions for improving it to meet future needs.

Project Rationale

The Wake County Board of County Commissioners asked TriData Corporation to conduct an in-depth study of the delivery of EMS in Wake County. Two factors prompted the commissioning of this report.

First, Wake County's population is currently growing by about 20,000 people per year. If growth continues as projected, the county population will top 633,000 by 2005. This expected growth will have a substantial impact on the EMS system because population protected is the primary determinant of EMS call volume.

Second, complaints about the mechanisms employed by the County to fund the activities of the independent volunteer rescue squads prompted the formation of an EMS Task Force, which pushed to have an outside study performed.

Methodology

This report represents the culmination of many hours spent studying the Wake County EMS system between November 1998 and March 1999. Four TriData analysts visited Wake County a total of nine times for periods of three to four days at a time.

TriData staff interviewed many people involved in every aspect of EMS delivery, including dispatchers, first responders, front-line EMTs and paramedics, volunteers and paid personnel, County as well as volunteer rescue squad personnel, emergency department nurses and doctors, trainers and instructors, state EMS office representatives, and representatives from the Wake County Government leadership. In addition, TriData conducted three "forums" open to any EMS system stakeholders who wished to attend.

TriData's personnel toured the county, visiting EMS facilities, hospitals, and "RESCOM" (the 9-1-1 communications center). They also did "ride-alongs" with EMS

units and monitored EMS radio transmissions. In short, there was no area of the EMS system with which TriData did not come in contact.

In addition to the intensive interviews TriData conducted, TriData used data from ambulance call reports from the last three years to measure and provide quantitative analysis of EMS system performance. These data were abstracted from the ambulance call report database maintained by WCEMS. The dataset used for analysis by TriData included every call for the last three years. This dataset was then purged of records that had obviously bad data (e.g., hospital transport times that are earlier than scene arrival times). When the bad records were cleaned out, about 150,000 individual ambulance calls that occurred over a three-year period remained for analysis.

II. OVERVIEW OF CURRENT WAKE COUNTY EMS SYSTEM

The EMS system in Wake County is unique in many respects. It is a combination of paid and volunteer services provided at both the municipal and county level. The uniqueness of the Wake County EMS system lies in the way that the County subsidizes the rescue squads – funding varies according to the staffing commitment of the squad (i.e., squads that staff more on their own get more funding).

It is important to describe the current status of the EMS system prior to discussing current or future problems or possible solutions to those problems.

The nomenclature used to characterize the participants of the system is confusing since some of the terms commonly employed in Wake County are counter-intuitive or have double meanings. Accordingly, it is important to define some terms before proceeding to describe the EMS system.

Definitions

When used in this report, the term "Wake County EMS system" refers to the total system for providing emergency medical services in the county. It refers primarily to the vehicles and personnel of Wake County EMS and the volunteer rescue squads, but it also includes first response agencies (i.e., fire departments), the 9-1-1 centers in Raleigh and Cary, the four hospitals, and other ancillary services (such as aeromedical services from Duke University and UNC).

The Wake County EMS system should be distinguished from "Wake County EMS" (WCEMS), the county-run ambulance service. As noted above, WCEMS is a component of the Wake County EMS system.

A "volunteer rescue squad" (VRS) is any of the EMS agencies that have been franchised by the County to provide emergency ambulance service in Wake County.[1] As will be discussed later in this report, VRSs often employ personnel to staff their units during certain periods. For this reason, it is important to delineate between a "volunteer"

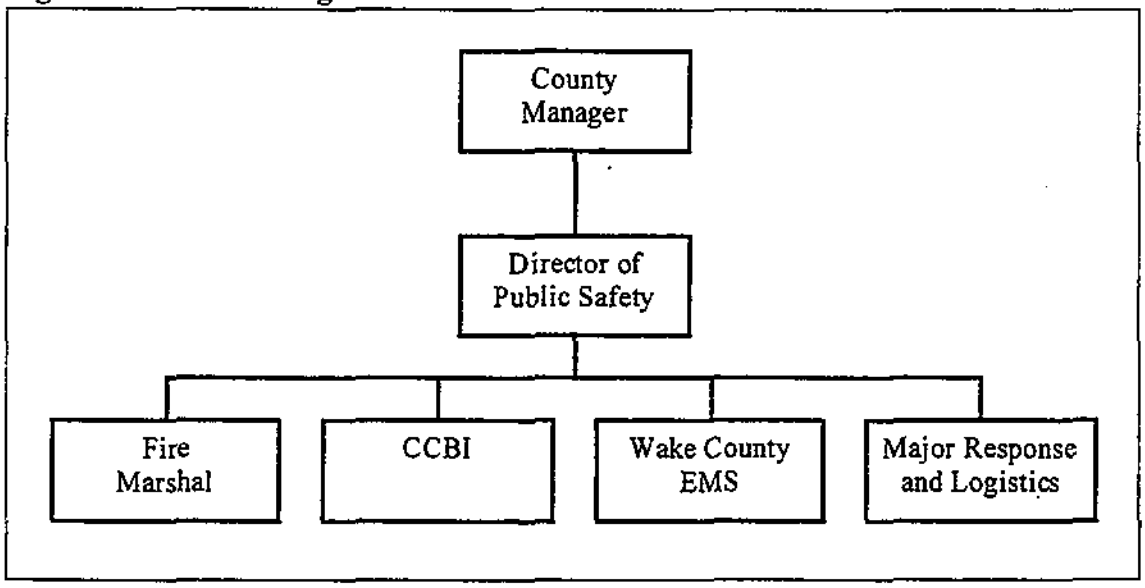
and the paid employees of a VRS. Where the term "volunteer" is used in this report, it refers to an individual who works as an EMT without remuneration.

"First-duty trucks" are ambulances that will take the first call for assistance in a given area. Should a subsequent call for assistance be received while the first-duty truck is on a call, the "second-duty truck" for that area will handle the call. Some VRSs are able to provide third- and fourth-duty trucks as well (although, with the exception of Cary EMS, third- and fourth-duty trucks are rarely staffed by in-station personnel).

Wake County EMS

WCEMS is a division of the Wake County Department of Public safety (see organizational chart in Figure 1). WCEMS is the primary provider of out-of-hospital emergency medical care to citizens of and visitors to Raleigh and some surrounding communities. WCEMS is also the service provider of last resort for all areas of Wake County, meaning that if any VRS ceases operations, the responsibility falls to WCEMS to provide the service to the area formerly covered by the VRS. This has happened on two occasions in the past five years.

Figure 1. WCEMS Organizational Placement



[1] For the purposes of this report, the Holly Springs Department of Public Safety will be called a VRS even though it is neither a volunteer organization nor a rescue squad. This is done for syntactical reasons only, and is not meant to suggest or imply an organizational structure that does not exist.

There are over 140 WCEMS personnel, almost all of whom are paramedics.

WCEMS has 12 ambulances (with an additional unit to be added by July 1, 1999) located throughout the county. In addition to providing almost all ambulance service within the city limits of Raleigh, WCEMS also serves outlying communities in Wake County by stationing paramedics, alone or with partners, on ambulances belonging to either to WCEMS or to a VRS. Essentially, local communities choose what level of service they are willing to provide, and WCEMS fills in the voids.

Wake County EMS	
General Information	***1998 Response Data***
Square Miles of Coverage: 103.9	Total Number of Calls: 25,169
1995 Population: 206,835	Transport Rate: 65.5%
Estimated 2005 Population: 245,532	Average Response Time: 6.9 min.
Estimated 2005 Density: 2,363/sq.mi.	90th Percentile Response Time: 11 min.
Paid Personnel: 140+	
Paid Hours: 24/7	
1998 Budget: $6.2 million	

Volunteer Rescue Squads

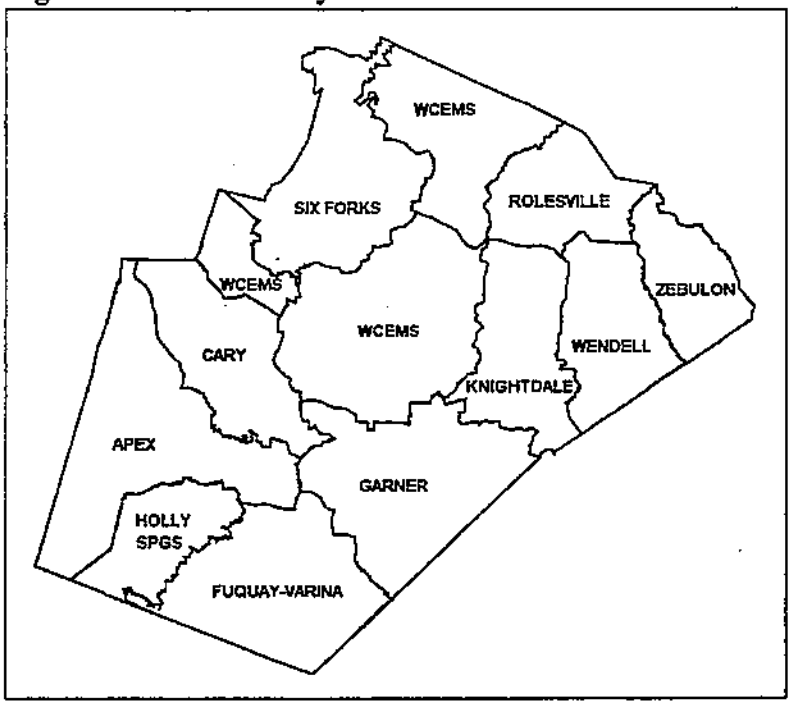
In Wake County, the term "volunteer rescue squad" is relatively misleading. It conjures images of people responding from their homes to provide care. While it is true that there is a core of dedicated volunteer personnel who donate substantial amounts of their time (and often their money) to respond to calls, the VRSs are primarily staffed by personnel paid by the VRSs. In reality, there is little difference between the VRSs and WCEMS in the manner that service is delivered.

Presently, 10 VRSs provide EMS in Wake County. Each VRS operates under a five-year franchise from the County that is governed by a contract that is automatically renewed each June. The contract details the subsidy and reimbursements that the franchisee will receive in return for providing certain levels of EMS in its ambulance service district.

The subsidy and reimbursement are a function of the franchise "option" chosen by each VRS. The various options differ in the way that "first-" and "second-duty trucks" are staffed. VRSs can provide ambulance service in their district, or they can choose to have WCEMS provide it. If they choose to provide it, they must provide advanced life support (ALS), or paramedic-level, service on at least the "first-duty" truck on a "24/7"-basis (i.e., 24 hours a day; seven days a week).

Figure 2 shows the geographic boundaries of the service areas of the 10 VRSs and WCEMS.

Figure 2. Wake County Ambulance Districts



Option Descriptions

There are four subsidy/funding options that a VRS can choose. In general, the level of funding is based on the level of staffing commitment undertaken by the VRS. The four funding options are:

- *Option 1* – The VRS will provide first- and second-duty ALS itself. The county provides a basic annual subsidy of $90,000 to do this.

- *Option 2* – The County assists the VRS by providing one paramedic with ALS equipment and medications on a 24/7-basis. The VRS supplies the ambulance and driver for the first-duty unit. The VRS also provides a second-duty unit staffed by an intermediate-EMT. The county provides a slightly lower subsidy of $75,000 per year.

- *Option 3* – The County provides a fully staffed ALS ambulance as the first-duty truck. The VRS provides a fully staffed ALS ambulance as the second-duty truck. The county subsidy under this option is $60,000 per year.

- *Option 4* – The County provides one paramedic with ALS equipment and medications on a 24/7-basis. The VRS supplies the ambulance and driver for the first-duty unit. The VRS also provides a second-duty unit staffed with its own personnel at the paramedic level. The county provides a slightly lower subsidy of $75,000 per year.

In addition to the base level subsidy indicated above, each VRS receives subscription dues generated within its service district, a fixed payment from the county of $30 per transport, and all patient revenues collected for transports in which no WCEMS personnel are involved.

One VRS, Holly Springs, has made a special arrangement outside of the four options described. Under this arrangement, which is due to end in June 1999, Holly Springs Public Safety (HSPS) provides an ambulance and an EMT-Basic as a driver but no second-duty service. Holly Springs receives no subsidy, but it does get subscription fees, the $30 transport fee, and all patient revenues received.

Table 1 summarizes the four options and which rescue squads have chosen them.

Squad Descriptions

This section describes the operations of and provides summary information for the various VRSs in the Wake County EMS system. The total number of volunteers on the roster of each VRS is indicated in the summary information; however, not all volunteers are active in the field. In addition, the summary information includes the number of paid

Table 1. Rescue Squad Reimbursement Options in Wake County

	County Responsibility	*Squad Responsibility*	*County Subsidy*
Option #1: Apex Cary Garner Rolesville Six-Forks	None	1st- and 2nd-duty: EMT-P level response	• $90,000/year • 100% of subscriptions • $30/transport • 100% of collections
Option #2: Knightdale Wendell	1st-duty: one EMT-P and ALS equipment Estimated value: $162,500/year	1st-duty: EMT-I driver and BLS equipment 2nd-duty: EMT-I level response	• $75,000/year • 100% of subscriptions • $30/transport • 100% of revenue from 2nd-, 3rd-, and 4th-duty responses
Option #3: Fuquay-Varina	1st-duty: EMT-P level response Estimated value: $325,000/year	2nd-duty: EMT-I level response	• $60,000/year • 100% of subscriptions • $30/transport • 100% of revenue from 2nd-, 3rd-, and 4th-duty responses
Option #4: Zebulon	1st-duty: one EMT-P and ALS equipment Estimated value: $162,500/year	1st-duty: EMT-I driver and BLS equipment 2nd-duty: EMT-P level response	• $80,000/year • 100% of subscriptions • $30/transport • 100% of revenue from 2nd-, 3rd-, and 4th-duty responses
Special: Holly Springs	1st-duty: one EMT-P and ALS drugs Estimated value: $162,500/year	1st-duty: BLS driver and ALS equipment 2nd-duty: none	• 100% of subscription • $30/transport • 100% of collections

Source: TriData research; WCEMS contracts

personnel employed by that VRS. The VRS revenue data shown were provided by each VRS and are 1998-1999 figures. Some figures (such as transport payments) are estimates because the year had not ended at the time of the report. Nonetheless, these data are representative of the total sources of revenue available to the VRSs.

Apex

Apex EMS is an Option #1 department, but it also receives funding through the Town of Apex. It operates three ambulances from its building on West Williams Street (NC 55). The first- and second-duty units are staffed around the clock with two paramedics. The third-duty unit is staffed by intermediate- and basic-level EMTs. Although its front-line personnel are paid, Apex EMS uses volunteers as available to staff its ambulances. There are 23 active volunteers on the roles of the department.

9-1-1 calls from the Apex area are received in Raleigh and transferred back to the Apex communications center, which is responsible for dispatching Apex EMS.

Apex EMS

General Information	*1998 Response Data*	
Square Miles of Coverage: 107.4	Total Number of Calls: 1,688	
1995 Population: 23,177	Transport Rate: 62.5%	
Estimated 2005 Population: 40,242	Average Response Time: 9.3 min	
Estimated 2005 Density: 375/sq. mi.	90th Percentile Response Time: 14 min.	
Volunteer Personnel on Roster: 23	*1998 Revenue Data*	
Active Volunteers: 23	County Subsidy:	$90,000
Paid Personnel: 3 F/T; 20 P/T	Town Subsidy:	$59,000
Paid Hours: 6a-6p M-Su	Subscriptions:	$80,000
	Transport Payment:	$27,000
	Collections:	$110,000
	Donations:	$20,000
	Other:	$16,900
	TOTAL	$402,900

Cary

Cary EMS operates four units from its headquarters building. The first- and second-duty trucks are staffed around the clock with two paramedics. The third- and fourth-duty trucks are staffed by intermediate- and basic-level EMTs.

Cary is an Option #1 department, but it also receives funding through the Town of Cary. The Town of Cary maintains its own PSAP. Calls for medical assistance originating in Cary are dispatched through the Town's 9-1-1 center.

Although its front-line personnel are paid, Cary EMS uses volunteers as available to staff its ambulances. There are 25 volunteers on the roles of the department, of which 24 are active. Cary EMS was recently the first volunteer ambulance service to be accredited by the Commission on the Accreditation of Ambulance Services.

Cary EMS

General Information	*1998 Response Data*	
Square Miles of Coverage: 64.5	Total Number of Calls: 3,646	
1995 Population: 74,016	Transport Rate: 65.6%	
Estimated 2005 Population: 96,535	Average Response Time: 8.2 min.	
Estimated 2005 Density: 1,497/sq. mi.	90th Percentile Response Time: 11 min.	
Volunteer Personnel on Roster: 28	*1998 Revenue Data*	
Active Volunteers: 27	County Subsidy:	$90,000
Paid Personnel: 11	Town Subsidy:	$25,000
Paid Hours: 24/7 on first and second units and one unit from 7a-6p M-F	Subscriptions:	$220,000
	Transport Payment:	$66,500
	Collections:	$280,000
	Donations:	$3,500
	Other:	$55,000
	TOTAL	$740,000

Fuquay-Varina

Fuquay-Varina Volunteer Rescue Squad, an Option #3 department, provides second-duty coverage to the town of Fuquay. WCEMS Unit 9 is housed at the Fuquay-

Varina Volunteer Rescue Squad and provides first-duty coverage in Fuquay-Varina's district. The rescue squad was revitalized after it shut for business in 1991. Since that time, the number of members has grown from 14 to 26, and it has been operating in the black consistently. Fuquay would like to begin providing paramedic-level service by the beginning of 2000.

Fuquay uses paid personnel from 6 a.m. to 6 p.m. on weekdays. At other times, ambulance services are provided by volunteers.

Fuquay-Varina Rescue Squad

General Information	*1998 Response Data*	
Square Miles of Coverage: 82.6	Total Number of Calls: 560	
1995 Population: 20,580	Transport Rate: 61.1%	
Estimated 2005 Population: 26,477	Average Response Time: 8.9 min.	
Estimated 2005 Density: 322/sq.mi.	90th Percentile Response Time: 14 min.	
Volunteer Personnel on Roster: 26	*1998 Revenue Data*	
Active Volunteers: 23	County Subsidy:	$60,000
Paid Personnel: 15	Town Subsidy:	$18,750
Paid Hours: 6a-6p M-F	Subscriptions:	$39,910
	Transport Payment:	$30,798
	Collections:	$7,350
	Donations:	$2,469
	Other:	$1,416
	TOTAL	$160,693

Garner EMS

Garner EMS is an Option #1 department, but it also receives funding through the Town of Garner. It staffs three ambulances. The first- and second-duty units are staffed around the clock with two paramedics. The third-duty unit is staffed by intermediate- and basic-level EMTs. The Garner Town Council requires that at least one of the three ambulances remain in the town limits unless dispatched on a call (i.e., the third ambulance is never sent on a mutual aid call outside the town limits) Although its

front-line personnel are paid, Garner EMS uses volunteers as available to staff its ambulances. There are 45 active volunteers on the roles of the department.

Garner EMS		
General Information	***1998 Response Data***	
Square Miles of Coverage: 92.4	Total Number of Calls: 3,168	
1995 Population: 35,680	Transport Rate: 66.9%	
Estimated 2005 Population: 44,569	Average Response Time: 8.0 min.	
Estimated 2005 Density: 483/sq.mi.	90th Percentile Response Time: 13 min.	
Volunteer Personnel on Roster: 45	***1998 Revenue Data***	
Active Volunteers: 45	County Subsidy:	$90,000
Paid Personnel: 7 F/T; 23 P/T	Town Subsidy:	$200,000
Paid Hours: 24/7	Subscriptions:	$115,000
	Transport Payment:	$60,000
	Collections:	$180,000
	Donations:	$80,000
	Other:	$30,000
	TOTAL	$755,000

Holly Springs

In Holly Springs, EMS is a function of the Holly Springs Department of Public Safety. There are no volunteer personnel at Holly Springs. There are 32 paid personnel, 10 of whom are dedicated EMS duties at Holly Springs. Prior to 1998, the Town of Holly Springs was protected by the Apex and Fuquay-Varina Volunteer Rescue Squads. In late 1997, the Town sought to have its own paramedic-level ambulance after a town employee became ill at a town meeting and had to wait 18 minutes for the second-due ambulance to reach Holly Springs.

The Wake County EMS Medical Director's concern about whether a paramedic in Holly Springs would run enough calls to maintain knowledge and skill levels led to the placement of a WCEMS paramedic on a Holly Springs ambulance. At present, Holly Springs provides a driver and an ambulance, and WCEMS provides a paramedic. This differs from the other "options" in that the WCEMS paramedic is paired with a basic-

level EMT, and no effort is made to provide second-duty coverage. Accordingly, Holly Springs receives no subsidy from the County. Revenues that the Town recovers (i.e., patient revenues and member subscriptions) go back into the Town's general fund. The Town spends more than $448,000 per year to fund fire and EMS operations, so the "Town Subsidy" figure shown in the 1998 Revenue Data below overstates the amount of the Town's subsidy for EMS.

<table>
<tr><th colspan="3">Holly Springs DPS</th></tr>
<tr><th>General Information</th><th colspan="2">1998 Response Data</th></tr>
<tr><td rowspan="8">Square Miles of Coverage: 40
1995 Population: 4,532
Estimated 2005 Population: 10,129
Estimated 2005 Density: 253
Volunteer Personnel on Roster: 0
Active Volunteers: 0
Paid Personnel: 10 dedicated to EMS
Paid Hours: 24/7</td><td colspan="2">Total Number of Calls: 406
Transport Rate: 63.3%
Average Response Time: 5.2 min.
90th Percentile Response Time: 9 min.</td></tr>
<tr><td colspan="2">1998 Revenue Data</td></tr>
<tr><td>County Subsidy:</td><td>$0</td></tr>
<tr><td>Town Subsidy:</td><td>$100,000</td></tr>
<tr><td>Subscriptions:</td><td>$9,850</td></tr>
<tr><td>Transport Payment:</td><td>$0</td></tr>
<tr><td>Collections:</td><td>$15,183</td></tr>
<tr><td>Donations:</td><td>$0</td></tr>
<tr><td>Other:</td><td>$0</td></tr>
<tr><td>TOTAL</td><td>$125,033</td></tr>
</table>

Knightdale

Knightdale EMS is an Option #2 department. It staffs two ambulances with intermediate-level personnel. A WCEMS paramedic is assigned to the first-duty ambulance. Knightdale EMS personnel are paid during the weekdays (7 a.m. to 7 p.m.) and are volunteers in the evenings and on the weekends. There are 19 volunteers on the roster of Knightdale EMS, of which 17 are active.

Knightdale EMS has expressed an interest in becoming a paramedic-level service and switching to Option #4 in the next year.

Knightdale Rescue Squad		
General Information	***1998 Response Data***	
Square Miles of Coverage: 60.8	Total Number of Calls: 1,316	
1995 Population: 20,427	Transport Rate: 65.8%	
Estimated 2005 Population: 27,941	Average Response Time: 8.5 min.	
Estimated 2005 Density: 461/sq.mi.	90th Percentile Response Time: 13 min.	
Volunteer Personnel on Roster: 19	***1998 Revenue Data***	
Active Volunteers: 17	County Subsidy:	$75,000
Paid Personnel: 4	Town Subsidy:	$20,000
Paid Hours: 7a-7p M-F	Subscriptions:	$58,900
	Transport Payment:	$11,700
	Collections:	$8,000
	Donations:	$1,150
	Other:	$1,800
	TOTAL	$176,550

Rolesville

Rolesville EMS is an Option #1 department. It provides both first- and second-duty paramedic-level coverage. The department was formed in 1995 with the support of the Town of Rolesville after the Wake Forest Rescue Squad removed its ambulance from Rolesville in an effort to concentrate its operations in Wake Forest.

During the day from 6 a.m. to 6 p.m. (usually seven days a week), the ambulances are staffed by two paid VRS personnel. Whenever possible, usually nights and weekends, volunteers provide service. Rolesville has 25 active volunteers, and there is a waiting list to become a volunteer.

Rolesville EMS		
General Information	***1998 Response Data***	
Square Miles of Coverage: 42.7	Total Number of Calls: 710	
1995 Population: 7,612	Transport Rate: 63.2%	
Estimated 2005 Population: 10,485	Average Response Time: 8.8 min.	
Estimated 2005 Density: 247/sq.mi.	90th Percentile Response Time: 14 min.	
Volunteer Personnel on Roster: 25	***1998 Revenue Data***	
Active Volunteers: 25	County Subsidy:	$90,000
Paid Personnel: 2	Town Subsidy:	$1,000
Paid Hours: 6a-6p M-Su	Subscriptions:	$30,000
	Transport Payment:	$10,000
	Collections:	$30,000
	Donations:	$40,000
	Other:	$0
	TOTAL	$201,000

Six Forks

Six Forks VRS is an Option #1 department. The first- and second-duty trucks are staffed around the clock with two paramedics. The third- and fourth-duty trucks are staffed by intermediate- and basic-level EMTs. Although its front-line personnel are paid, Cary EMS uses volunteers as available to staff its ambulances. There are 50 volunteers on the roles of the department, of which 42 are active.

Six Forks VRS actually provides coverage to some areas of the City of Raleigh, but it is the only VRS that does not have a town to which it can turn for additional financial support. Although it has no additional means of subsidy, Six Forks VRS is fortunate because it rents space in the Six Forks Fire Department building on Lynn Road, drastically reducing its operating costs.

Six Forks Rescue Squad		
General Information	***1998 Response Data***	
Square Miles of Coverage: 95.1	Total Number of Calls: 1,963	
1995 Population: 61,793	Transport Rate: 65.3%	
Estimated 2005 Population: 81,243	Average Response Time: 9.0 min.	
Estimated 2005 Density: 855/sq.mi.	90th Percentile Response Time: 14 min.	
Volunteer Personnel on Roster: 50	***1998 Revenue Data***	
Active Volunteers: 42	County Subsidy:	$90,000
Paid Personnel: 20	Town Subsidy:	$0
Paid Hours: 6a-6p M-F; 24/7 for EMT-Ps	Subscriptions:	$91,000
	Transport Payment:	$20,000
	Collections:	$154,000
	Donations:	$6,000
	Other:	$0
	TOTAL	$361,000

Wendell

Wendell VRS is an Option #2 department. As with Knightdale, the other Option #2 department in the Wake County EMS system, Wendell provides two ambulances at the intermediate level. WCEMS provides a paramedic to staff the first-duty ambulance at the paramedic level. There is one paid VRS employee on duty from 6 a.m. to 6 p.m., seven days a week. Two additional paid personnel are on duty 8 a.m. to 6 p.m.

There are 23 volunteers, of whom 17 are active. Evenings and weekends, volunteers provide second-duty coverage.

Wendell Rescue has expressed an interest in becoming a paramedic-level service and switching to Option #4 in the next year.

Wendell Rescue Squad		
General Information	***1998 Response Data***	
Square Miles of Coverage: 50.2	Total Number of Calls: 1,327	
1995 Population: 10,396	Transport Rate: 66.9%	
Estimated 2005 Population: 12,609	Average Response Time: 9.1 min.	
Estimated 2005 Density: 251/sq.mi.	90th Percentile Response Time: 14 min.	
Volunteer Personnel on Roster: 23	***1998 Revenue Data***	
Active Volunteers: 17	County Subsidy:	$75,000
Paid Personnel: 4	Town Subsidy:	$5,000
Paid Hours: 6a-6p M-Su	Subscriptions:	$53,000
	Transport Payment:	$22,000
	Collections:	$12,000
	Donations:	$15,000
	Other:	$0
	TOTAL	$182,000

Zebulon

Zebulon VRS is the only Option #4 department in the Wake County EMS system. It provides a first-duty intermediate ambulance which is staffed to the paramedic level by a WCEMS paramedic. The second-duty ambulance is staffed by Zebulon VRS personnel at the paramedic level. Third-duty service is provided solely by volunteers.

There are approximately 40 active volunteers on the roles of Zebulon VRS.

Zebulon Area Rescue Squad		
General Information	***1998 Response Data***	
Square Miles of Coverage: 41.5	Total Number of Calls: 1,254	
1995 Population: 7,548	Transport Rate: 67.6%	
Estimated 2005 Population: 10,304	Average Response Time: 7.5 min.	
Estimated 2005 Density: 249/sq.mi.	90th Percentile Response Time: 12 min.	
Volunteer Personnel on Roster: 40	***1998 Revenue Data***	
Active Volunteers: 40	County Subsidy:	$80,000
Paid Personnel: 3	Town Subsidy:	$11,000
Paid Hours: 6a-6p M-F	Subscriptions:	$46,500
	Transport Payment:	$23,000
	Collections:	$5,000
	Donations:	$24,000
	Other:	$5,500
	TOTAL	$195,000

Fire Department First Responders

In addition to the services provided by WCEMS and the various VRSs, EMS in Wake County is also provided by fire departments that act as first responders to certain high-priority medical calls.

There are 29 fire stations spread across Wake County. Often, fire department personnel are able to beat an ambulance to the scene and begin rendering care. Fire department first responders are used to "stop the clock" on life-threatening medical emergencies or where additional trained personnel are needed (e.g., difficult rescues or multiple casualty incidents).

In its 1994 study of fire protection services in Wake County, TriData recommended that "all fire departments should be incorporated in EMS response." Recent action by the Board of County Commissioners has mandated that fire departments that receive County funding provide first responder service. Fire departments have undertaken that role, with the exception of some of the town fire departments that do not receive County funding.

Other EMS System Assets

An EMS system consists of more than just ambulances and EMTs. Other assets of an EMS system include hospitals, helicopters, and communications centers. A brief description of these components of the Wake County EMS system follows.

Hospitals

The four general hospitals in Wake County (Wake Med, Western Wake Med, Rex Health Care, and Raleigh Community Hospital) receive ambulance patients. All four lie relatively close to the Raleigh Beltline. The hospitals provide on-line medical control primarily to EMS units from Wake County, but they have the capability to communicate with ambulances from other counties. The four hospitals receive patients from nearby counties as well as from Wake County.

Aeromedical Services

Helicopter medical service is available to Wake County from Life Flight (Duke University Medical Center) in Durham County and Air Care (UNC Hospital) in Orange County. Wake County EMS units do not routinely use aeromedical services at the scene of emergencies; however, the hospitals do occasionally transport critical patients by helicopter to tertiary care facilities.

Communications

The primary countywide public safety answering point (PSAP) is located in the basement of City Hall in Raleigh. The Town of Cary runs its own PSAP from police headquarters and handles only calls within the corporate limits of Cary. The Town of Apex maintains a secondary PSAP, meaning that 9-1-1 calls from Apex go to Raleigh first and then are transferred to the Apex PSAP, which dispatches Apex EMS.

Presently, about 75 percent of the 9-1-1 calls that come into the Raleigh PSAP (also called "RESCOM") are for incidents that have occurred within the city limits of Raleigh. Most (about 85 percent) of those calls are police-related. About 90 percent of RESCOM 9-1-1 calls are answered within two rings. Some of the telecommunicators

hired at RESCOM are hired strictly to take 9-1-1 calls when they come in; others are dual-purpose call-taker/dispatchers.

RESCOM, Apex 9-1-1, and Cary 9-1-1 use a proprietary medical dispatch protocol called Medical Priority Dispatch™ (MPD™). This system uses flip-cards with medical interrogation questions to create a decision tree that identifies the nature of the caller's emergency and the appropriate response. MPD™ is highly accurate and well validated in PSAPs across the United States. The flip-cards also provide the telecommunicator with "pre-arrival instructions" that detail for the caller what care to render and how to render it prior to the arrival of trained responders.

In order to gauge how accurately its telecommunicators are categorizing calls under the MPD™ system, RESCOM is currently auditing about 10 percent of the incoming medical calls using a computer program called *Aqua*™. The program derives measurements of "under-triage" (those calls that are really high-priority calls when the telecommunicator classifies them as lower-priority calls) and "over-triage" (low-priority calls that are classified as high-priority ones). RESCOM's under- and over-triage rates are in line with normal expectations for a PSAP that is using MPD™ correctly.

Private Providers

Until recently, there were five private ambulance service providers operating in Wake County. In mid-March, one of the franchisees, American Medical Response (AMR), announced that it would terminate operations in Wake County, effective April 1, 1999. The main service provided by the private ambulance companies is to transport non-emergency patients between medical facilities (including nursing homes) and to and from private residences. Private ambulance providers do not respond on 9-1-1 calls, and if they happen upon an emergency scene in the course of their travels, they are obligated to render emergency medical assistance until WCEMS or a VRS responds to the scene. Private ambulance providers do, however, represent a valuable medical resource in disaster situations, and accordingly, they are considered part of the inventory of EMS resources for those situations.

EMS System Demand Analysis

It is helpful to understand the volume of EMS calls that are being handled by different agencies in the Wake County EMS system. Knowing the demand for EMS is essential for making informed decisions about how to restructure the EMS system. As the following figures will demonstrate, there is considerable variation in how busy squads are in Wake County.

Overall demand for EMS is measured as the number of dispatches for a given system, agency, or ambulance. In addition to counting the number of times that an ambulance is dispatched, many EMS systems measure the number of patients transported to the hospital. Figure 3 shows the number of dispatches and the number of transports for the VRSs. WCEMS is omitted from this figure because its volume dwarfs the VRSs to the extent that their call volumes cannot be distinguished graphically. Figure 4 compares the call volumes of WCEMS and the VRSs taken together.

Figure 3. 1998 Volunteer Rescue Squad EMS Demand

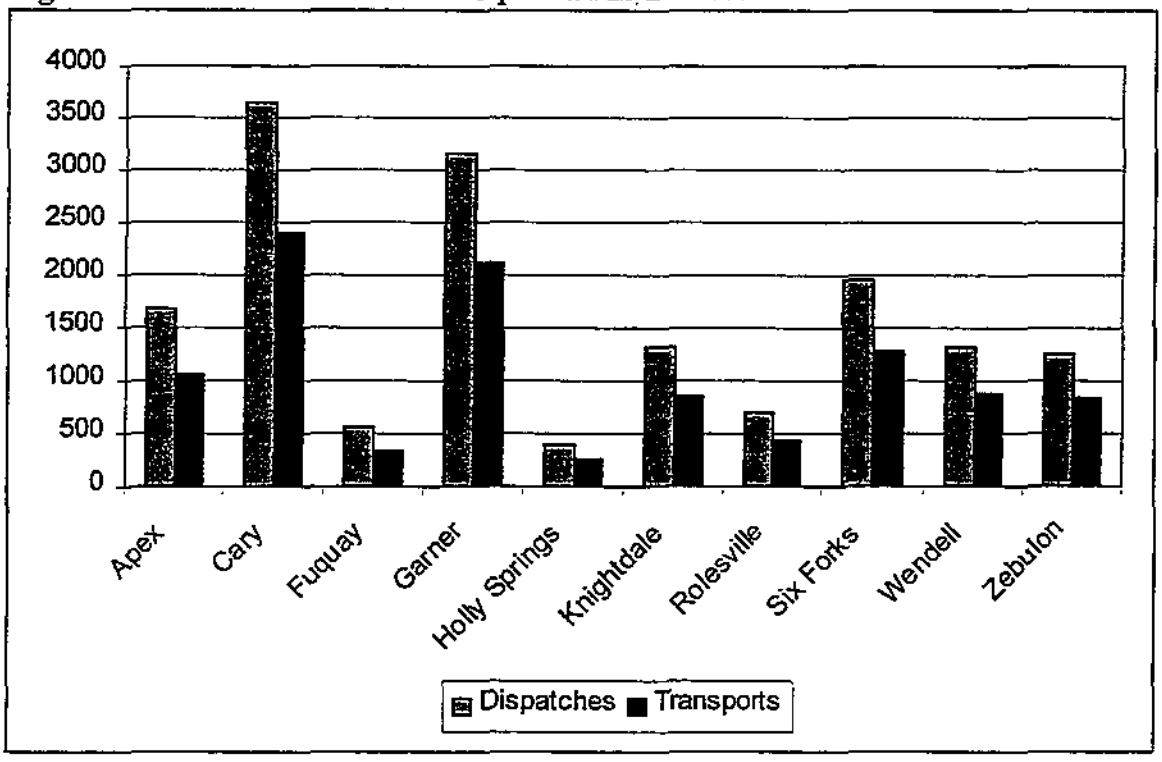


Figure 4. 1998 EMS Demand (WCEMS vs. All VRSs)

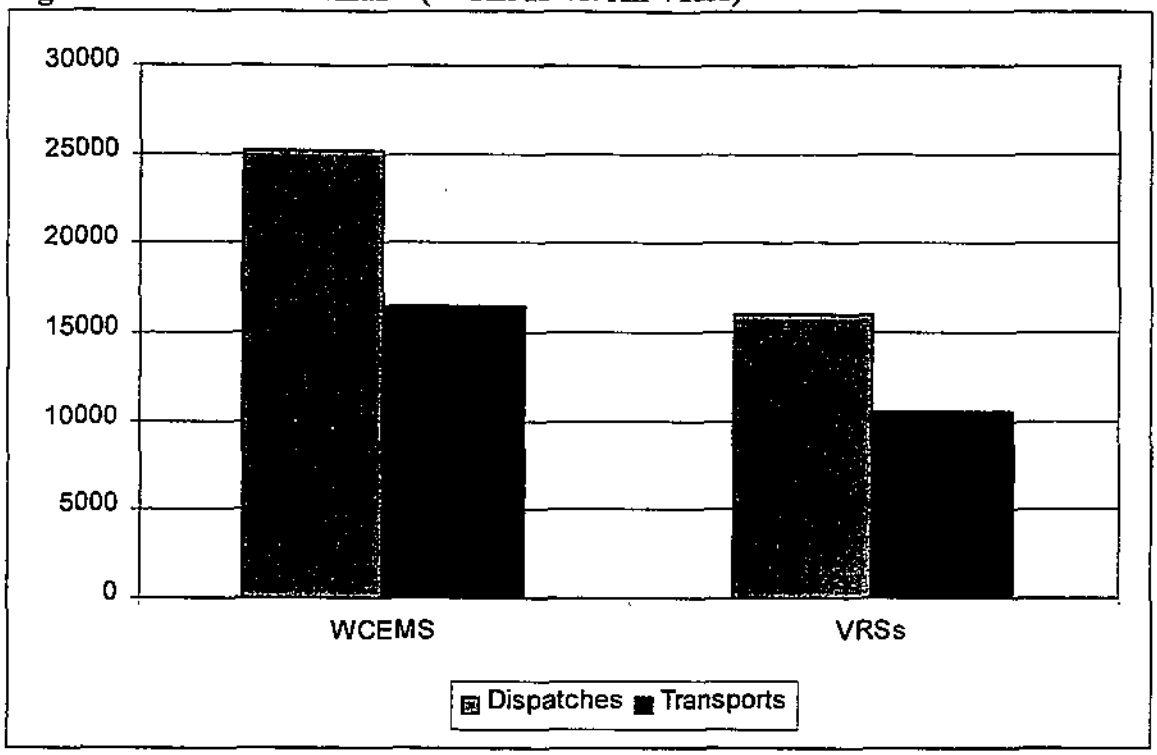
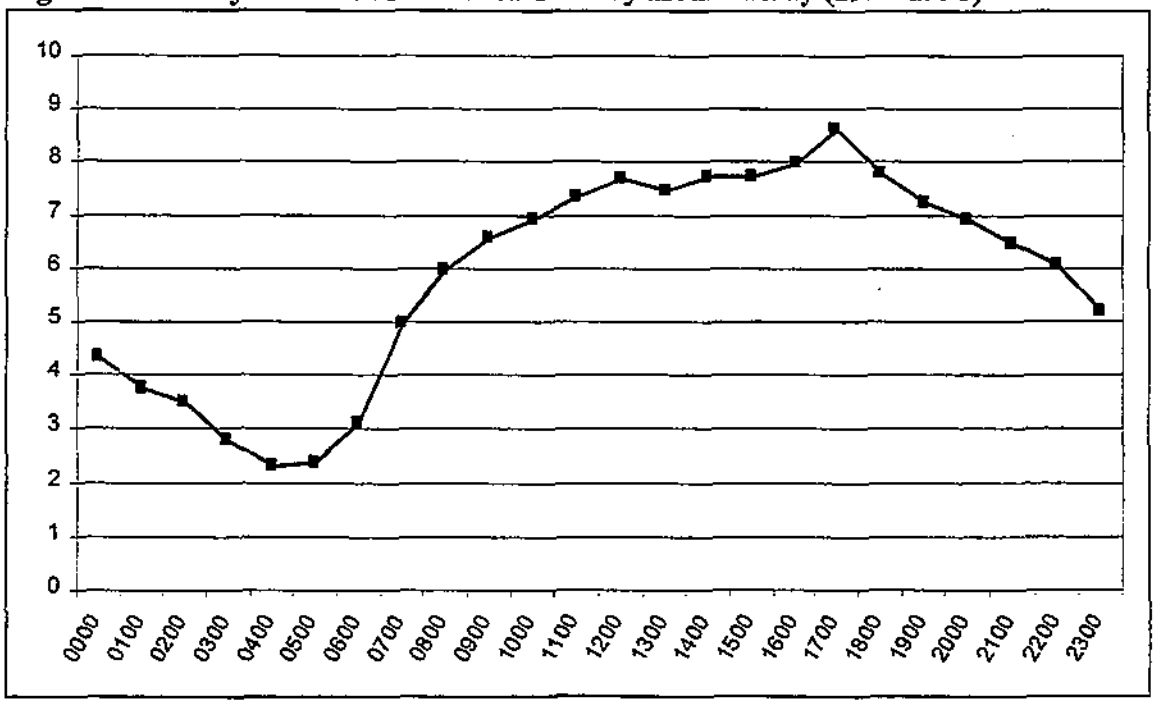


Figure 5. Countywide Distribution of Calls by Hour of Day (1995-1998)



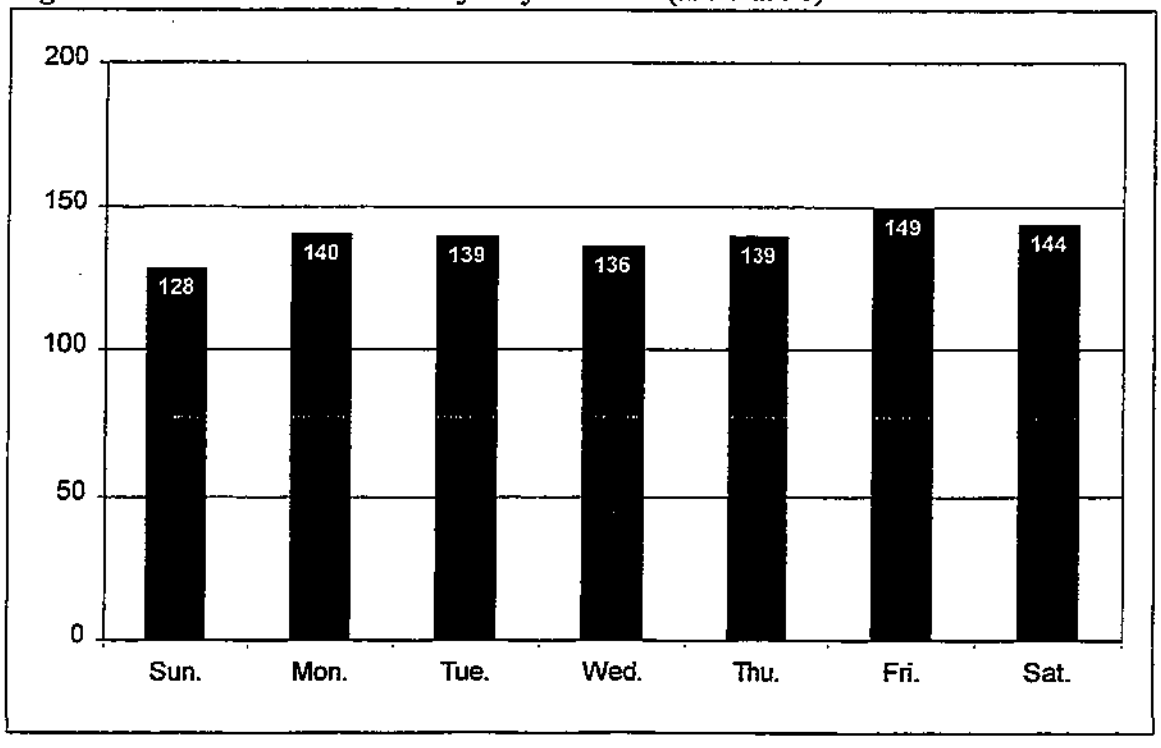
The number of EMS calls answered during any given hour of the day is fairly predictable. Average EMS demand for a 24-hour period follows the rough sinusoidal distribution shown in Figure 5.

The demand for EMS in Wake County is fairly level across the days of the week. Figure 6 depicts the average number of calls for each day of the week. Sundays are the slowest day of the week, and Fridays are the busiest.

Both of these patterns from Wake County mirror demand patterns found in most EMS systems across the United States.

These figures depict demand for the EMS system as a whole. Individual VRSs may have demand patterns that differ slightly from the system average. They enable EMS system managers to schedule units for service so as to more closely match resources to demand. More refined understanding of EMS demand would only be necessary if a decision were made to institute "system status management" in Wake County (see "System Status Management," page 108).

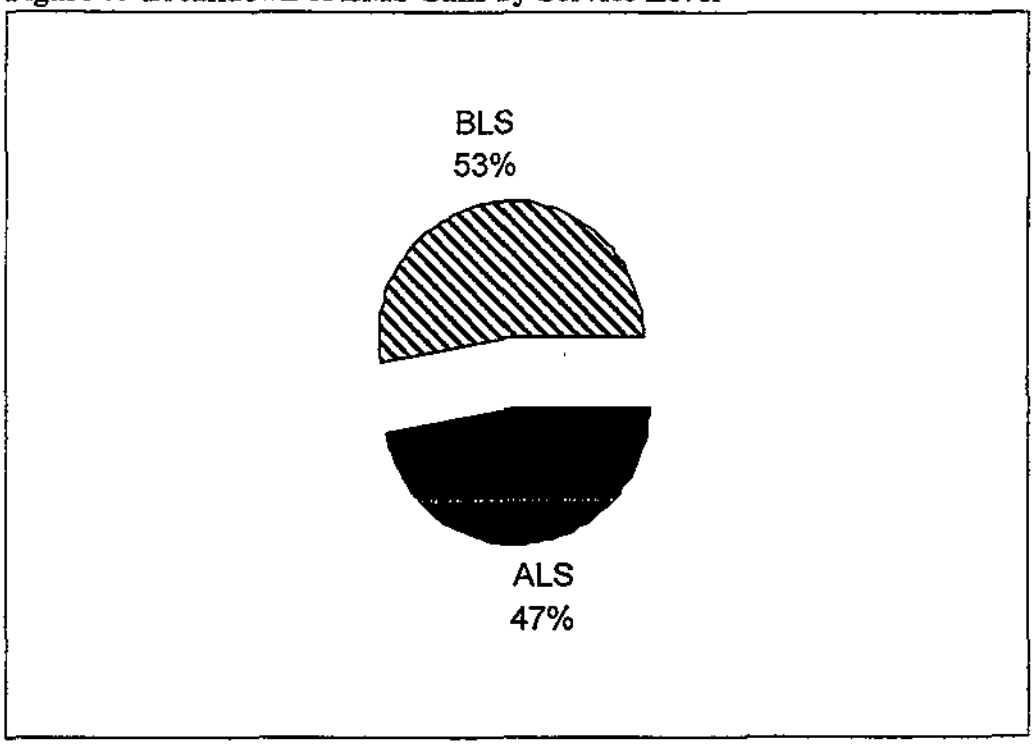
Figure 6. Distribution of Calls by Day of Week (1995-1998)



Another way to differentiate EMS demand is by the level of life threat or medical care required to treat the patient. Calls can be categorized as requiring either basic life support (BLS) or advanced life support (ALS). BLS is rendered by EMTs, and it does not include drugs or "invasive" therapies. ALS is care given by paramedics, and it includes the full complement of drugs, intravenous therapy, cardiac interventions, and other, more invasive techniques.

TriData assessed ambulance call data to determine the service level that would be indicated for each call received. Most (53.1 percent) of the calls in the Wake County database are BLS calls (i.e., they can be handled by a BLS ambulance and do not require an ALS unit). Examples of BLS calls include broken bones, "sick" patients, minor trauma, and many medical emergencies. ALS calls comprise the remaining 46.9 percent of the Wake County call volume.[2] Examples of calls requiring ALS include heart attacks, major trauma, allergic reactions, etc. This breakdown of BLS and ALS calls is typical for most EMS systems. Figure 7 depicts the percentage of EMS calls by service level.

Figure 7. Breakdown of EMS Calls by Service Level



Source: Wake County ambulance call report databases

[2] The number of ALS and BLS bills generated by the EMS system in 1998 also revealed about a 50-50 split between ALS and BLS calls (when canceled calls and calls not resulting in a transport were excluded).

Response Times

Ambulance response time is the most widely used measure of EMS system performance, but it is also one of the least informative measures. There are many other ways to measure how well an EMS system works,[3] but the necessary data are more difficult to collect and interpret. Although there are a number of philosophical problems with using response time as a performance measure, it remains the most easily understood and easily measured aspect of how well an EMS system functions – mostly because it is a concept that the lay public can easily grasp.

Response time is subject to a variety of measurement errors, and it really only measures one small aspect of EMS system performance – the amount of time it takes for a vehicle to travel horizontally and reach a street-side destination. Response time measurement is subject to error when units report their arrival on scene prematurely or belatedly or (in less fully automated systems) when time-stamping errors occur.

Another problem with using response time as a measure of system performance is that it ignores the call processing interval. In Wake County, response time is reported as the interval from the dispatch of an ambulance to its arrival on the scene of incident. It can take several minutes to process a call (i.e., obtain an address, verify the nature of the call, and dispatch an appropriate response). This time, which can be as long as two or more minutes, is usually not reported in discussions about EMS system response times. From a clinical perspective, this time still counts in a life-threatening emergency. Readers should remember that this analysis of response time does not reflect call processing time.

One final caveat on response times is in order here. Response times mostly measure road travel time. From the patient's perspective, however, response time is the time it takes the paramedics to arrive at the patient's side measured from the moment the caller gives the 9-1-1 center the address and nature of the call. According to the *Journal of Emergency Medical Services*, only 10.1 percent of fist response agencies and 11.4 percent of transport providers stop the clock when EMS personnel reach the patient's

[3] For example, dispatch time (the time required to receive and dispatch a call), hospital turn-around time (the amount of time between arrival at the hospital and returning to service), the number of ambulance collisions per 100,000 miles traveled, patient complaints received per 1,000 patient contacts, etc.

side.[4] Vertical response times (the time it takes for paramedics to exit their vehicles, get their equipment, and reach the patient's side) are seldom measured. Multi-story buildings can make this a factor in urban portions of Wake County. It is less of a problem in the suburban and rural portions of the county (although some areas such as the lakes, forests, and farms can occasionally create access problems. Accordingly, the emphasis on response time should be used in combination with other indicators of performance where they are available and feasible to measure (e.g., hospital turn-around time, the number of vehicle failures per 100,000 miles traveled, cardiac arrest survival rate, number of patient complaints per 1,000 patient contacts, etc.).

There is a loosely applied "national standard" for ambulance response times. It is an amalgamation of several standards, and it is interpreted differently by different people and EMS systems. No consensus group has ever met to define ambulance response time measurement or targets. The response time standard for transport vehicles in urban and suburban advanced life support systems that have automatic defibrillation-capable first responders (as is the case in Wake County) is eight minutes or less on 90 percent of the critical (i.e., life-threatening) calls. This standard is less well defined for rural areas.[5]

This standard is described as a "fractile" standard because it specifies that the response time criterion applies to a certain fraction of the overall call volume. In other words, the response time standard specifically acknowledges that there will be some response time outliers in even the best-performing EMS systems. The standard specifically does not use the average response time as its measurement tool because arithmetic averages can be heavily distorted by normally occurring outliers. The 90-percent standard more accurately describes what the typical experience with a given EMS system has been – in other words, the response time that 90 percent of the callers with the highest-priority problems experienced.

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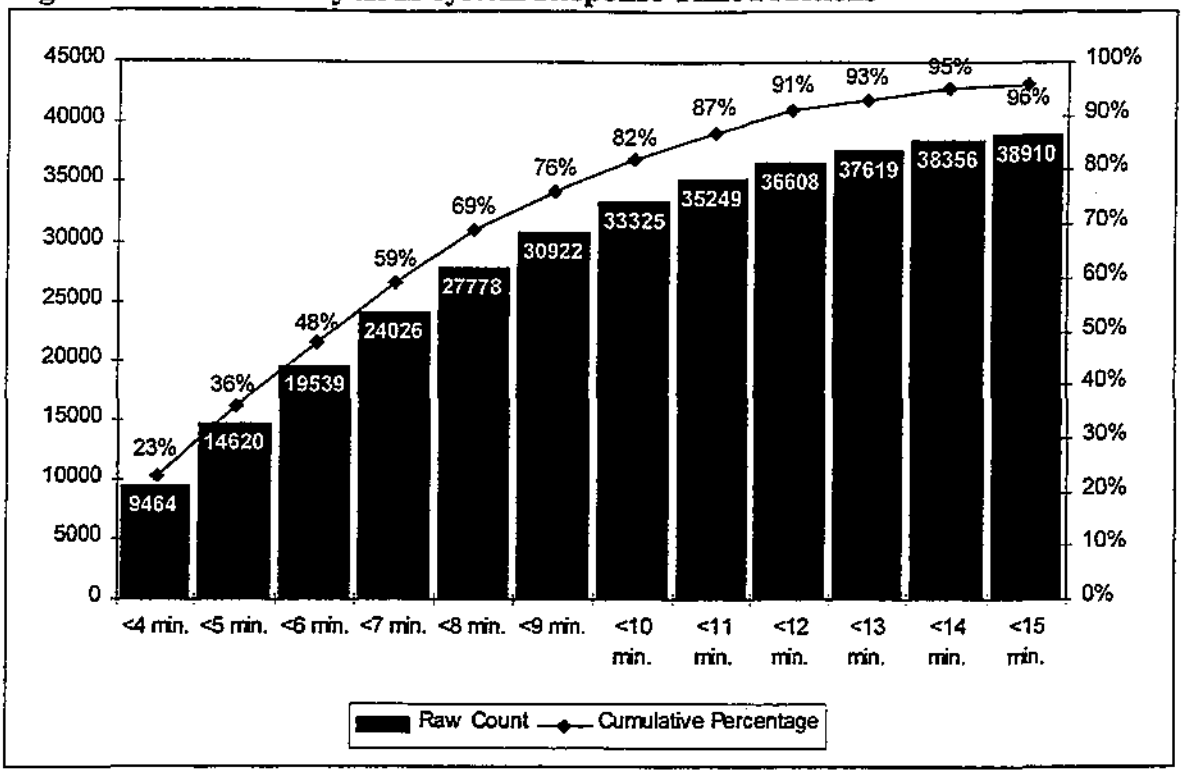
[4] Mayfield, T. "EMS in America's Most Populous Cities," *Journal of EMS*, February 1999, (24:2), p. 30.

[5] There is little consensus on how to define "rural" and even less on what an appropriate response time for rural EMS delivery should be. Some systems have arbitrarily set the "standard" at 90 percent of life-threatening calls within 20 minutes, whereas others have defined it as all calls. Response time targets are as high as 45 minutes in some "wilderness" areas.

Figure 8. Wake County EMS system Response Time Fractions



As Figure 8 demonstrates, the EMS system responds to 69% of calls in eight minutes or less. The "national standard" focuses on responses to life-threatening (i.e., ALS) calls. The EMS system was only able to respond to 57% of ALS calls in eight minutes or less. Table 2 shows the system's fractile response times.[6]

Table 2. Response Time Fractions by Level of Service

	Responses within 8 minutes or less	***Responses within 10 minutes or less***
All calls	69%	82%
Basic Life Support	70%	84%
Advanced Life Support	57%	70%

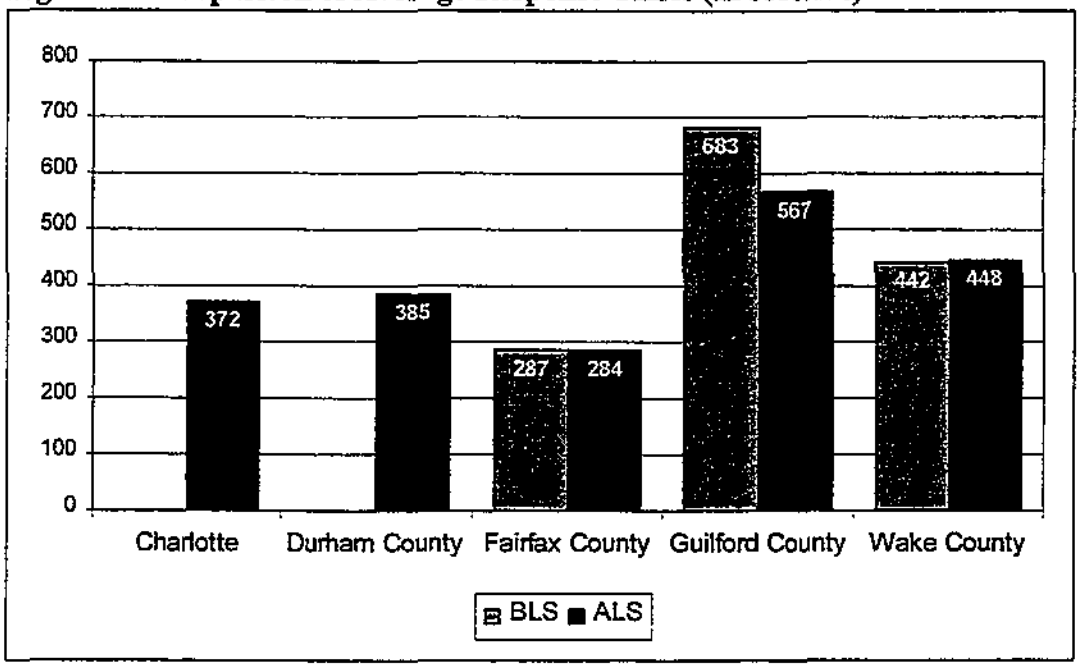
Source: TriData research; WCEMS ACR data

[6] The table distinguishes between ALS and BLS fractile response times for analytical purposes. It should not be interpreted to imply that EMS crews respond in a slower manner on ALS calls, but rather that the data simply indicate (for whatever reason) that a smaller percentage of ALS responses met the respective response time thresholds.

As noted above, these response times do not include call processing time, so from the patient's perspective, the EMS system response time is actually slower than represented here.

Wake County is a mix or urban, suburban, and rural areas. In the near future, however, Wake County will become increasingly urbanized and suburbanized. Therefore, application of urban and suburban response time standards to most of the county for planning purposes is reasonable. For the purposes of comparison, response time data from several EMS systems are presented in Figure 9. Where available, BLS response times have been included. Of special interest is the figure for Guilford County, which uses Medical Priority Dispatch and sends its EMS units in "routine mode" (i.e., without lights and sirens) for its lowest priority ("alpha"-level) responses. This practice tends to skew its average response time for BLS calls (although many would maintain that this is a good practice because it results in safer responses to less urgent calls).

Figure 9. Comparison of Average Response Times (in seconds)



Response times in Wake County are higher by almost a full minute (53 seconds) between the hours of midnight and 6 a.m. Response times begin to rise at about 10 p.m., and remain elevated until around 8 a.m. This is not unexpected, as ambulance crews

generally sleep during those hours if they are not on a call. Nighttime response times are longer because they involve additional time for waking up and dressing that is not required during the day. The increase in nighttime response times is more marked for the VRSs, especially those that rely solely on volunteers at night and those that do not have duty crews that sleep at the station. Figure 10 depicts the increase in nighttime response times.

Figure 10. Average Response Time by Hour of Day

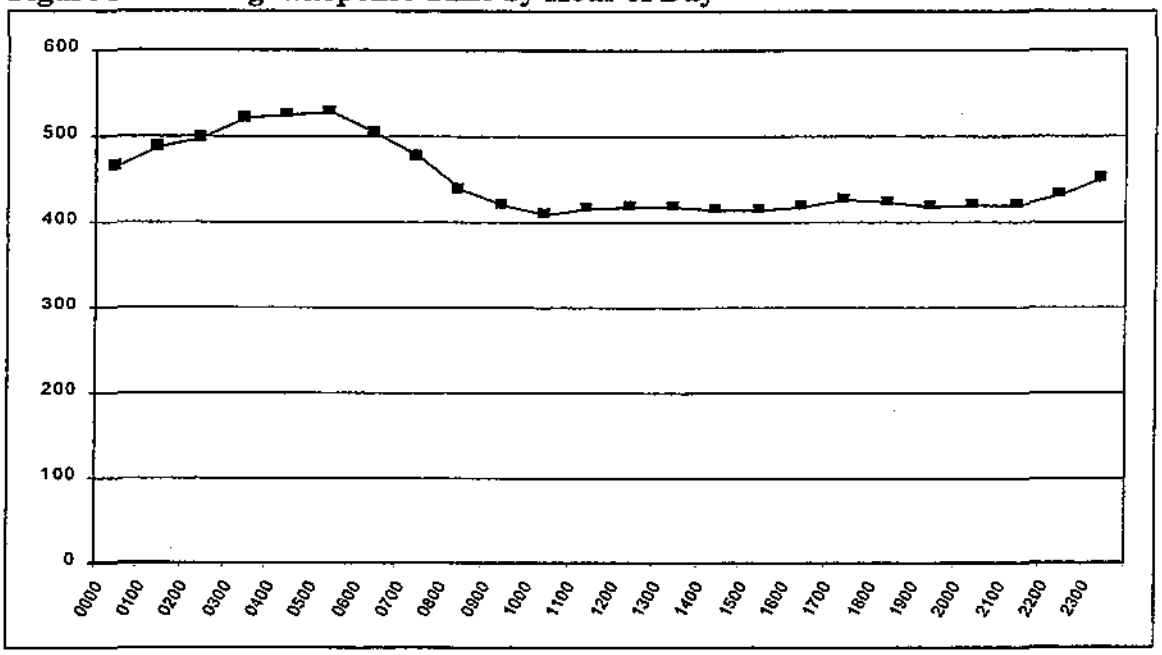
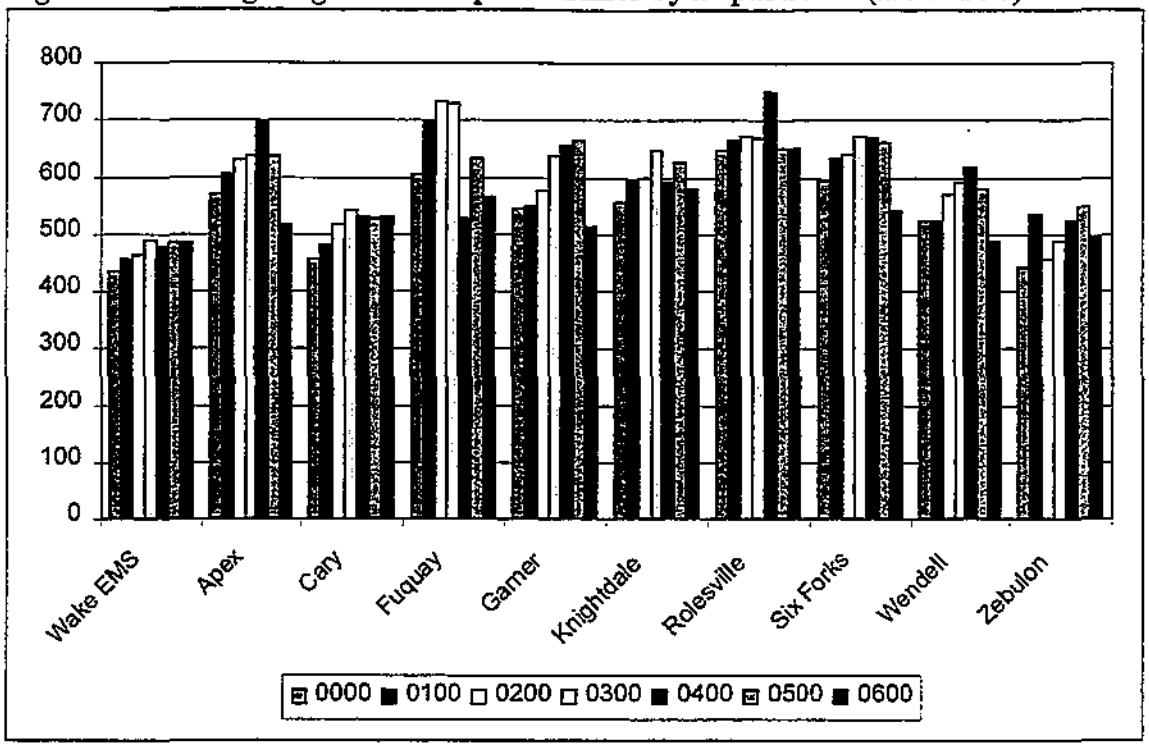


Figure 11 shows the average nighttime (midnight to 6 a.m.) response times by department (except for Holly Springs) for calls dispatched from 1995 to 1998.

Figure 11. Average Nighttime Response Times by Department (1995-1998)



Geographic Distribution of Calls

The ambulance placement studies conducted by AJC EMS Consultants contain excellent maps that show the numbers of EMS calls that have occurred in each map grid.[7] They demonstrate higher concentrations of calls in more densely populated areas. There is little reason to elaborate on the AJC findings – they are self-explanatory.

Impact of Out-of-County Responses

According to the AJC study, units from the Wake County EMS system responded to 347 calls outside the county in 1997. At a rate of less than one call per day systemwide, out-of-county response does not have a significant impact on the EMS system. The majority of out-of-county responses are to Johnston County.

[7] AJC EMS Consultants. *Wake County Ambulance Placement Study*, June 1998.

III. IDENTIFICATION OF TRENDS IN EMS

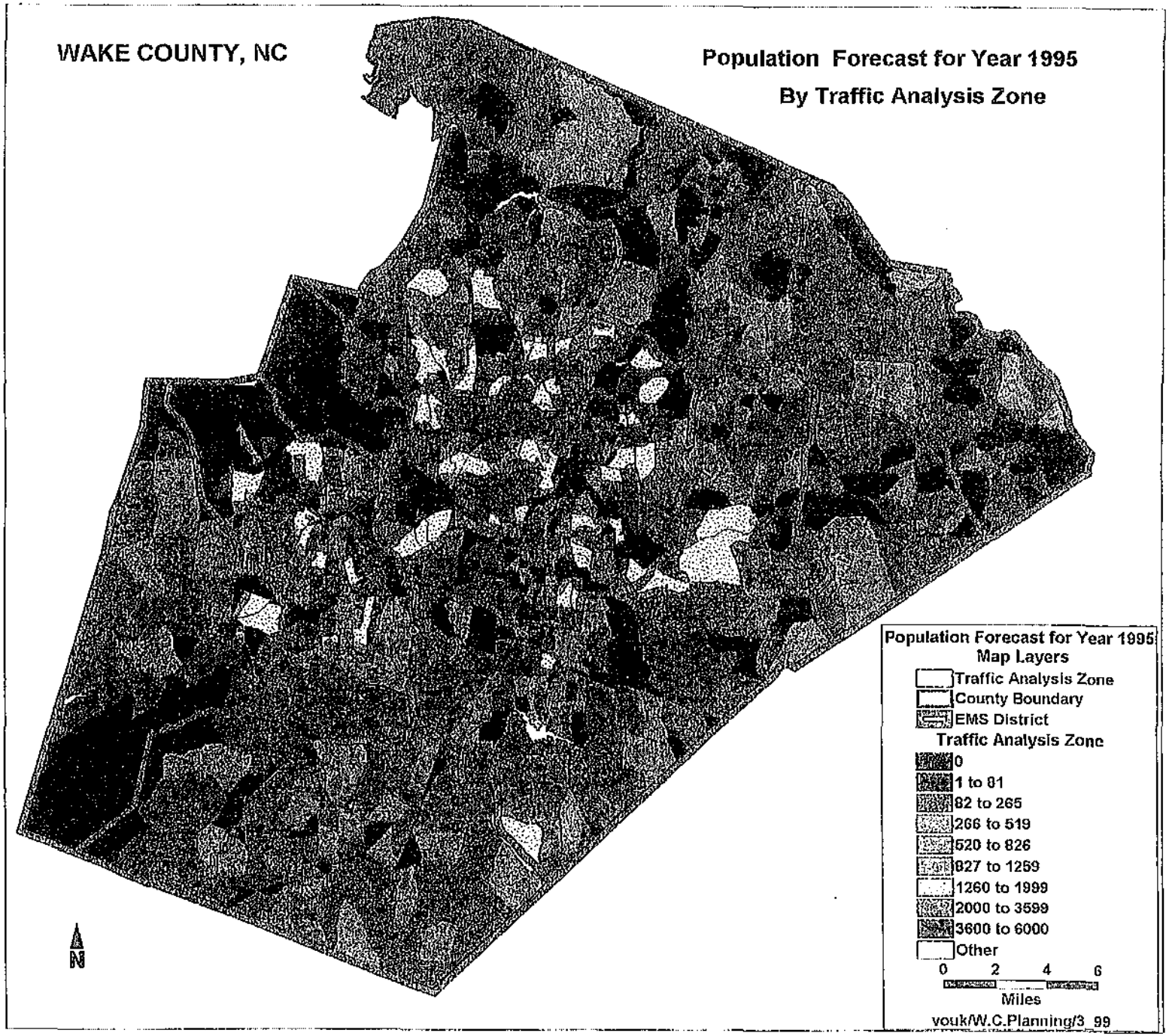
Several trends are coming together to change the way EMS is delivered in the United States. One of the desired outcomes of this study was to identify those forces, especially as they relate to the provision of EMS in Wake County. This section describes these recent trends and attempts to define their impact in Wake County.

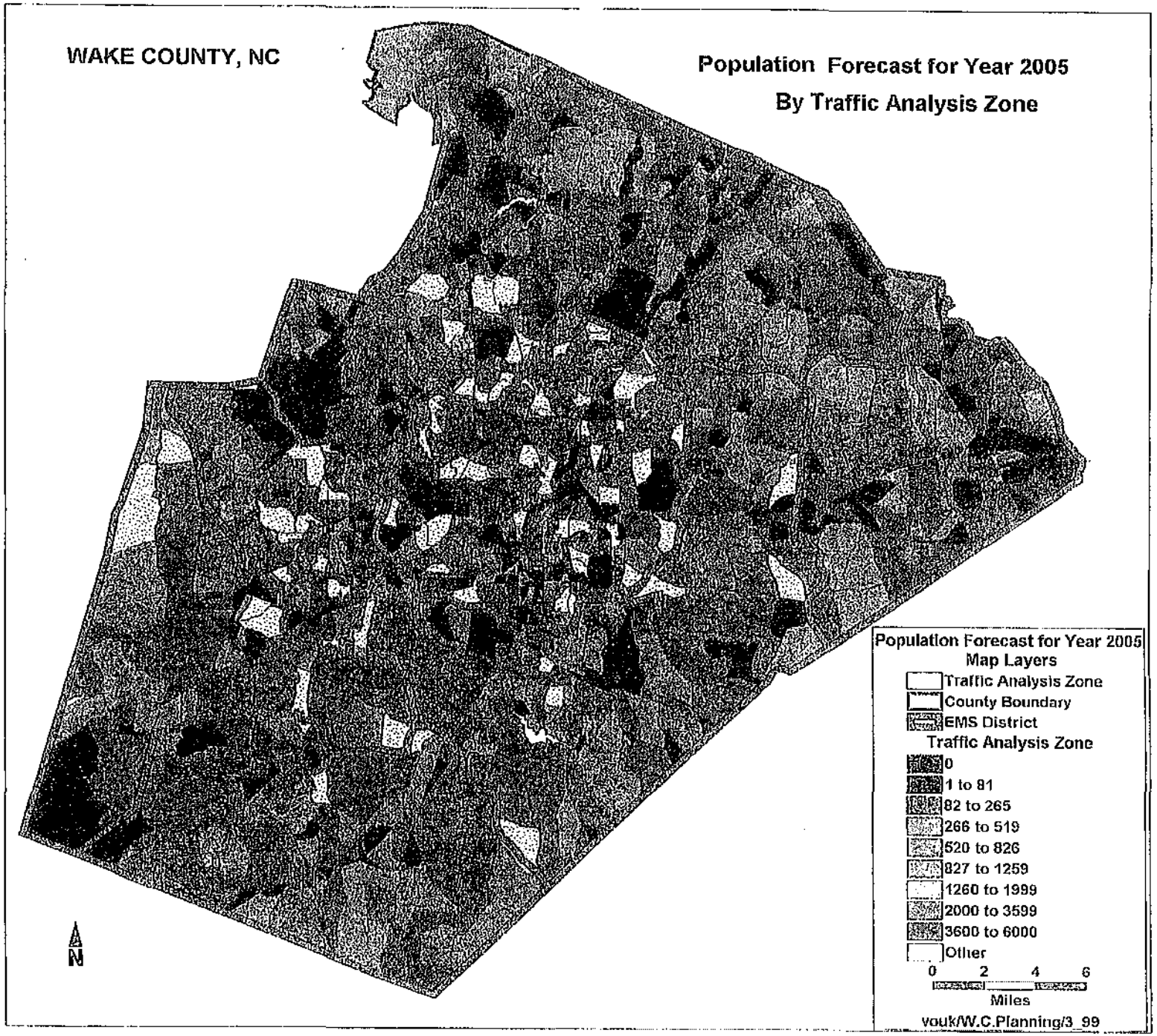
Population Growth in Wake County

Perhaps the most readily identifiable (and most important) trend that affects EMS delivery in Wake County is the population of the county itself. In general, the single-most important determinant of call volume in an EMS system is the population served. The number of EMS runs in any system is directly proportional to the size and density of the population and inversely proportional to the median income. In other words, EMS systems that serve larger, more tightly packed, and poorer populations will have more calls than EMS systems that serve populations that are smaller, more affluent, and more spread out. This relationship holds true in just about every EMS system in the country. It is not rocket science, its common sense.

Wake County has been, and will continue to be, experiencing large-scale population growth in the last few years. The County's Planning Department estimates that by 2005, there will be over 610,000 people living in Wake County. The maps on pages 32 to 35 geographically show how the population is projected to grow. The county is in the process of moving from discrete pockets of population interspersed with areas of rurality to a more even distribution of people, with the areas between population centers filling in with new development.

The maps indicate that Holly Springs, Garner, Apex, Cary, and Knightdale will experience the heaviest growth in population between the present and the year 2005. By 2015, virtually all of the county will have experienced large growth, and by 2025, all but the very outermost fringes of the county will be heavily populated.


WAKE COUNTY, NC
Population Forecast for Year 1995
By Traffic Analysis Zone
N
Population Forecast for Year 1995
Map Layers
Traffic Analysis Zone
County Boundary
EMS District
Traffic Analysis Zone
0
1 to 81
82 to 265
266 to 519
520 to 826
827 to 1259
1260 to 1999
2000 to 3599
3600 to 6000
Other
0 2 4 6
Miles
vouk/W.C.Planning/3_99


WAKE COUNTY, NC
Population Forecast for Year 2005
By Traffic Analysis Zone
N
Population Forecast for Year 2005
Map Layers
Traffic Analysis Zone
County Boundary
EMS District
Traffic Analysis Zone
0
1 to 81
82 to 265
266 to 519
520 to 826
827 to 1259
1260 to 1999
2000 to 3599
3600 to 6000
Other
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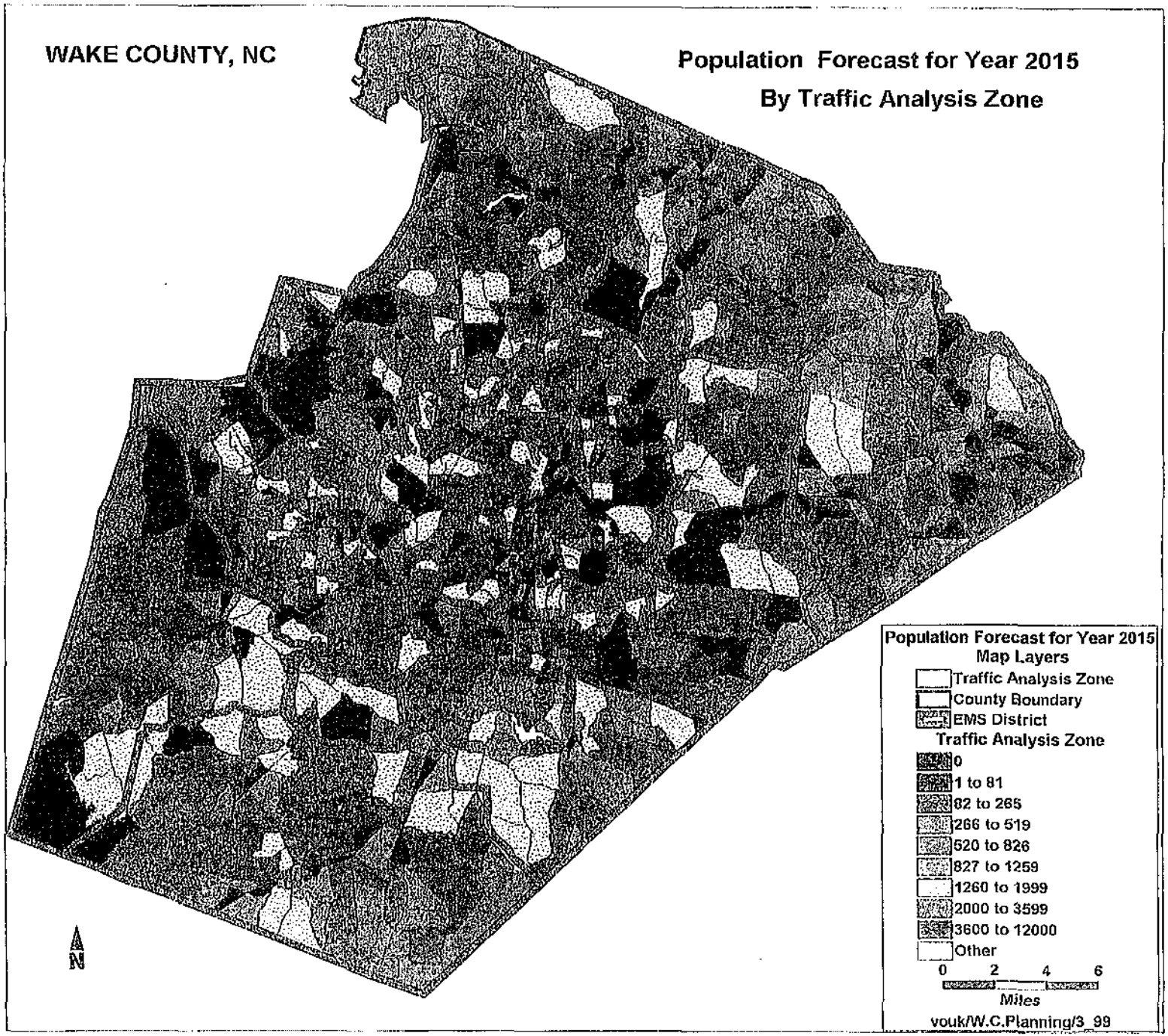
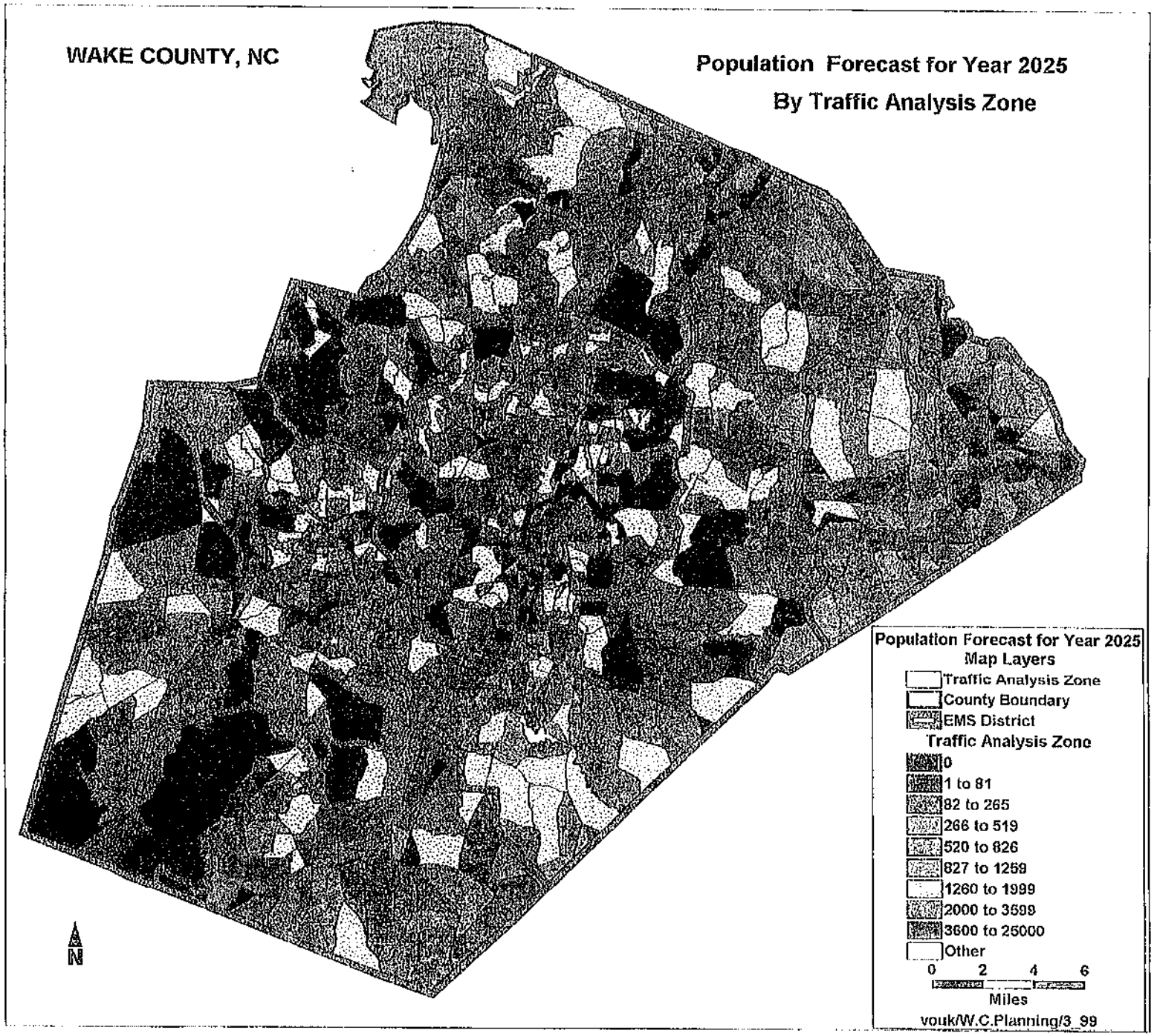
vouk/W.C.Planning/3_99


WAKE COUNTY, NC
Population Forecast for Year 2015
By Traffic Analysis Zone
N
Population Forecast for Year 2015
Map Layers
Traffic Analysis Zone
County Boundary
EMS District
Traffic Analysis Zone
0
1 to 81
82 to 265
266 to 519
520 to 826
827 to 1259
1260 to 1999
2000 to 3599
3600 to 12000
Other
0 2 4 6
Miles
vouk/W.C.Planning/3_99


WAKE COUNTY, NC
Population Forecast for Year 2025
By Traffic Analysis Zone
N
Population Forecast for Year 2025
Map Layers
Traffic Analysis Zone
County Boundary
EMS District
Traffic Analysis Zone
0
1 to 81
82 to 265
266 to 519
520 to 826
827 to 1259
1260 to 1999
2000 to 3599
3600 to 25000
Other
0 2 4 6
Miles
vouk/W.C.Planning/3_99

Increases in the number of subdivisions across the county will create more work for emergency response agencies. Given the explosive growth of the County's population, many of the people who will live in these newly developed areas are likely to be from out of the county originally. If they come from highly developed areas, they are likely to have greater expectations for the provision of EMS (something that will be discussed shortly). In short, areas that never needed ambulance service before will begin to require coverage, and the coverage that is required in those areas will need to be commensurate with what is provided elsewhere in Wake County.

Table 3 shows County population growth projections from 1995 to 2010.

Table 3. Wake County Population Estimates (1995-2010)

1995	*2000*	*2005*	*2010*
508,734	610,284	692,418	781,338

Source: Wake County Planning; estimates are straight-line projections.

Increased Expectations for Care

EMS is a fairly recent addition to the spectrum of services offered by most governments. It was not until the mid-1960s that the need was identified for an organized system of delivering care to the ill and injured outside of the hospital. In 1966, at the request of Congress, the National Academy of Sciences published a landmark white paper called *"Accidental Death and Disability: The Neglected Disease of Modern Society."* The white paper noted that, among other things, "[a]dequate ambulance services are as much a municipal responsibility as firefighting and police services."[8] At the time of publication of the white paper, most ambulance services were provided as a side line by morticians (mostly because they had the only vehicles capable of transporting a person lying down.

In the 30 years since the publication of the white paper, the American populace has come to expect that sophisticated emergency care will be rapidly available by dialing three digits from any phone. Television shows such as *Emergency!* and *Rescue 9-1-1*

[8] National Academy of Sciences. *Accidental Death and Disability: The Neglected Disease of Modern Society*, 1966, Washington, DC. p. 13.

have contributed greatly to the public's knowledge of the existence of organized systems of emergency medical care and of the capabilities of the personnel who staff those systems. Most people in the United States have heard of CPR; most people believe that 9-1-1 is the number one dials everywhere for an ambulance.[9]

Rapid response is not all that people are concerned about. They want sophisticated out-of-hospital care – paramedics with machinery and medications, who can make the difference in preventing premature death.

The public expects that when a life-threatening medical emergency occurs that paramedics will be able to access the patient and provide high-tech, life-saving medical intervention irrespective of where the medical emergency may occur. Heretofore, people who lived in the country did so understanding that they could not expect the same level of services as governments were able to provide in more populated areas. Now, communities leaders across America are hearing their constituents demand levels of service that are commensurate with their urban counterparts.

Decreasing Volunteerism

The second major reality that is redefining the delivery of EMS throughout the United States is the changing face of volunteerism. Most (about 75 percent) of the ambulance services in the United States are volunteer organizations, and many have been in existence for upwards of 50 years. Nationally, however, volunteerism in EMS is declining. A recent report by the U.S. Fire Administration summarizes the experience of volunteer fire and rescue departments from all 50 states as follows, "Virtually all of the workshop attendees said that it is harder to muster a strong cadre of volunteers today than 20 years ago."[10]

[9] Although, in reality, only about 93 percent of the population and 50 percent of the geography of the United States is covered by 9-1-1 (source: National Emergency Number Association).

[10] U.S. Fire Administration, *Recruitment and Retention in the Volunteer Fire Service: Problems and Solutions*, FA 185, December 1998, p. i.

Wake County's EMS system does not appear to be an exception to this trend. While specific numbers are not available[11], numerous VRS members with whom TriData spoke indicated that it is becoming more difficult to find and keep volunteers.

In the early days of EMS (stretching back to before the establishment of formal EMS systems), it was understood that an employer would allow an employee who was a member of a volunteer ambulance service (or fire department) to respond to the emergency. Because there were few full-time EMS agencies, calls would have gone unanswered without such practices.

Other factors made it feasible to rely mainly on volunteers for the provision of EMS. People worked closer to home and commuted less, so it was entirely feasible to staff an ambulance service with volunteers. Another advantage was that people used the ambulance services less than they do today. Ambulances were for "emergencies." It was an "event" to see an ambulance drive by with its lights and siren on. Drivers pulled to the side. Because the call volume was much lower than it is today, the time strain on volunteers was much less.

Today, it is almost impossible to staff a high-volume EMS system (i.e., one with an aggregate call volume of more than 10,000 calls per year) with volunteers. Systems with such high demand invariably experience most of their calls during the middle of the day, when volunteers are often scarcest. People commute to work, and few people remain in the bedroom communities to answer the EMS calls. Employers will seldom release their employees to respond on calls. To make matters worse, the number EMS calls has grown steadily over the years (as it has in Wake County). Throughout the United States, EMS agencies are experiencing growth in their call volumes of between five and seven percent per year.

Additional hurdles to volunteerism exist. The time demands for training are simply too high for most volunteers. When EMS first started, the basic training course for EMTs was 81 hours long. Gradually, it has grown to over 120 hours. It can take four months for a volunteer to complete a 120-hour EMT class that meets several nights a week and/or on weekends. Furthermore, states impose annual training requirements to

[11] Hard data are not available on the subject of volunteerism in the Wake County EMS system. Such data should be collected (this could be the responsibility of a County volunteer coordinator).

maintain certification. North Carolina State EMS Office regulations require an average of 24 hours of continuing education/refresher classes each year, no more than 12 of which may be from clinical observation or self-study. Occupational health and safety rules mandate certain annual training above and beyond that required for continued certification as an EMT. All this training and time commitments become quite burdensome for a volunteer (they're even burdensome for paid EMS providers).

These factors (among others) have conspired to cause a decline in the availability of volunteers to staff EMS systems. A 1987 study on volunteerism by the J.C. Penny Company (see Table 4) highlights some of the other reasons people don't volunteer.

Table 4. Reasons People Don't Volunteer

Lack of time	79%
Concern about honoring the commitment	40%
Health/physical problems	20%
No interest in volunteering	19%
Government should provide the service	16%
Don't know how to get involved	12%
Too old/too young	12%
Concern about legal liability	11%
Don't have the necessary skills	8%
People should be paid	7%
Too costly	7%

Source: J.C. Penny Company National Survey on Volunteerism, 1987

Managed Care and Capitation

The advent of managed care has been affecting EMS systems in some areas of the United States. Managed care organizations (MCOs) seek profit by containing health care costs. One method of cost containment is getting pre-approval of certain types of health care procedures. Another means that MCOs employ to contain costs is to capitalize on economies of scale by ordering uniform equipment and supplies in large quantities.

MCOs are beginning to affect EMS in a number of areas. First, in many places in the United States MCOs are trying to get their subscribers to contact the MCO prior to calling for an ambulance. The so-called "gatekeeper" function is intended to divert

patients from the ambulance service and emergency department by requiring them to get pre-approval before seeking emergency services.

Another avenue that MCOs are pursuing is getting ambulance services to contract with them to provide "capitated" patient transport services. Capitated payment plans differ from traditional "fee-for-service" plans as follows. Under fee-for-service arrangements, an insured person submits the ambulance bill to the insurance company for payment. Under a capitated payment plan, an ambulance service receives a set monthly payment from an MCO that is based on the number of MCO participants in that ambulance district. In exchange for the MCO using that ambulance service on an exclusive basis, the service agrees to provide necessary transport for a set fee per insured person for the life of the contract. This fee is calculated on the number of people who are covered by the MCO (hence the term "capitated"). In other words, the ambulance service will get the same payment irrespective of the number of the MCO's patients it transports.

Possible effects on EMS include creating an incentive not to transport MCO patients and possibly putting services that have contracted with an MCO in an nonviable economic position if the MCO's ambulance usage far surpasses the service's projections used to establish the contract.

Although MCOs do not appear to be much of a factor in Wake County, it is impossible to say that they will not have an effect in the future – especially if any of the four hospitals in Wake County is purchased by an MCO.

Negotiated Rule-Making

Pursuant to a congressional mandate, the Health Care Financing Administration (HCFA) has recently begun a process known as "negotiated rule making" (NRM) to establish a fee schedule for Medicare[12] reimbursement of ambulance service. This consensus process will provide HCFA with direction for the new Medicare ambulance reimbursement policy that will take effect January 1, 2000.

[12] Medicare is the federal health care insurance program for the elderly. Medicaid is a health care program for the indigent that is jointly funded by each state and the federal government.

Medicare reimbursement rates have a substantial effect on ambulance service providers because Medicare patients are generally a substantial percentage of the people who use ambulance services and because Medicaid reimbursement rates are frequently tied to Medicare reimbursement rates, even though Medicaid is a state responsibility.

Medicare reimbursement for ambulance service is confusing and uneven because it is based on "reasonable" rates for a given medical service region. Further, Medicare pays only a portion (80 percent) of the pre-approved rate for that region. Many perceive the present Medicare reimbursement program as unfair for three primary reasons. First, older EMS agencies are "penalized" compared to newer ones because older EMS agencies' Medicare reimbursement is based on their billing trends, and many older agencies billed a lot less than they should or could have. Newer services are reimbursed at much higher rates because they have no prior billing history that might pull down their reimbursement. Second, reimbursements for government-based ambulance services are low because bills were seldom a reflection of the true cost of providing ambulance service. Third, the determination of what Medicare will pay is calculated on a regional basis, even though there might be substantial difference in costs between ambulance services within the same region. Finally, Medicare pays only for patients who are transported to a medical facility. This means that there is a good deal of uncompensated care because most EMS systems have at least a 25 percent "no-transport" rate.

The NRM will result in the establishment of a fee schedule for reimbursing ambulance services. It is hoped that this new mechanism will be an improvement over what is currently in place because all ambulance services will be on the same schedule. However, the process is political, and the outcomes are anything but certain.[13] HCFA has already announced that the total amount that the fee schedule will apportion will be $65 million less than it would have been without a fee schedule. This presents the possibility that there may be adverse effects on the bottom-line profitability of ambulance providers who bill for service.

Another announced outcome of the NRM process is that HCFA will eliminate the present four allowable billing methods in favor of one method that is yet to be determined

[13] In fact, HCFA has the statutory authority to reject the outcome of the NRM process altogether and design a fee schedule as it sees fit.

(most likely, it will be similar to the method WCEMS now uses – service and supplies included but mileage separate).

At present, North Carolina has the 48th lowest Medicare reimbursement rate in the United States. There is the distinct possibility that the NRM will actually increase Medicare reimbursement in North Carolina because the "allowed rate" will be established on a national, rather than a regional, basis.

Unfortunately, there are no guarantees that this will happen. An unfavorable rule could have a double-whammy effect on EMS in Wake County. First, it could result in less federal reimbursement for service provided in the coming year. Second, reduced profitability might make it less economically feasible for private providers to operate. If private providers fold, it may mean that the Wake County EMS system would be called upon more to provide inter-facility transportation of non-emergency patients.

It is premature to guess what the final outcome of the NRM will be; however, it is not inconceivable that the economic picture for the EMS industry as a whole and for the Wake County EMS system will be less rosy than it is at present. Hence, it would be prudent to await the conclusion of the NRM process prior to modifying the billing structure or implementing new services (such as non-emergency transportation).

Hospital Consolidations

The University of North Carolina Health Care System recently announced its plans to purchase Rex Hospital. Raleigh Community Hospital was recently purchased by Duke Medical Center. Consolidation of hospitals might have an impact on the delivery of EMS in Wake County, although it does not appear to be a big factor at the present time. The most probable scenario would be an increase in the number of inter-facility transports from Wake County hospitals to hospitals outside the county for patients who require tertiary care that would be better (or more cheaply) provided at the larger institutions. This is even more likely given the recent departure of American Medical Response (AMR), one of the private ambulance services operating in the county.

North Carolina EMS Trends

EMS in North Carolina is experiencing some statewide trends. Across North Carolina, the public expects that ALS will be available. 98 counties have EMTs who defibrillate, intermediate life support, or advanced life support. Almost three-quarters of the state's 100 counties have paramedic-level service available somewhere in the county. Each county has the authority to define the EMS system. A minimum level of BLS is mandated by the state – ALS is optional.

EMS is provided through a county-run paid service in about three-quarters of North Carolina. An increasing number of jurisdictions are implementing fire service-based first response. Additionally, more hospitals are beginning to offer EMS. Carolinas Medical Center, Mission/Asheville, and 1st Health/Moore Regional each are in approximately six to seven counties across the state. EMS in Watagua County is now privately provided.

IV. EMS SYSTEM ANALYSIS

Overall, the level of care rendered by the Wake County EMS system appeared quite good to the TriData analysts who rode along with units and spoke with emergency department staff members. Unfortunately, it is also quite uneven. There is no shortage of vehicles or personnel with which to deliver EMS, and response times are pretty good across most of the population centers of the county. Nonetheless, while the EMS system may be adequate for the present, it will surely prove to be inadequate in the coming years when the population density intensifies and areas of the county that were formerly rural become suburbanized (or even urbanized).

This section addresses findings that TriData's analysts made in observing and studying the Wake County EMS system. Where appropriate, recommendations for improvement in the system are included.

Operations

EMS delivery in Wake County can be best characterized as "fragmented." From the standpoint of providing a countywide mechanism to ensure that patients are rapidly accessed, treated, and transported to a hospital, the Wake County EMS system does not well function as a "system." Instead, it is really a conglomeration of a number of small EMS agencies that abut each other, with little programmatic coordination (except for that provided by the WCEMS training division). For example, although VRSs do assist each other upon occasion by lending extra personnel or equipment to neighbors in times of need, there is much duplication of service, and each VRS insists on maintaining its unique specifications for vehicles and equipment. Increased programmatic coordination would involve capitalizing on economies of scale in such areas as equipment specification and ordering, payroll processing, and response planning.

Perhaps the single most important recommendation that could come out of this report is to erase the territorial rescue district boundaries that define EMS delivery within the county.

"Seamlessness" of Care

Patients don't generally care what color the ambulance is, what it says on the side of the ambulance, or what color the uniform the crew wears. They do care that they get as rapid a response as possible by providers trained to assess their medical condition and take the appropriate action. Patients shouldn't be made to wait longer for this care because they are on one side or other of an arbitrary line.

Unfortunately, this is precisely what is happening. Consider the following hypothetical situation. An individual has a heart attack just inside the WCEMS district line bordering on Garner EMS' district. No WCEMS ambulance is available on the south side of Raleigh, so a unit is sent from the north side of the city to the heart attack. Ambulances from Garner were available a few miles away, but because the call occurred in the WCEMS response area, they were not sent. Situations such as this happen regularly in Wake County. *Fixing this problem should be a high-priority item.*

Figure 2 depicted the basic ambulance district boundaries for Wake County. These district lines are a historical artifact, drawn years ago, when the population distribution was much different than it is today. The boundary lines do not divide the county into rational or efficient ambulance service districts based on projected travel time or number of people served. Instead, they create artificial catchment areas that result in a territorial view of providing ambulance service.

Current practice is to dispatch an ambulance from the agency that covers a given catchment area, even though a closer unit from a different department may be closer located. This practice is outdated. The closest appropriate resource should be dispatched automatically, irrespective of the service area in which the call occurs. Unlike its public safety counterpart, law enforcement (which has issues of legal jurisdiction), EMS should be delivered on proximity. The ambulance service district lines should, however, be kept to define who maintains operational authority over a given incident or where it is permissible to conduct grassroots fundraising efforts.

As noted above, the service districts lead to territorialism. Many people with whom we spoke reported that the level of EMS delivered is directly dependent upon where one lives. While every first-duty truck in the system is staffed with paramedics,

this is not the case for second- and third-duty trucks. This leaves the EMS system being in the position of providing a paramedic on a sprained ankle (because it was a first-duty call) while the heart attack that comes in subsequently (as a second-duty call) might get a less-qualified EMS provider in some areas.

The object should be to provide "seamless" care throughout the county. Levels of service (both in terms of response times and training/capabilities of personnel) should be transparent to EMS system users.

To do this, component corporations of the Wake County EMS system will need to view themselves as belonging to a larger system of care – not as discrete units. A policy of "automatic aid" will need to be established, whereby the closest appropriate EMS resource will be dispatched, *irrespective of ambulance district lines.*

Unfortunately, the funding system presently reinforces territorialism in EMS delivery. Because individual VRSs receive a portion of their annual funding based on how many calls they run, there is a counterincentive to relinquishing calls that would have occurred in one's catchment area to another VRS. In order for a seamless system of care to exist, annual VRS subsidies must not rely on call volumes.

Level of Service Provided

The Wake County EMS system has been built around the notion of always having a paramedic-level first-duty response. In some areas, the decision has been made to provide a paramedic-level second-duty response as well.

While the effort to provide a paramedic on every call is laudable, it is not an efficient use of resources. More than half (53.1 percent) of the calls run in Wake County do not require a paramedic; they could just as well be handled using a basic-level EMT. Because paramedics are vastly more expensive to train, keep certified, and pay, it doesn't make economic sense to over-employ them simply to have a paramedic on every call.

Implementation of a two-tier response system will more closely match resources to demand. Under a two-tier system, BLS ambulances would be dispatched to calls that do not require ALS; paramedic-level ambulances would be dispatched to ALS calls, and

if a basic ambulance were closer than a paramedic unit, the basic unit would also respond as a first responder. Such a system requires the dispatch center to be able to differentiate those calls that require a paramedic from those that do not. Therefore, implementation of a tiered response requires proper utilization of an emergency medical dispatching (EMD) system. The dispatch system in use at RESCOM (Medical Priority Dispatch™, or MPD™) has been validated to be able to distinguish between ALS and BLS calls.

It would be preferable to implement the computer-assisted version of MPD™, *ProQA*™, prior to Wake County's implementing a tiered response. The reason for this has to do with both the work process and high turnover of telecommunicators at RESCOM. The MPD™ system currently in use at RESCOM consists of flip-cards. TriData analysts observed irregular usage of the flip-card system during our observations at RESCOM. "The National Academy of Emergency Medical Dispatch has maintained for several years that the process of EMD ... can only reliably determine the emergent nature of calls by requiring absolute, non-discretionary compliance to a scripted protocol."[14] *ProQA*™ integrates the scripted protocol into the dispatching process, so it cannot be disregarded (as often happens now). This computerized integration ensures the compliance that the National Academy seeks in ensuring the correct determination of the nature of – and hence, the appropriate response to – a medical call. Additionally, the high turnover rate of the RESCOM telecommunicators (resulting in frequent reliance on new dispatch personnel) reinforces the desirability of forcing telecommunicators to adhere to the MPD™ interrogation protocol using the *ProQA*™ package.

Adequacy of Response Times

For the past several years, the County has hired AJC EMS Consultants to produce a study of ambulance placement in Wake County. This series of monographs documents the call volume and response times of EMS units throughout the county.

As expected, the studies have demonstrated faster response times in areas immediately surrounding where ambulances are located. They have also demonstrated that outlying areas with lower call volumes also have longer response times. Finally, the studies predictably showed that the highest concentrations of EMS calls were in the areas of densest population.

As mentioned in the discussion of response times above (see "Response Times," page 25), ambulance response time performance in Wake County exceeds national norms for urban and suburban settings. The AJC report indicates that "Wake County providers responded to 76.29% of the total calls (40,329) in less than 8 minutes during the 1997 study and 79.07% of the total calls in 8 minutes or less in the 1995 study."[15] The generally accepted standard for urban paramedic ambulance (i.e., transport-capable vehicle, not ALS first responder) response is eight minutes or less in 90 percent of calls for life-threatening calls, so by either TriData or AJC's calculations, the Wake County EMS system is not performing as well as it should.[16]

According to the AJC report, the County decided that a response time goal of 20 minutes for rural areas was appropriate.[17] It is debatable what the rural response time goal should be; however, in thinking about the response time performance for a given EMS agency, it should be considered that some of these rural areas will soon become suburbanized. This implies that what may be an acceptable response time now for a given grid will not be considered acceptable in a few years.

Proximity-based dispatch and Automatic Vehicle Location

One means to lower response times has already been alluded to – proximity-based dispatch, or sending the closest appropriate resource irrespective of district boundaries. Determination of the closest unit can be done in one of two ways. First, the dispatcher can give the call to whatever ambulance the map shows should be closest. If another unit hears the call and identifies itself as being closer to the call than the resource initially

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[14] Clawson, J. "In Defense of Telephone Triage," *EMS Insider*, May 1999, Vol. 26, No. 5, p. 6.

[15] AJC EMS Consultants. *Wake County Ambulance Placement Study*, June 1998., p. 15. TriData calculations of response time used data for the three-year period, 1995-1998, and excluded canceled calls and certain calls for which data were missing, so the percentages shown will be different. The magnitude of the performance is roughly the same, however.

[16] It should be noted that these response times do not speak about the ability of the EMS system to place a medically trained first responder at the patient's side within the window of opportunity for resuscitation. The comparison statistic for such capability would be an EMS *system* response time of something like 6 minutes in 90 percent of calls. This figure is not possible to calculate at present because first responder response times are not kept in the ambulance call report database. At some point (i.e., when the ambulance call reporting system is fully automated and tied into a modern computer-aided dispatch system), the County should endeavor to collect such information.

[17] By way of comparison, one community TriData has recently worked with (Colorado Springs, CO) has a rural EMS response time performance target of 20 minutes or less, 90 percent of the time, with a maximum response time for any call of 30 minutes.

dispatched, it can notify the dispatcher to reassign the call. This system is predicated on EMS personnel monitoring the radio to hear calls as they are being sent out.

The second method is much better, but also considerably more expensive. It involves using automatic vehicle location (AVL) technology to track the status and location of every unit in the EMS system. Upon receipt of a call, the computer would identify the closest appropriate unit to send by pinpointing the location of all available units. This system is much more accurate, much faster, consumes less airtime, and does not require personnel to constantly monitor every dispatch.

Another benefit of AVL is the increased responder safety such systems afford. With an AVL system, EMS crews that get into trouble simply push one button, which alerts the dispatch to the fact that an emergency situation exists and the *precise location of the unit*. The crew does not need to be able to communicate its position (which they may not be able to do if they are lost). This margin of safety could mean the difference between life and death for an EMS crew in danger.

In-Vehicle Navigation System

In-vehicle navigation (IVN) is another technology that could be put to use to help lower response times builds upon the AVL system and the County's previous investment in geographic information systems (GIS). An IVN system displays a computer-generated map in the driver compartment of a vehicle. The map can be zoomed in or out to display as much or as little detail as is needed. These maps can be invaluable because they can help guide the responding unit to the correct location, irrespective of how well the driver knows the area. This is critical for two reasons. First, WCEMS personnel rotate throughout the county on a regular basis. It is not possible for anyone to know every street in the county, especially with the rapid growth and development the county is experiencing at present. Second, if a decision is made to implement proximity-based dispatch, there is greater likelihood that drivers will be called upon to respond to incidents in unfamiliar territory.

While AVL and IVN technologies may seem like a luxury at present, they will not be viewed that way in a few years. The County should move toward implementing these systems as soon as possible. Unfortunately, it is almost impossible for TriData to provide

a cost estimate for these systems because the cost is highly dependent on the radio communications infrastructure, and decisions that have yet to be made in that regard will strongly affect the price. It is safe to say that it will be cheaper to integrate IVN, AVL, proximity-based dispatch, EMD, and a new computer-assisted dispatch system (see "Dispatch Center Technology," page 67) if these systems are planned and specified with integration in mind from the outset. *Constructing a high-tech EMS command and control system in a piecemeal fashion is highly inadvisable.*

Adequacy of Transport Times

Units in the southern and eastern portions of the county are especially prone to long transport times. The problems with rush hour congestion on the major traffic arteries serving the south and east are well documented. Because all four hospitals are proximate to the Beltline, patient transports during rush hours can be prolonged (as long as a half hour to 45 minutes). Ambulance calls in the south and east routinely take upwards of two hours from start to finish.

Transport times in this range are clearly undesirable; however, the transportation infrastructure is the controlling factor for transport times. There is little the EMS system can do to reduce transport times, with the exception of making greater use of the aeromedical helicopters from outside the county. This is not really an option, as helicopters are limited in supply, very expensive, and subject to weather limitations. The use of helicopters for routine EMS calls probably would not be tolerated by either aeromedical service, especially since Medicare would likely reject reimbursement claims on the basis that transportation by helicopter was not medically necessary.

"No-transport"/"Slow transport" Options

Possible means that could be considered to reduce the impact of lengthy transport times on ambulance availability is to establish "no-transport" or "slow-transport" options.

In some instances, a patient simply does not need to go to the hospital by ambulance. A "no-transport" option allows an EMS provider to not transport a patient, after the provider has documented the patient's condition and the reasons for not transporting the patient and has received approval for the no-transport decision from on-

line medical control. A "slow transport" option allows EMS personnel to arrange (with the patient's permission) for a scheduled, non-emergency pick-up of the patient by a van, ambulette (invalid coach), taxi, or other appropriate means of transportation. Use of a "slow transport" would also require thorough documentation of the patient's condition by field personnel and approval from on-line medical control.

San Francisco was one of the first large EMS systems to implement a no-transport option. Paramedics in San Francisco were empowered, after consultation with on-line medical control, to deny ambulance transport to patients who met certain exclusion criteria. The San Francisco paramedics were issued tokens that could be given to these patients for use with taxis and the public transportation system. Very few paramedics have ever used the option. It is unclear whether they transport out of personal fear of liability or because they do not feel it is in the patient's best interest to deny transport.

In the case of a system such as Wake County, which is plagued by extremely long transport times from the southern and eastern portions of the county, no-transport or slow-transport options might make sense. However, there are a number of major safeguards that must be put into place in creating a such transportation alternatives, because denying someone ambulance transportation to a hospital is inherently risky (both medically and legally).

First, a transport protocol must be written. It must clearly identify the conditions under which a non-transport or alternative- (i.e., "slow") transport is permissible. It must also clearly identify the procedure that must be followed with on-line medical control to document those conditions. The protocol must be developed with the blessing of both the EMS Medical Director and the County's legal counsel, and all MICNs and emergency physicians must be properly educated about the existence and use of the protocol.

Second, where the "no-transport" option is exercised, some alternative means of transportation should be made available, in case the patient wishes to go to the hospital. This might be a private ambulance, private automobile, taxicab or, where available, public transportation. The no-transport protocol should address how the alternative means of transportation are to be accessed.

Third, a means of quality assurance must be employed to review all alternative transport decisions for medical safety. This should be performed under the auspices of the EMS Medical Director, and if necessary, discussed in the Audit and Review Committee.

The EMS Medical Director should carefully consider whether implementation of a no-transport option, a slow-transport option, or both is warranted. If warranted, the EMS Task Force should develop a policy governing use of such options with the strong direction of the Medical Director, ensuring that the safeguards discussed above are addressed.

Ambulance Utilization and Deployment

There are more than a sufficient number of ambulances in Wake County. They are not well distributed, however, which is part of the reason that there are long response times in some parts of the county. Essentially, EMS resources are clustered in population centers. While this produces an acceptably low response time in those areas, the outlying areas have to suffer longer response times because the units have to travel from the central location to the outer fringes. As more and more people begin to inhabit those areas, this will no longer be a viable placement strategy.

The current placement scheme, like the ambulance district boundaries, is a historical artifact. Initially, it made sense to house a community's ambulance centrally in that community. Call volumes were low enough that (probably) only one ambulance was needed to protect a given area. Farmers and those who lived in the truly rural areas understood that it would take a while for the ambulance to come from town. As call volumes grew, so did the ambulance quarters. It probably made more sense to expand an existing facility to accommodate a second ambulance than it did to build an entirely new ambulance station.

A new ambulance placement strategy needs to be rationalized according to response times and call volumes. Moving what are now "second-" and "third-duty" trucks[18] to new locations will increase their call volumes, making it easier to justify the expense of maintaining an additional unit in a state of readiness, and decrease their

response times to areas that have traditionally been underserved in this respect. Naturally, spreading the same number of ambulances out more evenly may somewhat increase the response time for what would have been second-duty calls under the former placement scheme. This is a tradeoff that may have to be made.

Unit-Hour Utilization

The primary measure of ambulance usage is unit-hour utilization (UHU), which is the ratio of the total number of hours spent delivering EMS to the total number of hours that the system could possibly deliver EMS. In Wake County, EMS runs take an average of 52 minutes to complete. The UHU is simply the number of runs times 52 minutes, divided by the number of unit-hours produced by the EMS system, or 525,600 (the number of minutes a year) times the number of units placed in service (see Equation 1).

Equation 1. Unit-Hour Utilization Formula

$$UHU = \frac{(\text{\# of runs}) \times (52 \text{ minutes/run})}{(525{,}600 \text{ minutes}) \times (\text{\# of units})}$$

The UHU shows how busy a given unit or agency is. The UHU is affected not only by the number of calls per time period (in this case a year) that a given unit runs, but also by the amount of time the units spend on a call (on the average).

It is difficult to establish the best UHU target for a service area such as Wake County. Generally, in urban areas, experts tend to calibrate EMS systems to produce a UHU of about 0.42.[19] Wake County spans the urban, suburban, and rural. Some UHU experts would argue that the large rural portion of the County militates in favor of reducing the UHU target to something along the lines of 0.35 or even 0.30.

The Wake County EMS system has a UHU of 0.15 (see Table 5). No EMS agency in Wake County has a UHU of greater than 0.23. Even if one were to establish a

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[18] And a "fourth-duty" truck in the case of Cary.

[19] This figure has been derived empirically by the managers of some of the best EMS systems in the country. It represents the point at which personnel and vehicles are performing optimally – beyond this number, these components of the EMS system are subject to stresses that degrade their performance; below this number, the resources are not being utilized to their fullest extent.

UHU target of 0.30 (on the basis that Wake County is heavily rural), there would still be excess capacity in the system. This means that lowering response times can be accomplished by repositioning ambulances and that additional EMS units are not needed.

Table 5. Unit-Hour Utilization Rates by Agency

Agency	*UHU*
Systemwide	.15
Wake County EMS	.23
Apex	.08
Cary	.19
Fuquay-Varina	.08
Garner	.20
Holly Springs	.01
Knightdale	.06
Rolesville	.03
Six Forks	.09
Wendell	.07
Zebulon	.08

Source: TriData research; WCEMS ACR data

Presently, units are clustered at EMS stations throughout the county. Some EMS stations have three or more vehicles. This distribution scheme may have made sense twenty years ago, but it will not suffice for the future. Future population expansion will create demand for EMS where it didn't exist before, or where it was very low. As call volumes to those areas increase, present response times will become less and less acceptable. There will be a future need to reduce response times to area of the county that traditionally have had low call volumes.

There has been a historical aversion to co-locating EMS units with fire departments, so most ambulances have separate facilities. There are 29 fire stations throughout the county. They are better dispersed than the ambulance stations. The solution to providing greater areas of the county with faster response times is to uncluster the ambulances and disperse them more widely throughout the county. The efficient way to do that would be to co-locate EMS and fire units whenever possible. While it is true that there have been tensions associated with housing two agencies in one building in the past, there are means to ensure that these problems are averted. For example, putting crew quarters on opposite sides of the vehicle bays could be helpful. Another suggestion

would be to require personnel of both agencies to undergo training on conflict resolution and problem solving. Finally, almost all problems associated with multiple agencies living under one roof can be eliminated by having in-station policies and procedures worked out in advance that clearly establish expectations for behavior, station duties, and reporting/chain-of-command. Co-location of multiple agencies does not have to be problematic if the potential problems and their solutions are discussed and solved in a consensus-building manner.

District Supervisor Utilization

The original plan for District Supervisors called for them to be used as paramedics to upgrade BLS units to ALS units when necessary. According to most sources, this happens only infrequently.

In some areas, staffing a second-duty unit with a paramedic is inefficiently costly given the low call volumes of these units (see "Tiered Response System," page 110). It would make more sense to staff these units at the BLS level and upgrade them as necessary. This is something that the WCEMS District Supervisors could assist with.

Adequacy of First Responder Program

Fire departments provide first response for certain high-priority calls. As noted earlier, the basic idea is to use the proximity of the fire departments to get trained responders on the scene prior to the arrival of the ambulance. These personnel can then administer life-saving treatment, such as stopping bleeding, starting CPR, etc. while the ambulance is en route to the scene.

First response is an excellent use of resources, but only if the firefighters truly can reach the patient prior to the ambulance crew getting there. The use of first responders must be rational. It is unlikely that a fire department will be able to beat an ambulance to the scene if the fire station is right next to the EMS station and the firefighters must respond from home to get a fire engine out on a medical call (especially if the EMS station is staffed around the clock). In its 1994 fire service study, TriData recommended that volunteer fire departments consider "live-in" or overnight staffing. We reiterate this suggestion, especially as it pertains to providing first response.

First Responder Automatic Defibrillation

By July 1, 1999 all fire departments receiving County funding will be capable of using automatic external defibrillators (AEDs) to correct life-threatening cardiac disturbances. The use of AEDs in the fire service has become widespread in the United States, and cardiac arrest survival rates in jurisdictions where AEDs are in use are often improved over those jurisdictions that lack the technology. In 1997, in Wake County, fire department first responders defibrillated 68 patients in cardiac arrest (17 percent of all patients treated for cardiac arrest). Twenty-two of these patients resuscitated, and 11 (or 16 percent) ultimately survived to be discharged from the hospital. In 1998, fire department personnel defibrillated 42 patients (or 11 percent of the cardiac arrests), of which 12 were resuscitated.

While it is unclear whether these patients would have died had they had to wait for a defibrillator-equipped ambulance before being defibrillated, these statistics support the contention of the American Heart Association and a growing body of medical literature that AEDs increase cardiac arrest survivability in ALS systems.

There are large portions of the county which are distant from ambulance stations, but which are adequately protected by fire companies. Because of the strategic positioning of the fire departments, and in light of the demonstrated success of first response, the County should continue to facilitate the first responder/AED program as a vital adjunct to the delivery of EMS in Wake County. With the increased population growth expected, the value of this program will only increase over time.

Integration of First Response and EMS

In order to make the most use of first responders, EMS and fire personnel must train together and respond together. EMS personnel will be more likely to utilize firefighters in a meaningful fashion when they are sure of the knowledge and skills of the fire personnel. Smooth functioning on the scene of a motor vehicle collision or difficult rescue requires lots of tight teamwork, which can only be created through lots of cooperative practice.

Adequacy of Extrication/Rescue Services

TriData was unable to observe any automobile extrications taking place; however, we did gain some understanding of the availability of extrication and rescue services. In its 1994 study of the Wake County fire service, TriData noted that the responsibility for extrication and rescue services should be assigned to the fire departments. While some fire departments have undertaken the extrication/rescue mission, others show no interest and/or refuse to.

Working around wrecked automobiles and on the scene of other rescue emergencies poses numerous hazards to personnel from sharp objects (e.g., jagged metal or glass), hot fluids and vapors (such as heated motor oils or radiator steam), shrapnel from vehicles that are being cut open, etc. Safe performance of these functions requires teamwork, specialized skills, and specialized equipment. WCEMS personnel are not equipped with "turnout gear" (i.e., NFPA-compliant personal protective clothing). Most VRS personnel do not have such equipment either.

EMS personnel (from either WCEMS or the VRSs) who are expected to work in hazardous environments or to perform extrication or other rescues must be properly trained and equipped for the mission.

The County should recognize that providing these services is an expensive undertaking. Special vehicles, tools, and protective gear are required. In addition, personnel performing such work should be trained at least to the Rescue Technician level. Acquisition and disposal of wrecked vehicles on which to practice also presents additional costs. None of these extra rescue-related costs are eligible for Medicare reimbursement. The fire departments performing these services have County funding to cover the costs of these operations. The EMS agencies performing them in lieu of fire departments that refuse to take on the responsibility should also receive County funding (preferably from the fire tax fund).

Adequacy of Equipment

TriData was impressed with the vehicles and equipment in use in both WCEMS and the VRSs across the county. Both vehicles and equipment appeared to have been selected with care and maintained well.

Vehicles

Overall, the ambulance fleet appears more than adequate for the types and numbers of missions it is called upon to handle. There is an orderly plan for the replacement of WCEMS vehicles, and this is accomplished on a regular enough basis that the oldest front-line ambulance in the fleet is a 1998 model.

The VRSs are not as fortunate. They replace vehicles as they can afford to. Naturally, some squads (such as Cary) can afford to regularly; others must hold special fundraisers and go to great lengths to acquire new vehicles. Given the tight budgets of many of the VRSs, replacement of vehicles can be problematic without savvy financial planning. VRSs should avail themselves, as much as possible, of the purchasing power of the County by purchasing their ambulances under the County contract.[20] The common rationale for not doing so is that the VRSs prefer their own specifications for cabinetry, trim, and paint scheme. In our experience, custom vehicle specifications rarely make a difference in patient care (and almost never in terms of patient outcomes).

There are, however, good reasons (aside from reduced cost) for adopting a uniform ambulance specification throughout the county. First, uniformity facilitates interchanging units when vehicles are substituted for maintenance, etc. Second, uniformity ensures familiarity with operation of the vehicle (and placement of equipment if a countywide inventory is adopted), irrespective of personnel assignment. This is especially helpful since WCEMS paramedics are rotated to new locations every few months and because many personnel volunteer or work part-time at multiple locations in the county. It is also helpful when personnel from multiple agencies (e.g., different VRSs or fire departments) are working together at an incident. Finally, maintenance of uniform

[20] From time to time, it may be possible to identify potential savings by deviating from the County ambulance-purchasing contract. If the savings are substantial enough, it may be warranted to examine incorporating the specification into the next County contract. In general, uniformity should probably receive greater weight in the decision-making process unless the savings identified are substantial.

vehicles is facilitated and made less expensive because uniform parts can be inventoried, used, and interchanged.

Capital EMS Equipment

As with vehicles, many VRSs find it difficult to replace capital EMS equipment. Expenditures for defibrillators (usually the capital equipment in question) can range from $3,000 for an AED to over $15,000 for a 12-lead, manual monitor/defibrillator. This can represent a sizable portion of a VRS budget for a given year. Under the present contracts, the County no longer replaces "big-ticket" items – these are supposed to be replaced by the VRSs out of the subsidies received from the County. However, the VRSs are concerned that they are being asked to replace equipment they deem functional with newer equipment that may soon become obsolete. Biomedical equipment has a useful lifespan. At a certain point, the cost and frequency of repairs and difficulty in getting replacement parts militates in favor of replacing the equipment. Nonetheless, the County needs to ensure that capital equipment replacement mandates are well thought out to ensure that County and VRS funds are spent wisely.

There are also strong arguments to be made in favor of standardizing capital biomedical equipment. As with EMS vehicles, there are economies of scale in the purchase of such equipment. Additionally, most biomedical equipment requires disposable components (such as electrodes or paper, in the case of defibrillators). Often, in the long-run, the on-going costs of such disposables exceed the capital cost of the equipment. Therefore, it makes sense to have uniform equipment so that supplies may be purchased in bulk.

Additional considerations include facilitating the training of personnel on such equipment, lowering costs of repair or standard maintenance, quicker replacement of units that are out of service, and better patient care because providers are uniformly familiar with the use of the equipment.

The County should consider purchasing the equipment for the VRSs. This has several advantages. First, uniformity of equipment can be assured that way. Second, because the County will own the equipment, it can set and adhere to a replacement schedule without worrying whether a VRS will be financially capable of meeting the

replacement deadline. Third, when equipment needs to be swapped out for maintenance, the County needn't worry about getting a specific piece of equipment back to the VRS. Fourth, the County can provide the exact equipment that the Medical Director wants used without the VRSs balking at the price. Finally, the County can ensure the compatibility of data associated with a given piece of equipment (e.g., the data contained on the "event recorder" module of an AED).

Large-Scale Events

Wake County is host to a variety of large-scale events, both planned and unplanned. Planned annual events include graduations from the local colleges and universities and sporting events. This year, the area is playing host to the World Special Olympics. Unplanned large-scale events in recent years have included hurricanes and airplane crashes.

Large-scale events can create logistical nightmares for EMS systems. The sudden, short-term influx of tens of thousands of event participants can strain an EMS system with extra calls, multiple casualty incidents, or increased threats of terrorism. They call for advanced planning with all affected agencies, extra personnel to be hired on overtime, additional equipment to be made available, and concerted efforts to coordinate EMS activities the day(s) of the events.

Some EMS agencies around the country have turned to "bicycle medics" to provide rapid response planned, large-scale events. Other departments have golf cart-style vehicles that have been retrofitted into mini-ambulances. Still other departments deal with "special events" on such a regular basis that they have a dedicated special operations coordinator and special operations division.

Rex Hospital has recently expressed interest in creating an ALS "emergency response team," and WCEMS now provides stand-by services to numerous events. There is no demonstrated need for WCEMS to create a bicycle medic team for such events.

There is, however, a pivotal role for WCEMS in coordinating the extensive mutual aid that would be necessary for either a planned or unplanned event. WCEMS can provide not only personnel and computers, but also EMS supplies and equipment.

WCEMS has a multiple casualty incident trailer housed at Station One in Raleigh. It carries a large cache of backboards and other medical equipment that can be used in a major event.

There is no one "right" way to handle large-scale events. Proper use of an incident management system (Wake County has an excellent one that is documented in the "Wake County Incident Command Master Plan") will aid in the ability to handle such events. Free training is available from the National Fire Academy, both in the form of standard classes and on CD-ROM. Further, specialized training in handling large-scale incidents is also available free from the National Fire Academy. Personnel who have important roles to play in planning for and managing such incidents should be sent to the Fire Academy's EMS Special Operations Course.

One of the vulnerabilities of the EMS system right now is that its communications backbone hampers interagency operations. On a large-scale incident, an EMS supervisor might have to carry two or three portable radios to be able to monitor events and communicate with those people he must.

Diversion Policy

On occasion hospitals shut their doors to patients brought in by ambulance. Hospitals "divert" ambulance patients for a variety of reasons. Common reasons include a lack of bed space in the emergency department or a specialized facility, such as ICU or a post-surgical recovery ward. Other times, hospitals must divert because they have a mechanical failure of a key piece of equipment – power, air-conditioning, or a diagnostic unit (such as a CAT scan or MRI) can fail.[21]

Diversion causes logistical problems for outlying services because it lengthens the time before units can return to service – sometimes considerably. It also is frustrating and difficult for patients who desire to be seen in a particular hospital (because it is closer, it is where the patient's medical records are, or because the patient simply is more comfortable at a given hospital). Diversion to another hospital can mean lengthened time in the emergency department, extra travel time for the patient and the family, and

[21] It should be noted that, under the Hill-Burton Act, hospitals may not shut their doors to walk-in emergency patients.

confusion (when the family is told to meet the patient one place and then the patient is brought somewhere else).

Many people interviewed believe that the diversion system in Wake County does not work well. The common belief is that once one hospital goes "on diversion" that one or two of the remaining three will soon follow so that they do not get swamped with patients. According to a review of the records, this has happened only twice in the past three years, and measures have since been implemented to ensure that this does not happen in the future.

WCEMS has provided the four ambulance-receiving hospitals with computers and pagers that provide up-to-the-minute diversion status reports for all the hospitals.[22] Additionally, WCEMS is experimenting with an Internet-based technology to monitor and disseminate diversion statuses of the four hospitals. This technology appears to work well and offer some advantages (i.e., speed, flexibility, and data management) over the computer/pager system WCEMS has in place.

WCEMS tracks the diversion status of the four ambulance-receiving hospitals in Wake County. In 1998, the four hospitals produced 35,040 hours of available emergency department (ED) access.[23] Of that time, 1,531 hours of ED access were diverted.[24] This translates to a diversion rate of 4.37 percent.

Even though the diversion rate may appear to be tolerably low, the four hospitals in Wake County share the philosophy that diversions are undesirable. Their goal is to stop diverting ambulance patients (except in the rarest of circumstances, e.g., catastrophic mechanical failure) by creating internal policies and practices that allow them to handle as many patients as need to be brought in. In the interim, until the hospitals reach the point where they voluntarily stop diverting for all reasons except for failure of key mechanical systems or medical equipment, diversions will likely continue to be a reality for the EMS system.

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[22] In fact, WCEMS is field testing an Internet software application that will handle diversion status updates as well as track patient destinations from multiple-casualty incidents.

[23] 8,760 hours x 4 emergency departments (EDs) = 35,040 ED-hours

[24] Diversion reporting practices have not been consistently followed, so some of these data may be slightly inaccurate. The general magnitude of the diversion rate is believed to be correct.

Diversion is an event that is beyond the control of the EMS system, but which has an impact upon the EMS system. Each hospital has its own internal policy controlling when and how it may go on diversion. As noted above, the four hospitals share their diversion status with each other through WCEMS. While computers and pagers offer a technological fix for coordinating the diversion statuses of the four hospitals, these devices are a symptomatic cure and do not address the problems underlying diversion. The four hospitals should actively pursue operational and structural changes that will allow them to remain open in all but the rarest of circumstances.

Communications

TriData is not a communications consulting firm. Our analysis did not include reviewing the operations of and making suggestions for improving the Wake County radio communications system; however, TriData did note some communications problems that hamper proper patient care. These problems are noted in the section that follows, but the identification of radio-based solutions to these problems is left to radio communications experts. We highlight them here only to document how these problems interfere with the EMS mission and why they should be corrected.

Emergency Department Notification

Both ambulance and hospital personnel noted that communications between ambulances and emergency departments was often highly problematic. The purpose of these communications is two-fold: first, simply to let the hospital staff know that a patient is headed its way, and second, to give a brief patient status report which might result in treatment orders from the physician on duty.

A number of emergency department nurses stated that ambulance notification to hospitals occurs "when EMS units are at the back door." The usual description was that the EMS units would notify the hospitals when they were three to four minutes away.[25] One hospital estimated that this occurred in 75 percent of the transports to that hospital.

[25] It should be noted that EMS personnel state that they often have to hail the hospitals repeatedly over the radio before getting someone on the radio. This could be due to the frenetic pace in many emergency departments, or to the radio volume being kept too low.

Whatever the reason for the delay in making radio contact, this is too short a period for notification. In cases of trauma, slow notification could ultimately delay life-saving surgical care. Wake Med is a Level-II Trauma Center, and the trauma surgeon on call could be as much as 20 minutes away. The hospital needs sooner notification to recall the trauma surgeon in a timely fashion.

Ambulances assigned in the City of Raleigh have rather short transport times – 12.5 minutes on average. Transport times for units from outside the city average 24.2 minutes. Accordingly, with a communications system that is functioning properly, there should be ample time to notify a hospital well in advance of the ambulance's arrival.

Assuming that hospital radios are properly monitored, it would appear that the problem is one of insufficient radio coverage (i.e., inadequate communications infrastructure) rather than frequency crowding or congestion. The County should rely on previous studies of radio communications issues for specific guidance in this area.

Dispatch Center (RESCOM)

The City of Raleigh operates RESCOM for the County under a cooperative agreement. Accordingly, problems at RESCOM that hamper the delivery of EMS are identified so that discussions with the City can be carried on with an eye towards resolving them for the betterment of the EMS system.

RESCOM Staffing

There is high turnover of personnel at RESCOM. Personnel turnover has become a problem for many PSAPs across the United States, although benchmarking studies have not yet been undertaken by the National Emergency Number Association (the PSAP trade association). Table 6 shows selected staffing statistics for a number of jurisdictions in North Carolina and one in Virginia (Fairfax County). As is evident in the table, RESCOM has the highest turnover and lowest tenure of the comparison group. It is difficult to know exactly why RESCOM's turnover is higher than the rest. RESCOM's leadership believes that it is a function of an increasing call volume being handled by RESCOM (the recent trend has been an increase of 1,500 to 3,000 more 9-1-1 calls per month) and higher paying opportunities available elsewhere in the Triangle Region.

Table 6. PSAP Staffing Comparison

Agency	*Authorized Positions*	*In Last 12 Months*		*%Positions Turnover*	*Current Vacancies*	*Average Tenure*
		Left	*Hired*			
Charlotte FD	20	4	4	26%	2	5 yrs.
Durham 911	48	12	12	25%	0	5.5 yrs.
Fairfax 911	109	20	21	18%	10	5 yrs.
Guilford 911	52	0	6	0%	1	10 yrs.
RESCOM	59	18	18	31%	2	3 yrs.

Source: TriData research, RESCOM

High turnover creates obvious problems in dispatchers' familiarity with the field units and their operations. In a high-stress, fast-paced environment such as EMS dispatching, having tenured personnel is extremely important. A knowledgeable telecommunicator can make a difference not only in the safety of field personnel (e.g., in cases of assaults on EMS providers[26]), but also in coordinating the deployment and response of units, especially when the system becomes busy. Personnel who are familiar with the capabilities and locations of EMS resources can make instantaneous command and control decisions that a computer or a neophyte dispatcher cannot. Efforts should be made to rectify the turnover problem. If it cannot be fixed, WCEMS personnel should be assigned as dedicated EMS telecommunicators to assure consistency of EMS communications and system control.

In their several visits to RESCOM, TriData team members noted another problem with the Raleigh PSAP – the manner in which the EMS dispatch console is operated.[27] The EMS console is in a "pod" of four consoles – the other functions include county fire departments, local police, and law enforcement inquiries. Because RESCOM does not

[26] Although there were no cases of assaults on EMS personnel related to the TriData team, there is an ever-present danger of assault. Increasing numbers of EMS systems across the country are beginning to experience this phenomenon, and the fact that it is an infrequent occurrence at present in Wake County doesn't mean that an EMS provider won't be attacked tomorrow. Durham County EMS has tracked assaults on EMS personnel since 1987. Between 1990 and 1996, there were an average of 11 reported physical assaults on EMS personnel each year. The number of assaults reported has dropped significantly since 1997, when training and a new dispatch protocol for potentially violent situations were completed.

[27] It is important to note that there is no "right way" to operate a dispatch center. Every PSAP that TriData has visited operates differently, although there are similarities. Operational choices are a function of the call volume the system is expected to handle, the types of calls that the PSAP receives (some PSAPs handle after-hour s calls to the local government as well as 9-1-1 calls), and the budgetary constraints. Every PSAP is a product of a number of variables that include population, geography, political realities, and historical decisions. Accordingly, there is no "model" way of doing things. This notwithstanding, TriData is in a position to see where PSAP operations have untoward effects on field operations. It is in this light that we discuss RESCOM.

have enough personnel designated solely as call-takers, telecommunicators from this pod often answer incoming 9-1-1 lines. When one person is on a 9-1-1 line, the others watch over his/her console and handle radio communications from units in the field. Telecommunicators often pick up situations that were being handled by their "podmates." This leads to a confusing (and somewhat dangerous) condition in which field personnel continually communicate with different RESCOM personnel.

This is dangerous for field personnel because they are reliant on the RESCOM telecommunicators knowing where they are and what the nature of the problem they are dealing with is. Dispatchers are not focused enough on EMS because they are being distracted by fire and police operations and by incoming 9-1-1 calls. Moreover, because different people are continually adjusting the status of the EMS system (by assigning or clearing units), it becomes relatively difficult for any one person to have a clear mental picture of the EMS system status. Knowing where units are, what units are available, what resources are low, and what is going on is critical information that should be centralized in one EMS dispatcher, but that is currently spread among the four people at that pod.

Steps are underway to correct the turnover problem. Telecomunicators recently received a 7.5 percent pay raise, and RESCOM was recently authorized to hire four additional call-takers. Three people have been hired and trained to act solely as call-takers. RESCOM is seeking six additional personnel in its upcoming budget year. These positions are needed, but even more than that, current personnel need to be retained.

Dispatch Center Technology

It is possible to improve the EMD quality assurance (QA) process. The QA program used by RESCOM, *Aqua*™ (developed by the manufacturer of MPD™), relies on manually entered dispatch data. This process is both time-consuming and error-prone. *ProQA*™ (described earlier) not only automates the medical interrogation process, it also feeds the EMD data directly to *Aqua*™, thus speeding up the EMD QA process while assuring greater accuracy. Acquiring *ProQA*™ would maximize the County's investment in *Aqua*™, and it is the next logical step for the PSAP to take. Unfortunately, *ProQA*™ is not supported for integration with the Unisys computer-assisted dispatch (CAD) system used at RESCOM.

The Unisys CAD system is outdated for a number of other reasons as well. It is a DOS-based computer program, and hence cannot take advantage of the multi-tasking environment of Windows™. It is ergonomically unsound – it requires too many keystrokes to enter an assignment, and it cannot take advantage of the speed and comfort of "point-and-click" computing. This hampers the work flow. Further, because the program is DOS-based, it is less extendible by new technologies (almost all of which are Windows™-based.

The Unisys CAD is slow and cumbersome. It operates on fixed, programming-intensive routines. This hampers the ability of the CAD managers to create a new EMS district or to place a new EMS resource into the system (either of which take substantial programming hours to accomplish). Moreover, the current CAD does not provide for functions such as rotating units in multiple-unit EMS stations, such as Stations #1 and #5.

Producing management reports on the CAD slows the system down to the point that dispatching operations can be compromised. Additionally, ad hoc reports cannot be generated on the Unisys CAD – they must be programmed into the system. Finally, there is no ability to set user-defined alarms for events such as extended time on scene, extended time at the hospital, etc. These functions must be pre-programmed.

In summary, the Unisys CAD is inflexible and outdated. At some point, it should be replaced, especially if the County hopes to implement a tiered response (see "Tiered Response System," page 109) or proximity-based dispatch (see "Proximity-based dispatch and Automatic Vehicle Location," page 49).

Cary and Apex Communications Centers

As noted earlier, there are two communications centers in Wake County in addition to RESCOM – Cary and Apex both have their own PSAPs.

The Cary communications center appears to work well. The HTE CAD system used there is sophisticated and supported for integration with Medical Priority Dispatch's *ProQA*™ program. The call volume appears low enough that incoming 9-1-1 calls can be handled without problem. Field units appeared able to communicate with a single

telecommunicator, and the problems evident in RESCOM were not evident at Cary. TriData heard no complaints about communications with the Cary dispatch center.

TriData staff did not visit the Apex communications center. Because the Apex center functions as a secondary PSAP (i.e., 9-1-1 calls are not answered at Apex, they are answered at RESCOM and switched to Apex) and because Apex also uses an HTE CAD, it was not felt necessary to visit the center. TriData heard no complaints about communications with the Apex communications center.

The main problems that TriData noted vis-à-vis all three communications centers were that there is no common CAD platform and there is no electronic link between the three centers for sharing of dispatch information. Proximity-based dispatching of EMS units requires that all the dispatch centers have the most up-to-date statuses of resources. This means that each dispatch center needs to share information with the other two and be able to read information from a common database. Access to the countywide automatic vehicle location data stream is equally important. Finally, all three PSAPs need the capability of accessing/dispatching any resource. These constraints argue strongly for having a common dispatching system.

Another argument for creating a common CAD platform and an electronic link between the PSAPs is that given the investment in communications infrastructure that the three PSAPs represent, it would seem logical and efficient to be able to use any of the three centers as a fail-safe for any of the others. There should be a mechanism by which one center could, with the flip of a switch, transfer its operations to another center. This would provide redundancy for catastrophic contingencies. Obviously, it would be much harder to switch RESCOM into either of the two smaller centers, but with good planning it would be possible to switch essential operations over for a short period.

Data Collection and Management

WCEMS is fortunate to have an advanced computer network and talented data management professionals to support it. At TriData's request, WCEMS was easily able to provide a large amount of data in a format suitable for analysis. Clearly, in this respect WCEMS is at the very forefront of the EMS systems with which TriData has had contact. By comparison with many of the other EMS agencies TriData has studied, the data that

WCEMS maintains itself are quite good. The data that are part of the county's accounting system leave a lot to be desired.

Analysis for this report was complicated by data that simply did not make sense. Although WCEMS was able to provide quite a lot of data, most of which were good, a substantial amount of data were unusable (through no fault of the computer professionals who support WCEMS' computer system). Data that are incongruous, keypunch errors, lack of data definitions, incomplete records, and data that are not tracked detract greatly from the usability of the County's data for making management decisions. The most obvious example is the billing system (which will be discussed in detail later).

Part of the problem with the accounting data is that information from the ambulance call reports (ACRs) is entered into the data management system by hand. Hand-entering the data increases the likelihood of error. Moreover, the hand-entry process also slows the billing process. At present, WCEMS has a backlog of about 3,000 Medicare bills that need to be filed by hand, despite the fact that three full-time employees are dedicated to ACR data entry.

WCEMS has experimented briefly with pen-based automated patient records management systems. At the time, they were considered too unreliable to continue past the concept-testing stage. In the intervening time, a number of more reliable data management systems have been developed. By converting to one of these systems, WCEMS could facilitate the transfer of patient information to the hospital and actively create a patient database that could be used for billing and system management purposes. One particular advantage of such a system is that the field care provider enters the information during the patient contact. This obviates having office personnel dedicated to ambulance call report (ACR) data entry. The people who are doing the data entry now could be better used in other areas helping to administer the EMS system.

If it is determined that the available technology does not meet the performance criteria established by the EMS system, then the use of forms that can be read by an optical scanner should be considered. This might be another way to eliminate the keypunching of data that currently takes place.

It is important that the ACR somehow be automated because having this information available in an electronic form will facilitate the billing process and, it is hoped, lead to an increase in collections.

Funding and Billing

One of the central concerns of the County was analysis of the VRS funding mechanism and the billing structure of the EMS system. There are few topics that are as important or as confusing. How the VRSs are funded is a function of their relationship to the County, and recommendations for their funding have an impact on the operation of the EMS system as a whole. Central to the issue of how the VRSs are funded is the question of EMS billing – whether billing should be centralized or done by each corporation and whether billing should be done in-house or contracted out.

Current Agency Contracts

As part of the study, TriData was asked to review the County's contracts with the VRSs for ambulance service franchises. As requested, TriData reviewed the contracts to ensure that they address the necessary components of providing EMS. A note of caution is in order. TriData is not a law firm, and we do not purport to provide legal advice or render legal opinions. Accordingly, TriData did not review the language of the franchise contracts for legal soundness or validity.

General Analysis of Contracts

The contracts appear to address the subjects required to manage an EMS system. They detail the extent of coverage that the VRSs must provide under the applicable funding option, the County's responsibilities in helping the VRSs meet their obligations, and the means by which the VRSs will meet their obligations. This includes standards on the certification levels of the VRS personnel who will staff the ambulances, the times of operation, response time performance, training participation, protocol compliance, quality assurance, and discipline, equipment, communications, data collection and reporting, and maintenance of required insurance policies. The contracts also spell out the County's obligations with respect to subsidies and reimbursements.

Only one problem was noted with the contracts, as written. The last paragraph of Section B1 of the contracts addresses response time performance standards. All VRSs are held to a response time performance standard of 10 minutes or less on 90 percent of dispatches. According to the wishes of Holly Springs DPS, the Holly Springs contract specifies a lower standard of nine minutes or less on 90 percent of dispatches.[28]

Two problems arise with this paragraph:

1. The contracts establish a single, arbitrary response time performance standard that does not distinguish varying difficulties of providing service. The county should be differentiated into urban/suburban, rural, and "hindered access" response zones. Performance standards should be based on the type of zone in which the call occurs, and the zone designation of a given area should be determined through negotiations because there are few objective criteria that can be applied to classify zones correctly under every circumstance. Suggestions for performance standards include:

Zone Type	*Response Time Standard*
Urban/Suburban	8 minutes, 90% of responses
Rural	15 minutes, 90% of responses
Hindered Access (e.g. lakes district)	30 minutes maximum

2. Response time standards should be expressed in seconds (i.e., the contract should read "600 seconds" rather than "10 minutes." The reason for this is that it is unclear whether the minutes include all the seconds of that minute. In other words, compliance with a 10-minute standard means 10 minutes and zero seconds; it does not mean 10 minutes and 59 seconds.

Contract Provisions for VRS Responsibilities

The contracts should require the VRSs to submit an audited set of business reports (balance sheet, income statement, and statement of cash flows). These reports should be prepared in accordance with Generally Accepted Accounting Principles, and each VRS

[28] The math in this paragraph does not add up correctly. The paragraph requires a nine-minute response time, but it allows for three minutes of chute time and seven minutes of driving time.

should be required to report income and expenditures using a standard template for the entire county. One of the problems TriData encountered in reviewing the annual reports provided was that accounting practices varied somewhat from squad to squad, making comparisons of budgetary data difficult.

Franchising Non-Emergency Transport

The contracts do not address non-emergency and inter-facility transports (i.e., critical care and convalescent patients). These functions have traditionally been handled by private ambulance services franchised for those functions. One of the franchisees, AMR, recently terminated operations in Wake County.

The departure of AMR may cause the VRSs to start thinking about providing non-emergency service. Cary EMS has announced its desire to initiate non-emergency service. TriData, in consultation with the EMS Medical Director, believes that a pilot study of provision of non-emergency transport by Cary EMS is in order. It is important that such a study demonstrate that the provision of non-emergency transport in no way interferes with the provision of emergency ambulance service if permanent non-emergency franchises are to be awarded to the VRSs.

A note of caution is in order. The revenue-generating capabilities of non-emergency transport will be strongly affected by the pending changes to the Medicare reimbursement system. It would be prudent for the VRSs to wait until the federal financing framework has been established. Only then will it be possible to assess the financial advisability of instituting such service.

Legal counsel will be in the best position to give advice on how to franchise VRSs for non-emergency service. One idea the County should explore is creating a separate franchise agreement for non-emergency service. This would leave the current contracts intact and create a mechanism for VRSs to discontinue non-emergency service without having to renegotiate a franchise contract. Again, TriData does not offer this as legal advice, but rather as a suggestion to be discussed with the County's counsel.

Future Provisions for Holly Springs

The current agreement with Holly Springs Department of Public Safety expires in June 1999. TriData was asked to make a recommendation as to how EMS in Holly Springs should be delivered after the contract expires.

At present, the Holly Springs Department of Public Safety is providing an ambulance and an EMT-Basic driver. WCEMS provides a paramedic and the necessary ALS equipment. Although there is a second ambulance in Holly springs, it is not staffed. This service delivery mechanism is unique in Wake County (it is not a standard option).

It is difficult to justify having an ambulance in Holly Springs at anything other than the BLS level. Holly Springs has a low call volume (406 calls in 1998). About half of its responses (49 percent) are BLS in nature. Advanced life support response is available from both Fuquay and Apex, and putting stand-alone ALS into Holly Springs would be expensive and would likely not produce a sufficient call volume to maintain ALS skills. The initial decision to implement ALS in Holly Springs was a political decision, and providing additional ALS in the community is not warranted at this time.

Although one might make a case for having a single ambulance in Holly Springs because access into and out of the town is limited to one major road, adding a second ambulance when call volumes are as low as they are would create an idle and underutilized resource. Further, personnel on the second unit would not have a sufficient number of patient contacts to maintain skill levels, especially at the ALS level.

In fact, the low call volume in Holly Springs makes a good case for adopting a decentralized approach to ambulance placement in the rest of the county. The Holly Springs response area is small, and response times in the district are low. Second-duty calls into the Holly Springs district could easily be handled by a quick response vehicle and a transport unit from Apex or Fuquay.

At present, the Holly Springs/WCEMS arrangement provides low-cost ambulance service. It should be continued because it is efficient. If, however, the Town of Holly Springs were to want a subsidy, to reduce its subsidy, or to be unable to provide an ambulance or personnel, the desirability of the arrangement would be questionable. In

that case, it would probably be preferable for WCEMS to take over operation of the unit entirely. This would be more expensive, but it would assure the EMS Medical Director that the proper level of care was being delivered for the money.

Future Provisions for Other Rescue Squads

Fuquay-Varina (an Option #3 department), Knightdale (an Option #2 department), and Wendell (an Option #2 department) all wish to become paramedic-level ambulance services (meaning that both the first- and second-duty ambulances would be paramedic ambulances). TriData was asked to comment on the advisability of converting these VRSs to ALS services.

The VRSs argue that they can provide paramedic-level service on both first- and second-duty units for a mere $5,000 per year in additional subsidies. They argue that they have long turn-around times on their first-duty units, and so there should be some ALS capability left in the community when the first-duty unit is unavailable because it already has a call. Finally, the VRSs state that they lose some volunteers because paramedics who would be willing to volunteer in their communities will not because they cannot render paramedic-level care as volunteers in a VRS that is not authorized by the state to operate at the paramedic level.

The EMS Medical Director is concerned about the level of care that will be provided on second-duty units that run few ALS calls each year. This is a valid concern. It is highly questionable how many ALS calls a volunteer paramedic with Fuquay, Knightdale, or Wendell would run during the course of a year. Even the busiest VRSs (Cary and Garner) only had about one second-duty ALS patient per day in 1998. One of the advantages of putting a WCEMS paramedic in these communities is that they receive paramedics who have a high volume of patient contact over the course of the year because they rotate assignments throughout the county.

It is doubtful how much increased volunteer participation will result from moving these squads to the paramedic level. If service level is truly a roadblock to having volunteers provide paramedic service in these communities, a method could probably be worked out by which people could volunteer with WCEMS (as an "auxiliary member") and be "stationed" in the VRS of their choice. This would provide an umbrella under

which the volunteers could provide service and by which the County could maintain sufficient medical control of the volunteers to satisfy the concerns of the EMS Medical Director. As WCEMS is already providing paramedics on ambulances owned by VRSs that are not certified at the paramedic-level, having County volunteer paramedics could be seen merely as an extension of this arrangement. (For additional discussion on this, see "Use of Volunteer Paramedics," page 109).

The VRS' concern about being able to provide ALS care when needed can be met through a two-tiered response system. This would ensure that ALS resources are not consumed by BLS calls. Given the low volume of second-duty calls in most of the county, ALS units would remain available in their communities unless they were initially dispatched on a first-duty call.

Paramedic quick response vehicles could provide ALS back up to BLS units or provide second-duty ALS coverage. Given the call volume at this time, this would be a more efficient use of resources than simply staffing a second ambulance at the ALS level.

Nonetheless, the VRSs are correct that it may take a while before a two-tiered system in fully implemented in Wake County. During the interim, it may make sense for the County to take the VRSs up on their offer to provide second-duty ALS. TriData qualifies this statement with the following caveats.

First, this should be viewed as an *interim* solution only. There are sufficient ALS resources already in the county. They just need to be better utilized.

Second, the County should not increase its subsidy of these three squads *beyond the additional $5,000 per squad per year*. If the VRSs truly can provide the additional service for $5,000 per squad per year, then it seems like a good investment for the interim. Raising the subsidy beyond $5,000 per squad per year is not warranted, as it would represent an over-investment in a resource that is of dubious necessity.

Third, the revised contracts for these squads should indicate that if the VRSs are unable to meet their commitments under the Option #1 or Option #4 contracts, they should be returned automatically to their previous option.

Fee Structure

Establishing a fee structure for ambulance service is more complex than simply determining the cost of providing service and then dividing by the number of runs per year. An ambulance service can charge what it likes for service; however, getting reimbursed is a different story.

Most ambulance services are heavily dependent on Medicare reimbursement, and to a lesser degree on Medicaid reimbursement. According to the North Carolina Association of EMS Administrators, "older North Carolinians, and thus Medicare beneficiaries are the prevailing ambulance users in every North Carolina county."[29] Medicare and Medicaid reimbursement are not a function of what an EMS agency bills a patient – reimbursement is standardized by region for a given level of service.

Ambulance services that are not part of a hospital bill Medicare under "Part B." Medicare Part A is for hospital expenses. Part B is for non-hospital expenses, including ambulance services.

Medicare pays the lowest of the amount billed, the provider's customary bill, the 75th percentile bill for the region, the provider's Inflation Index Charge (IIC), and the prevailing IIC for the region. IICs are 80 percent of the "allowed amount" for a given service provided (i.e., they are what the federal government will reimburse). IICs are increased on a yearly basis by the Consumer Price Index-Urban (generally about three percent per year). When ambulance services submit low bills, they depress their individual reimbursement rates as well as the reimbursement rates for the region.

In other words, increases in Medicare reimbursement occur on a yearly basis and are controlled by the Consumer Price Index. An ambulance service increasing its bill will not cause an increase its Medicare reimbursement. However, decreases in ambulance service bills can cause a decrease in Medicare reimbursement.

Under Medicare regulations, providers must bill beneficiaries for co-payments; however, the degree to which a provider chooses to pursue payment is left to the discretion of the provider. In other words, providers cannot simply dismiss the co-

[29] NCAEMSA web page (http://www.co.rowna.nc.us/ncaemsa/impacton.htm)

payment portion of a bill, but they do not have to be aggressive about collecting it. If a provider routinely waives the co-payment portion of a bill, Medicare will begin to reimburse as if its previous reimbursement amount was the bill (i.e., Medicare will begin to reimburse only 80 percent of what it has been reimbursing). Further, Medicare could request that the provider refund a portion of the "overpayment." Therefore, it behooves a provider to ensure that it bills the co-payment portion of an ambulance bill.

Medicare permits ambulance services not to bill subscription plan members for the co-payment; however, the subscription plan membership fee must be actuarially sound (meaning that the total annual membership fees exceed the good-faith estimate of the co-payments that are not billed). Medicare views membership fees that are insufficiently low to cover co-payments (i.e., "programs [that] are not based on actuarial risk, but instead are a sham used to disguise the routine waiver of co-payments and deductibles")[30] as illegal.

Medicaid reimbursement is a state function. The federal government matches state Medicaid funds on a sliding scale. Unlike Medicare, federal rules governing Medicaid matching grants stipulate that states cannot require co-payments or deductibles from Medicaid beneficiaries. In other words, whereas Medicare reimbursements constitute only part of the revenue for a given patient bill, Medicaid reimbursements are the entire reimbursement. Reimbursement for Medicaid patients is typically even lower than for Medicare.

Wake County's Rates

The bill for BLS service is Wake County is $217; the bill for ALS service is $303. In Wake County, the Medicare allowed amount for BLS service is $103.46, which means that Medicare reimburses $82.77 for BLS service.[31] The Medicare allowed amount for ALS is $166.38; the ALS reimbursement is $133.10. Medicaid reimbursement for BLS service is $56.58; for ALS it is $99.91.

Table 7 presents a comparison of BLS and ALS bills for selected counties in North Carolina. As can be noted, Wake County's bill is very close to the average.

[30] Editor. "Six Cities Sued for EMS Medicare Fraud," *EMS Insider*, May 1999, Vol. 26, No. 5, p. 3.
[31] Medicare reimburses at 80 percent of the IIC, or "allowed amount" (80% of $103.46 is $82.77).

Table 7. Comparison of Billing Rates in Selected North Carolina Counties

County	*Basic Life Support*		*Advanced Life Support*	
	Base Charge	*Per-Mile Charge*	*Base Charge*	*Per-Mile Charge*
Bladen	$225	$3.00	$300	$3.00
Carteret	$215	$3.50	$350	$5.00
Columbus	$200	$3.50	$300	$5.00
Currituck	$200	$3.00	$250	$3.00
Durham	$200	$3.00	$360	$3.00
Forsyth	$250	$3.00	$250	$3.00
Granville	$200	$5.00	$325	$5.00
Johnston	$225	$3.00	$300	$3.00
Onslow	$225	$3.00	$350	$5.00
Orange	$250	$3.00	$350	$3.00
Pamlico	$195	$3.00	$291	$3.00
Wake	$217	n/a	$303	n/a
Average	**$217**	**$3.00**	**$311**	**$4.00**

Source: EMS Management and Consultants, Inc.

Wake County could raise its rates; however, since its fees are already in excess of the Medicare approved rate no increase in federal reimbursement would be seen. An increase in rates would, however, be reflected in reimbursement from private insurers, co-payments, and self-payers.

Wake County should not raise its rates. Doing so will not increase revenues, and it will only decrease the County's collection rate. The better option is to wait until the NRM process has been completed to see what changes emerge from that process.

Billing Method

The Health Care Financing Administration (HCFA) is the federal agency responsible for administration of Medicare. HCFA has established four billing methods for ambulance service bills:

- *Method 1* – A single charge that includes all mileage, supplies, and services (typically referred to as a "bundled" bill).

- *Method 2* – A single charge for supplies and services, but with mileage calculated separately. This is the method used by WCEMS.

- *Method 3* – A single charge for services and mileage, but with disposable supplies itemized separately.

- *Method 4* – All charges itemized separately.

Under current Medicare rules, ambulance services must use the billing method that is typical for the state. The North Carolina Medicare carrier, CIGNA, has only approved Methods 2 and 4 for use in North Carolina. Further, CIGNA will not allow ambulance services to change billing methods – ambulance services must live with decisions made years ago when the ramifications of choosing a particular option were not as clear as they are today.

It is unfortunate, because Method 4 (itemized) billing generally results in higher reimbursements for providers because the Medicare-allowed reimbursement for many supplies includes an "overhead" factor. For example, it is common for services to bill $28 to $35 for a cervical collar. The replacement cost for a disposable cervical collar purchase in bulk can be as low as $6 to $7. Likewise, oxygen administration can often be billed as high as $50. An oxygen face mask can cost as low as a dollar.

The NRM process (see "Negotiated Rule-Making," page 40) will likely result in implementation of a nationwide uniform billing method. Depending on the method adopted, this could be favorable to Wake County (it will probably not make things any worse). If the billing method is not changed by the NRM, then there will only be one way to change billing methods (and it probably will only work for the VRSs).

Medicare allows providers to adopt a billing method when they file for a provider number. The VRSs had their own Medicare provider numbers, but they have all lapsed into "inactive" status since the County took over billing.[32] Were the VRSs to apply for new provider numbers so they could begin billing on their own, they might be able to

[32] The present billing arrangement is not clearly legal. Wake County is billing for services under its provider number that other ambulance services have been rendering. It remains unclear whether the HCFA Office of the Inspector General would view this as permissible even given the fact that the County is passing the reimbursement back to the original service providers.

elect billing under Method 4 (itemized billing). There is the distinct possibility that CIGNA would simply reactivate the old Medicare numbers, which would mean that the VRSs would be stuck with their former billing methods. There is also the possibility that either CIGNA or HCFA could question why there was a sudden jump in the number of Medicare provider applications from Wake County. This could cause all the applications to be rejected or to be reinstated to their previous billing method.

As noted above, this will probably only work for the VRSs. WCEMS will not be able to change its billing method. Accordingly, WCEMS will need to pursue another means of increasing Medicare reimbursement.

Outsourcing the EMS Billing Function

The County Revenue Department is geared up to produce bills and collect revenue; however, EMS billing is unlike standard accounts receivable billing. EMS billing is complicated, and because of the vagaries of dealing with insurance carriers and federal reimbursement, obtaining maximum revenues is difficult without specific expertise in EMS billing. For example, because Medicare only reimburses for "medically necessary" transports, it is important to ensure that the diagnosis code on the bill matches the patient condition as described by the paramedic. Incorrect medical coding of the bill will result in rejection of the bill on the grounds that the transport was medically unnecessary – this will lead to revenues foregone.

The County should consider contracting out the EMS billing and collections process to an EMS billing specialist. The ideal situation would be for WCEMS to coordinate data collection on a countywide basis and to be responsible for transmitting the necessary data to the billing contractor on a daily basis.

A billing contractor offers several advantages. First, it is the responsibility of the contractor to stay abreast of changes in federal reimbursement policies and procedures. Second, an EMS billing specialist will know the best methods to code bills to obtain maximum reimbursements from insurance carriers and the federal government. For example, a billing specialist will be able to identify when it is advisable to submit a bill to an automobile insurance carrier rather than a health insurance carrier as well as how to properly code the bill. Third, an efficient contractor will be able to turn bills around

rapidly to increase cash flow. Finally, a contractor will assume the responsibility for pursuing delinquent payments (according to the collections philosophy of the County).

Collection rates on EMS bills vary across the United States and are highly dependent on the "payer mix" (i.e., the breakdown of insurance coverage of the resident population). The national "norm" is about 60 to 65 percent, but collection rates as high as 82 percent have been obtained in communities such as Castle Rock, Colorado. Comparative collection rate data are reproduced in Table 8. A billing contractor should be able to produce collections on the order of 60 to 75 percent of billings.

Table 8. Comparative EMS Billing Collection Rates

City	*EMS Billing Collection Rate*
Castle Rock, Colorado	82%
Phoenix, Arizona	70%
Washington, DC	63%
Los Angeles, California	60%
Nashville, Tennessee	60%
San Diego, California	56%
San Jose, California	55%
Indianapolis, Indiana	55%
Chicago, Illinois	50%
Philadelphia, Pennsylvania	48%
El Paso, Texas	47%
New Orleans, Louisiana	42%
Memphis, Tennessee	39%
Wake County, North Carolina	**33%**
Detroit, Michigan	23%
Baltimore, Maryland	20%
Average (excluding Wake County)	**51%**

Source: TriData research

Billing contractors work on different fee schedules, but a commission of between eight and 12 percent of the total collected is fairly standard. Given Wake County's high volume of EMS calls, a lower commission would likely be in order.

Implications for Data Collection and Data Management

Working with a billing contractor will result in higher and faster collections if the data the contractor requires to generate and submit bills can be supplied electronically. Using electronic data interchange (EDI) will also probably allow the County to negotiate a more favorable collections fee from the contractor (because less work will be required of the contractor). Most sophisticated EMS billing contractors are set up to receive EDI in a variety of formats used by the popular EMS data management software.

From a work process standpoint, the most efficient means of collecting the needed data is to do so at the point of patient contact. A pen-based or optical mark recognition system (i.e., "bubble" reader) would provide field personnel with a means of documenting the call (i.e., filling out the ACR) and collecting the data simultaneously. This would obviate the data entry function that currently requires the efforts of three full-time employees in the EMS office. These employees could then turn their attention to improving customer service and data management.

Computerizing the ACRs would not only allow that information to be downloaded directly to the EMS billing contractor for bill generation and submission, it would provide timely and more accurate management information and allow the quality assurance process to be automated. The collection and management of the data should remain a function of WCEMS, and only the necessary billing data should be sent via EDI to the contractor. WCEMS should retain control of all the data. It should dispatch the needed subset of its data to the billing contractor as required. By freeing up front-office personnel from the billing function, they can be used in part to assure that the data being collected is complete and "clean." With better data, WCEMS should be able to produce more valuable management information reports.

The cost of implementing a data collection and management system such as this would likely be offset rapidly through the increased collections made possible by direct billing of insurance carriers. Implementation of a pen-based or optical mark recognition system could be piggy-backed on to the existing WCEMS computer network. It would only require acquisition of new software and the data entry hardware (either a hand-held computer or optical forms and a scanner).

Public Information, Education, and Relations

Several field providers, both from WCEMS and the VRSs, indicated that there is an insufficient amount of public awareness/education delivered by the EMS system. Responders point to the large number of calls that originate in doctors' offices as evidence of the need to educate people about EMS.[33]

It is often difficult to judge how well a public information, education, and relations (PIER) program is working. Because it is almost impossible to quantify the intangible benefits of PIER programs, the cost-benefit analyses often do not work out on paper in favor of continuing such programs. Despite this, it is widely thought that PIER programs impart substantial benefits to the departments that conduct them and the communities that receive them. These benefits include increased membership subscriptions, increased awareness of EMS agencies' roles and responsibilities, better delivery of bystander care, and favorable attitudes toward EMS providers and agencies. TriData knows of no department that has ever discontinued its PIER efforts because they were thought to be a waste of time or money.

PIER is all about making sure that people *don't need* EMS in the first place. Prevention is a far more cost-efficient way of saving lives than trying to speed an ambulance to someone after the fact. By educating the public about how to live a more healthful lifestyle, how to avoid injury, and how to best use the EMS system when it is needed, unnecessary medical costs will be avoided, as will unnecessary loss of productivity and happiness.

PIER should be a higher priority for WCEMS. It should create a speakers' bureau with prepared programs (and appropriate audiovisual resources to support them) for use by members of the speakers' bureau in their communities. These people, lesson plans, and resources ought to be made available through community groups and institutions.

Additionally, WCEMS should designate a public information officer (PIO) for each shift (and some backup PIOs). The PIO needs to be someone other than the

[33] Although it sounds illogical that a doctor's office would need to call an ambulance, there are times when this happens. Usually, doctor's offices use ambulances simply for transportation. Efficient utilization of a limited medical resource such as an ALS ambulance dictates that doctor's offices call private ambulances unless their patients are in extremis (in which case the paramedics would be warranted).

individual who will be the EMS incident commander on a major incident. The PIOs (and their backups) should receive relevant training on the roles, responsibilities, and techniques of being a PIO. Such courses generally run one to two days in length. The half-day courses now being offered to District Supervisors are probably not enough to equip them to be PIOs.

Medical Control

Medical control of EMS providers is accomplished through a combination of standing orders (protocols) and on-line medical control. Medical control is required by North Carolina EMS regulations. It is essential because EMS personnel are not physicians licensed to practice medicine – they are laypersons certified to render emergency medical treatment (albeit highly sophisticated in nature). Because EMS personnel deliver medical care under the "delegated practice" of a physician's license, it is necessary that the physician retain ultimate authority and control over the medicine practiced by the EMS personnel. This applies to field delivery of care as well as preparation (i.e., training) for field care.

"Standing orders" refer to written medical protocols that specify the exact procedures (in sequence) that a paramedic may execute on behalf of a patient *without having to get direct voice orders from a physician or physician-designee*. On-line medical control is the provision to field paramedical personnel of direct voice orders for the treatment of a patient. This is accomplished using radio and/or cellular telephone communications. The standing orders instruct field providers to contact medical control for treatment options after they have reached a certain point in the appropriate treatment regimen. Upon reaching that point, the paramedic must contact the base-station physician (or designee) for additional medical instructions.

The first step in obtaining on-line medical control is to give the hospital a "patient report" that details the nature and history of the emergency.

Patient Reports

Many of the emergency department staff members with whom we spoke felt that radio reports about patients' medical conditions were too long and detailed.

There are no national standards on how radio reports should be given. Rather, radio protocol is a matter of regional habit and expectation. Giving shorter patient reports runs somewhat counter to how a paramedic is trained, but since these comments came from three of the four hospitals, it would appear to be a good idea to establish a dialogue with the emergency departments as to what they desire in a report. This is a "quick fix" that should be readily implemented.

The Role of Mobile Intensive Care Nurses (MICNs)

By North Carolina law, the emergency department of each hospital that receives ambulances is supposed to have a mobile intensive care nurse (MICN) and an emergency physician on duty at all times.

The emergency physician directs treatment for all patients, although many of those treatment instructions may be delegated through a MICN. The role of the MICN is to take radio reports from incoming ambulances, relay necessary information between the physician and the paramedics, and issue treatment instructions to field providers. Although North Carolina requires training for MICNs (about 24 hours initially, plus 12 hours per year of continuing education), none is required for physicians and there is no nationally standardized training course for EMS base-station physicians. In a few communities across the United States (e.g., Alameda County, California), emergency physicians need specialized courses to become base-station physicians, and the State of South Carolina has designed a "base hospital physician course." However, as Odelia Braun, M.D. succinctly put it, "Systems with strict and specific criteria for MICNs often have no physician requirements, as if the ability to provide adequate direct medical control is innate in physicians."[34] Requiring such training of physicians in Wake County would probably be politically unfeasible and would result in the generation by physicians of many of the same complaints that MICNs have about such certification.

Most MICNs with whom we spoke indicated that they no longer see a need for MICN certification. They feel that there is too much training required, and that being an MICN doesn't allow the nurse to do anything more or any extra latitude in what they do

[34] Braun, O. "Direct Medical Control" in Kuehl, AE (ed.). Prehospital Systems and Medical Oversight. (Mosby Lifeline:St. Louis), 1994, p. 206.

at present. Most MICNs felt that almost anyone could handle the role with a minimum of formal training.

MICN certification requires the time of not only the nurses who attend classes, but also the WCEMS staff who track and deliver their continuing education. Unfortunately, even though most MICNs regard the training and the certification as unnecessary, the State of North Carolina mandates it. Without a waiver to or a change of the EMS regulations prescribing MICN certification, nurses will have to continue taking the training and Wake County will need to continue to offer it.

There is a way that the need for MICN certification could be eliminated. MICNs are only required when hospitals wish nurses (or physicians' assistants) to give orders to paramedics instead of physicians (who do not require any certification to give orders via radio). The Wake County paramedic protocol could be rewritten so that all but the very most aggressive and/or invasive treatments could be done under "standing orders." This would alleviate emergency department physicians from consulting with paramedics on all but the very sickest or most badly injured patients. This would mean that paramedics would communicate with nurses only to give notification that a patient was being transported to that facility – the nurses would not be responsible (or empowered) to give medical orders via radio. While this would obviate the need for MICN certification, it would also reduce the flexibility of emergency department staffs in providing on-line medical control. However, this should not be a problem as long as the paramedic protocols are rewritten to be as permissive as possible.

Centralized On-line Medical Control

Another way to relieve the majority of MICNs from having to remain MICNs would be to centralize the on-line medical control for the EMS system. Under a centralized concept, all medical control would be shifted to one emergency department, meaning that none of the remaining three emergency departments would provide on-line medical control. The centralized medical control function would free personnel in these departments from needing to remain MICNs or taking radio reports.

This concept has several disadvantages that weigh against implementing it unless the standing orders were expanded and the radio reporting requirement reduced. First, it

would mean that the personnel at the hospital that acted as the county-wide medical control would spend more time on the radio. This might even necessitate that hospital assigning one person simply to handle the radio. Second, during periods of high EMS demand, queues for medical consultation could form. Obviously, not every patient would be of the same priority, so RESCOM would need to act as a "gatekeeper" for the medical-control radio channel, bumping patients up in the queue according to medical exigency. All in all, centralized medical control probably creates more headaches than it cures, and so it is not recommended at this time.

Off-line Medical Control

Off-line medical control consists of administrative oversight by a physician of the medical care delivered by an EMS system. This includes design of applicable curricula, oversight of quality assurance, development and promulgation of medical protocols (standing orders), approval of providers to practice, and assistance in the design of the EMS system.

The physician who presently provides off-line medical control in Wake County has many years of experience in the EMS system. Although compensated for his services through a small contract, the position is essentially part-time and a labor of love. While such an arrangement may have been adequate in the past, the responsibilities and demands of the EMS Medical Director position are such that it should be at least a half-time position (and possibly even a full-time one). The Medical Director should be compensated commensurately for the services expected.

The Medical Director should be on call 24 hours a day to provide overall medical command (in conjunction with an EMS incident commander) during a major disaster and to provide appropriate direction and guidance for after-hours incidents (e.g., serious occupational exposure to an infectious disease). The County should also consider equipping the Medical Director's vehicle with emergency lights and a siren, for use in responding to incidents for which the Medical Director will be assuming medical command. Additionally, the Medical Director should be encouraged to participate in the EMS system by responding on calls.

There are several advantages of having a medical director do this. First, the Medical Director will be in a position to perform concurrent quality assurance on the care being rendered. Second, the Medical Director will meet more paramedics and emergency responders that way. This should make the Medical Director more familiar with the individuals and their capabilities. Finally, responding on calls will give the Medical Director first-hand knowledge about what the prehospital care environment is like in Wake County.

The standing orders under which ALS provider in Wake County operate are a component of off-line medical control. They appear to be up-to-date and progressive, and they allow for a wide range of treatment modalities. Standing orders should be (and are) reviewed annually by the EMS Medical Director, as the practice of medicine changes constantly.

Quality Assurance

EMS quality assurance (QA) is vital because it helps identify and correct suboptimal patient care. *As importantly*, QA recognizes exemplary patient care, rewards the practitioners, and disseminates information about excellent practices so they may be emulated by other EMS personnel.

Quality assurance is the crucial feedback connection between EMS operations and training. A well-functioning QA program will not only oversee the care that is being delivered, it will have constant contact with the EMS training division, helping inform decisions about what classes or information should be presented.

Quality assurance does not just happen. It takes a lot of work to make a QA program function. Patient care data need to be collected and analyzed. When problems are found, the root source of the problem must be identified so the problem can be corrected. Sometimes, problems are limited to one individual. In these cases, an individualized remedial program must be developed. Other times, problems can be shown to be prevalent practices or outcomes for a service or system. If this is the case, the problem must be addressed through widespread educational efforts.

Sometimes, rectifying a problem uncovered in the QA process may require changing the EMS system. "When goals are not being met, system change and policy clarification are more often appropriate steps than disciplinary action against personnel. Morale is best in systems in which prehospital personnel sense that the system is willing to learn, adjust, and evolve as problems arise rather than find yet another individual scapegoat for each 'incident.'"[35] Efforts should be made to ensure that QA is not perceived solely as a means to "catch paramedics screwing up." This is usually best accomplished by having the QA system be one of the platforms by which a provider can be singled out for outstanding care.

Quality Assurance in Wake County

The EMS training division performs QA activities in Wake County as a delegated function of the Medical Director. All WCEMS ACRs (on the order of 25,000 per year) are reviewed in the QA process. The VRSs are responsible for reviewing at least 25 percent of the ACRs written by each ALS provider on the department (although most VRSs appear to be reviewing almost 100 percent of their ACRs). The results of these initial audits are forwarded from the VRSs to the training division for further review and, if necessary, action. The training division also reviews three-quarters of all ACRs in the system each year.[36] Finally, the training division audits all ACRs pertaining to identified patient types or treatments (such as all patients who suffered cardiac arrest or all patients who received nasal or endotracheal intubation).

Because there is no dedicated, full-time QA person in WCEMS, the training division personnel address the large amount of work associated with the QA process as time permits (because delivering training must occur on a fixed schedule). Unfortunately, the quality of a QA program is related to the ability of personnel to dedicate sufficient time to the process, as so QA in Wake County suffers as a result. There are three primary complaints about the QA mechanism:

1. It is not getting done. QA is a lower priority for the training division because its primary mission is to ensure the delivery of needed instruction. When

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[35] Kallsen, GW. "Quality Assurance in EMS" in Quality Management in Prehospital Care, Swor, RA (ed.). (Mosby Lifeline:St. Louis), 1993, p. 7.

[36] Wake County EMS, *Wake County EMS System Training: A Five Year Report*, 1997, unpublished, p. 16.

faced with competing demands for time, QA must often be delayed in favor of preparing for or teaching classes.

2. It is not effective enough for volunteers. Though a majority of VRSs are auditing 100 percent of ACRs, because the VRSs are only required to audit 25 percent of their ALS providers' ACRs, the perception exists that the cared delivered by the VRSs is not being scrutinized adequately.

3. Feedback to hospitals is insufficient. A number of hospital personnel cited the need for some form of official feedback concerning the outcome of complaints about poor care.

Fixing the QA system requires a combination of personnel and technology – neither of which are sufficiently in place at present.

Quality Assurance Coordinator

The County should hire a person to be the full-time, dedicated QA coordinator. According to the *Journal of EMS*' annual survey of EMS systems, all of the 21 large, multi-jurisdictional EMS systems (and 166 of the 200 largest cities) employ a full-time QA coordinator.[37] Having a dedicated QA coordinator would not only allow the review of more VRS patient care, it would also facilitate closure of the QA loop with feedback to hospitals or other affected parties. Furthermore, a QA coordinator could be involved with the dispatch QA process to ensure that the EMD function was tied into what was happening elsewhere in the EMS system.

Quality Assurance and Data Collection

The entire QA process would be facilitated by automating the patient care record. Conversion to a computer-based ACR would mean that the first level of QA would take place at the time the patient care record was being created. A computerized ACR can check for completeness of the patient record as well as protocol compliance. Were critical information missing, the computer would ensure that it was entered prior to

[37] Mayfield, T. "EMS in America's Most Populous Cities," *Journal of Emergency Medical Services*, February 1999, Vol. 24, No. 2, pp. 40-45.

closing the record. Additionally, the QA problems associated with an illegible patient care record are obviated with a computer-based system.

A computer-based ACR would facilitate retrospective analysis of patient care because the computer can be programmed to identify for further review all ACRs that met certain criteria. Because it is not necessary to identify those ACRs by hand, the audit can be done faster and more accurately. Additionally, a computer can spot patterns of problems that a human cannot. For example, a computer could quickly scan all 40,000 ACRs of a given year to determine whether certain paramedics made protocol errors more frequently than the norm, under what conditions these errors occurred, etc. This type of analysis is simply beyond the capacity of one or two people working part-time on QA.

Hiring a full-time QA coordinator and automating the patient care record are the two main curatives for the QA system as it now stands. Without a functional QA system, poor patient care stands a greater chance of slipping through the cracks. It is important to reiterate, however, that QA should be viewed not only as a means to identify and rectify substandard care, but also as a means to identify and showcase excellent care.

Training

Training is an essential component of any EMS system. Without an adequate initial education program, it is likely that there will not be enough personnel to staff the EMS system. Without an adequate continuing education program, personnel will lose skills that they do not use frequently, and they will not be exposed to new medical techniques and practices.

Initial training varies in length and depends on the level of certification. EMT classes are about 120 hours long; paramedic instruction is a minimum of 610 hours long. The State EMS Office requires EMTs to complete 24 hours of continuing education per year, no more than half of which may be from clinical observation time or self-study.

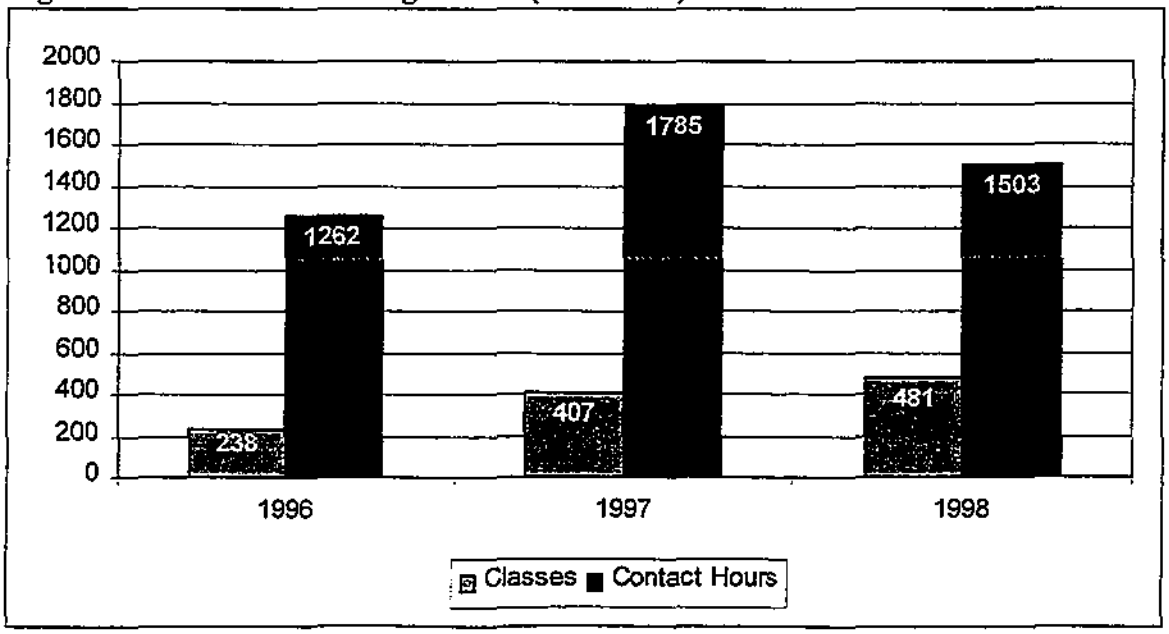
EMS training in Wake County is offered through two state-approved training institutions – Wake County EMS and Wake Technical Community College.

Wake County EMS Training Division

WCEMS primarily conducts continuing medical education, but it also offers first responder and EMT-Defibrillation classes. WCEMS coordinates the continuing education training for over 1,400 personnel (both WCEMS and VRS) of the Wake County EMS system. Educational offerings are selected to ensure that learning objectives required for recertification by the State of North Carolina are properly covered. The training division offers national standard courses (such as Basic Trauma Life Support, Advanced Cardiac Life Support, and Pediatric Advanced Life Support) as well as courses designed specially for Wake County EMS personnel (Medical Life Support I and Medical Life Support II). In addition to these courses, the training division conducts weekend training on selected topics at each VRS every other month. This is an impressive commitment to providing needed EMS training courses.

The WCEMS web site lists numerous training classes offered by the training staff, with dates scheduled all the way through the end of the year. In 1998, WCEMS conducted nearly 500 classes, for a total of over 1500 hours of instructional contact time. Figure 12 depicts the numbers of classes and contacts hours provided by the WCEMS training division for the past three years. In addition, the WCEMS training staff also conduct about 30 public education/public relations training events each year.

Figure 12. WCEMS Training Efforts (1996-1998)



WCEMS employs two full-time EMS educators who not only teach classes, but also coordinate the education program, quality assurance program, and the EMS provider certification database. Their teaching efforts are supplemented by additional instructors who receive overtime pay, are contractors, or volunteer their time. Nonetheless, the training division staff is spread very thinly. The quality assurance responsibilities should be reserved for a dedicated quality assurance coordinator (as discussed above), so the training division personnel can focus on training.

By comparison with many other EMS systems, WCEMS has an excellent training facility complete with sophisticated audio-visual equipment, editing facilities, an extensive library, necessary training adjuncts, and on-line, Internet-based instructional capabilities. The training classroom has one drawback, however – its size. It can only seat 25 students, and it is too crowded for adequate "hands-on" training. Because there are more than 25 WCEMS personnel on a shift, there is no way to conduct shift-wide call-back training. Additionally, the small size of the classroom limits the number of VRS and fire department personnel who can attend a class. The County should ensure that the proposed Public Safety Training Facility has adequately large classrooms for EMS training.

Availability of Training to Volunteers/VRS personnel

There is considerable difference of opinion about the accessibility of WCEMS training to volunteers. Members and employees of VRSs frequently complain that WCEMS offerings for VRS personnel are canceled at the last minute because they are underenrolled, but that WCEMS will hold a class with just one or two WCEMS employees if those people need a required class. The WCEMS training department responds that classes may occasionally be rescheduled but not canceled, and that this is only done out of absolute necessity. Further, the training division makes available alternative means of education for those needing it for immediate recertification.

The problem here appears to be one of communication rather than intentional disregard for the needs of volunteers. Scheduling of classes is a two-way street. In addition to schedules that are posted on the WCEMS web site and that are distributed for posting at the VRS stations, each VRS has a training officer who is responsible for alerting members to the offerings. Underenrollment of classes that people truly need for

recertification should not be a problem if they are scheduled for nights and weekends (which they appear to be).

Other complaints about WCEMS offerings include problems with instructors not showing up for classes, VRS members and employees being bumped from daytime training classes to make room for WCEMS personnel, and laxity in enforcing the requirements for the number of contact hours for classes taken by WCEMS personnel. The WCEMS training division maintains that occasionally instructors need to cancel for personal reasons, but that whenever this happens that serious efforts are made to find a replacement instructor before a decision is made to reschedule an offering.

It is important to reiterate that these complaints are perceptions, and that the perceptions form the basis of opinions – whether those perceptions are founded or not. Efforts to increase communications about offerings and to increase enrollment in offerings should be undertaken by both the WCEMS training division and the VRS training officers.

Wake Technical Community College

Wake Technical Community College (Wake Tech) offers both initial training and continuing education for all levels of EMTs. Most of Wake Tech's EMT student pass their certification examinations on the first attempt. Many end up working in Wake County, although few begin their careers working for WCEMS (mostly because WCEMS desires paramedics with at least two years of field experience). Through its Extension Division, Wake Tech provides recertification classes at no charge to EMS personnel.

In past years, Wake Tech focused mainly on providing classes in its Associate's degree program, but in the past year or so, Wake Tech has begun to offer more classes in the "certificate" programs (i.e., the basic training for the various levels of EMT). Wake Tech also appears to be making a genuine effort to offer more classes at times that meet the needs of the VRSs.

Recruitment and Retention

There appear to be problems throughout the Wake County EMS system in the recruitment and retention of personnel. Recruitment and retention issues are usually discussed in the context of volunteer personnel, but the problem in Wake County extends to paid personnel as well.

Unfortunately, there is a paucity of data on the recruitment and retention of personnel in the EMS system. Accordingly, most of the information presented in this section is based on anecdotal evidence. WCEMS should design a system to track the entry, longevity, and progress of personnel in the EMS system.

Paid County Employees

A number of people indicated that WCEMS is having difficulty recruiting personnel. Greater numbers of paramedic candidates are washing out during their internships. (TriData has learned that recruitment and retention issues for paid personnel were part of the Department of Public Safety's Strategic Plan, but that this portion of the plan was put on hold because the Wake County Department of Personnel is currently studying means to address personnel retention on a Countywide basis.)

WCEMS employees earn a starting base salary of $27,038.[38] This is somewhat below $30,455, the average base salary for paramedics in the southeastern United States.[39] Lower pay may explain why WCEMS has fewer applicants and is finding it harder to retain its personnel than in prior years.

Another factor that may be increasing the difficulty in recruiting paramedics to WCEMS is the County's preference for paramedics with at least two years of field experience. The quality of a paramedic is generally linked to that individual's tenure as a paramedic, so hiring experienced paramedics should yield a better workforce. In fact,

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[38] Actual starting paramedic compensation is generally between $30,000 and $31,000 when overtime and holiday pay are included.

[39] Mayfield, T. "Long Hours, Modest Pay: The 1997 *JEMS* Salary Survey," *Journal of Emergency Medical Services*, November 1997, Vol. 22, No. 11, p. 49. This number was estimated from the 1997 average (the last year for which data were available) using the Gross Domestic Product Price Deflator.

recent research from Great Britain tends to confirm that hypothesis.[40] Unfortunately, recruiting a paramedic with tenure can be difficult for a number of reasons.

First, the WCEMS salary needs to be competitive to induce people to leave a situation in which they already have some seniority. If a paramedic is with a service that has a run volume sufficient to give that person credible street experience, then the WCEMS starting salary may well be too low to attract the right people. If the paramedic is with a transport service (which generally pay lower than emergency services), then the salary and the lure of being an emergency paramedic should suffice to attract applicants, but it is questionable whether two years of ALS non-emergency transport experience really adds value to the applicant's readiness for street work.

Second, applicants will tend to come from one of two places. Either they will be paramedics currently working for Wake County VRSs, or they will be from outside Wake County entirely. Hiring paramedics from the VRSs is fine, except that it can create a staffing problem for the VRSs. Hiring personnel from outside the county means that these people will need to relocate and then learn their way around the county.

WCEMS has recently converted its two-year experience policy into a hiring preference. This has the advantage of being able to tap directly into the pool of new paramedics graduated each year by the Wake Tech paramedic program. The current minimum qualification to become a WCEMS paramedic is certification as an EMT-P. In acknowledgment of the value of street experience, WCEMS should establish a recruitment bonus for new paramedics with more than two years of emergency response work. Additionally, having changed the tenure requirement to a preference, WCEMS should ensure quality in its new paramedics through a more intensive internship program.

Paid Employees of Volunteer Rescue Squads

As mentioned earlier in this report, the VRSs employ personnel to cover their units when volunteers are unable to provide coverage. It is important that the VRSs also be able to hire and retain suitable personnel, and hence the VRSs face the same need to

[40] Soo LH. "Resuscitation from Out-of-Hospital Cardiac Arrest: Is Survival Dependent on Who is Available at the Scene?" *Heart*, January 1999, Vol. 81, No. 1, pp.47-52.

compensate paid employees on a competitive basis with WCEMS and other EMS agencies that could attract paid personnel away from the VRSs.

Volunteers

Recruitment and retention of volunteers is becoming a national problem for EMS. The effects on the provision of EMS in Wake County are manifest as well. The number of new members of VRSs has declined each year since 1988.[41] Some of the VRSs in Wake County report little or no difficulty in obtaining volunteers; others can barely meet their self-imposed duty obligations. Loss of volunteers in the Wake County EMS system means that paid personnel from either the VRSs or WCEMS would need to provide service. Assuming an average VRS wage of $12 per hour for a paramedic, this would require expenses of at least $1.3 million per year, not counting benefits and retirement contributions.

If volunteers are to be a part of the system configuration in the future, then the County needs to take serious measures towards facilitating volunteerism in Wake County. Following are some suggestions to improve volunteer participation in the EMS system.

Volunteer Coordinator

A volunteer coordinator position should be created in the Department of Public Safety. Although it would be preferable to have an individual dedicated solely to EMS, the position could be shared between WCEMS and the Office of the Fire Marshal. The individual would have the responsibility to ensure that the programs and activities of WCEMS (and the Wake County fire service) are opened to and involve volunteers to as great an extent as possible. Duties might include being the main point of contact with WCEMS for volunteer personnel, meeting on a regular basis with the VRS (and VFD) chiefs, representing them at meetings that were scheduled when they were unavailable, handling registration in WCEMS training courses, ensuring the correct tracking of continuing education/recertification requirements, etc. In short, the coordinator would be a paid advocate for the volunteers. There are positions similar to this in jurisdictions in California, Florida, Maryland (Anne Arundel, Montgomery, and Prince George's Counties), Ohio, and Virginia (Loudon, Fairfax, and Chesterfield Counties).

Accessibility of WCEMS Training to Volunteers

WCEMS could also increase volunteer satisfaction by ensuring that training activities are available to volunteers on evenings and weekends. The WCEMS web site lists numerous courses for volunteers; however, they complain that these courses are frequently canceled and that registration in "call-back" classes is limited and tenuous. As noted in the earlier section on training, this may be a matter of perception; however, it is a considerable source of discontent among volunteers.

Recognizing that volunteers must make sacrifices in their personal or work lives to attend training classes is important – cancellation of classes that people need for recertification and have scheduled months in advance causes volunteers a significant amount of frustration and discontentment. While some classes may need to be canceled at the last minute due to instructor illness or other exigent circumstance, anything that WCEMS can do to ensure that classes occur when they are scheduled to will go a long way towards mollifying volunteer concerns in this respect.

Elevating the Role of Volunteers

Another problem that volunteers report is that they feel they must frequently take a "back seat" to the WCEMS personnel with whom they work. This is manifest in paramedics who tend to ignore the presence of volunteers or who treat them as little more than "go-fers." It is also manifest by policies such as the one that requires the WCEMS unit to function as a first-duty truck even though an equally qualified volunteer-staffed ambulance is available in the district. WCEMS should modify its policies to allow VRS ambulances to take first-duty calls on an alternating basis. This will not only increase volunteer satisfaction because they will be running more calls, it will be congruous with the Medical Director's desire to see paramedics increase their expertise by running more calls. If a decision is made to implement a two-tier response system (see "Level of Service Provided", page 47), then volunteers will undoubtedly play a larger role in ensuring BLS response in many areas of the county.

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[41] Wake County EMS, *Wake County EMS System Training: A Five Year Report*, 1997, unpublished, p. ii.

Volunteers want to feel that the time (and money) they spend in training and maintaining their certification allows them to be involved in EMS in a meaningful way. Efforts should be made to incorporate volunteers into the delivery of care in a manner that treats them as equals whenever possible. It must be said, however, that doing so will place a greater onus on volunteers as well.

Specific Suggestions for Volunteer Recruitment

Assisting the VRSs with development of programs or initiatives to recruit volunteers would be one of the main responsibilities of the previously discussed volunteer coordinator. However, there are several low-cost or no-cost things that the County could do even without a volunteer coordinator to facilitate volunteer recruitment. These include:

- Advertise for volunteers on the WCEMS and the general Wake County web sites. Use the technology of the Internet to allow people to find out about volunteer opportunities and to channel information requests to the appropriate person at each VRS.

- Enlist the assistance of the United Way, Lions Clubs, Kiwanis, Knights of Columbus, and other similar community service organizations. Send these groups information packets on opportunities to volunteer with the VRSs. Ask them to advertise within their membership. These types of organizations are especially good sources of volunteers who do not wish to provide field care (it must be remembered that volunteering as an EMT is not the only way to provide valuable volunteer services to a VRS).

- Host a "volunteerism summit" or volunteer job fair. This could be done in conjunction with the community service organizations just mentioned. The summit could address volunteer opportunities and concerns.

- Use PowerPoint or other graphic arts media to design a slide to advertise the need for volunteers in the slide show that many movie houses show before movies begin. Ask movie theaters to "donate" that advertising time.

- Work with the AV facilities of the County, Wake Tech, or a local TV station to produce a short public-service advertisement for volunteers.

Specific Suggestions for Volunteer Retention

New recruits are the future lifeblood of a VRS, but current personnel provide the blood supply a VRS needs to survive right now. The departure of active personnel from a VRS hurts not only because the valuable resource of volunteer staffing is reduced, but also because active personnel have formal EMS training (which is expensive and lengthy to obtain) and informal "street smarts" (which can only be acquired over time). Accordingly, it is more important to retain current volunteers than to find new ones.

The major reasons that people stop volunteering "boil down to two major categories: problems in one's own life, such as lack of time, family demands, emotional problems, or a job change that make it difficult to remain a volunteer of any organization; and factors relating to the ... [organization] that drive out a volunteer who would otherwise stay, such as dictatorial leadership or too much mandatory training."[42]

The first group of problems may be addressed by incentives and/or programs offered by the department or other entities. For example:

- The County could modify its policies to allow members of VRSs to access the County Employee Assistance Program (run by Rex Aware) for counseling on or help with emotional, financial, or family problems. (Currently, Rex Aware will only provide service to people listed as "employees" of Wake County.)

- The County could seek corporate sponsors of goodwill gestures for volunteers (e.g., volunteer appreciation day at a local ice cream store, free admission to matinee shows at movie theaters, etc.).

- The County could provide access to day-care services (through its contractors Bright Horizons or Kid Works) for volunteers who are taking training classes.

[42] U.S. Fire Administration, *Recruitment and Retention in the Volunteer Fire Service: Problems and Solutions*, FA 185, December 1998, p. 16.

- The VRSs could nominate members for recognition at the annual County Commissioners' awards ceremony for outstanding volunteers.

The second group of problems can be addressed through increased management and leadership training. The National Fire Academy offers classes specifically tailored for volunteers – it even has one (EMS Administration for Volunteers) that is offered over the Internet. The County should facilitate participation in these classes. It might consider getting the appropriate curricula from the National Fire Academy and offering the classes in-county through WCEMS or the VRS chief's association.

Availability of Federal Report on Volunteer Recruitment and Retention

The U.S. Fire Administration and the National Volunteer Fire Council recently jointly published a 170-page report entitled *Recruitment and Retention in the Volunteer Fire Service: Problems and Solutions*. Although the report was written specifically to address the issues for the volunteer fire services, it is entirely applicable to EMS as well. In addition to analyzing the problem and offering advice on how to combat volunteer attrition and lack of volunteerism, the report contains a number of examples of programs that have proven successful in departments around the country.

TriData suggests that the report be considered "required reading" for addressing this problem. The report (number FA 185) may be obtained free of charge through the U.S. Fire Administration Publications Center, (800) 238-3358.

Coordination with County Office of Volunteer Services

The Wake County Department of Human Services has an Office of Volunteer Services that has become a focal point for volunteer activities in County Government. The Office has a full-time Coordinator of Volunteer Services. The Office could serve as an interim resource for VRSs seeking to work on the recruitment and/or retention problems. The Coordinator of Volunteer Services can be reached at (919) 250-3842.

Wake County Association of Volunteer Administrators

The Wake County Association of Volunteer Administrators is a private membership organization. The Association holds meetings every other month and offers

both resources and instruction on administration issues relating to volunteers. Annual dues are $20, so membership should be affordable to all of the VRSs.

V. EMS SYSTEM STRUCTURAL ALTERNATIVES

One of the major areas of the study's focus was to determine how the EMS system should be structured to best meet future needs. This section explores the alternative EMS system models that could be implemented in Wake County.

Maintain Status Quo

The first option would be to maintain the status quo. This is not a very good option for the future.

As discussed earlier in the report, the population of the county is growing fast, and heretofore undeveloped areas of the county are going to provide new housing stock. The current ambulance deployment scheme concentrates too many units in the established population centers of the county, leaving the areas that will be developed underprotected. Accompanying the large-scale growth will be increases in traffic congestion along the major traffic arteries (and along ones that have traditionally been viewed as minor traffic arteries as commutation to the new housing stock increases).

Reliance on the status quo will produce a mismatch between the patterns of ambulance deployment and ambulance usage.

The primary advantage of the current structure is that it uses volunteer personnel to provide more unit-hours of ambulance coverage at a lower cost. That cost advantage will soon disappear.

In the next few years, it will become increasingly difficult for the EMS system to rely on volunteers as much as it has been. The number of available hours of coverage by volunteers continues to shrink in face of changing economic realities. In fact, at present most VRSs are really not staffed by volunteers – they essentially use paid personnel who are *supplemented* by volunteers. As the call volume rises, volunteers will be less and less able to provide the needed coverage, and reliance on paid personnel will increase.

County-wide EMS System

One structural alternative would be creation of a single entity responsible for all EMS delivery in the county. In many respects, this is the most desirable option because it would help ensure a consistent level of service delivery throughout the county. A countywide EMS system could still incorporate a role for volunteer personnel, but it would relieve the local communities from having to figure out ways to provide EMS.

This alternative is the most expensive. At present, the VRSs combined produce 2,856 unit-hours of coverage per week (this does not include units that are not contractually mandated, i.e., third- and fourth-duty units). WCEMS' current budget is $6.2 million. The unit-hour cost for 12 EMS units is $59.44. Therefore, providing an additional 2,856 unit-hours of coverage per week would cost the County about $8.8 million, which would bring the total EMS system cost to just about $15 million annually. This might be somewhat less, depending on whether all the unit-hours currently being produced would still be produced. In addition to the personnel costs, the County would probably need to purchase (or lease) vehicles, facilities, and equipment from the VRSs (at least for the initial few years while the County was acquiring additional vehicles, facilities, etc. This could add hundreds of thousands of dollars to the total cost of this option.

Although there would be savings in the form of economies of scale, and certain ambulances could probably be eliminated through strategic placement of units throughout the county, the cost of this option probably remains prohibitive at the present. Additionally, there would likely be stiff opposition from local communities, many of which have expressed the desire to preserve the "identity" of the local VRS.

For these reasons, TriData recommends against this option at this time. However, the County needs to continually plan for the eventuality that one or more VRSs ceases to operate in a given year. The County should begin to acquire additional resources that could assist it in providing service should one of the VRSs shut its doors.

Private Provider

Use of a private ambulance provider would likely not be feasible from an economic, a political, or an operational standpoint. Until recently, one of the largest private, for-profit ambulance services in the country, AMR, was operating several units in Wake County. The company recently shut down its Wake County operations for financial reasons. AMR had been providing non-emergency transport. Considering that such service is usually considered "cream skimming" in the ambulance industry (i.e., it provides good reimbursement because most patients are insured), AMR's failure in Wake County should probably be taken as an indication that few private ambulance services would be interested in providing emergency service (because of the high percentage of unreimbursed care that is associated with emergency service).

Second, given the high level of pride exhibited by the VRSs, it is highly doubtful that implementing a countywide private ambulance service would be politically palatable.

Finally, any private provider who would undertake countywide provision of EMS would need to rely heavily on fire department first response in order to meet response time expectations. In order to assure that it operated economically, a private provider would undoubtedly concentrate its resources in the Raleigh area and a few select, higher volume locations outside the center of the county. This means that fire departments would need to be dispatched on a greater range of calls – more than the life-threatening calls and automobile extrications to which they currently respond. It is unlikely that the fire department first response system could bear the additional response load that a private ambulance service would need to impose on it, especially in the more rural areas. In fact, the Zebulon Town Fire Department currently refuses to engage in EMS first response. This would mean that a private provider would have no first response in that area. It is improbable that a private provider would station an ambulance sufficiently close to Zebulon to assure a sufficiently rapid response in the absence of first responders.

For these reasons, it appears that private provision of EMS in Wake County would prove unworkable.

System Status Management

System status management (SSM) involves dynamically redeploying EMS resources to meet anticipated EMS demand. The concept of SSM is simple – its application is less straightforward.

The core of a SSM operation is the "system status plan." A system status plan can be conceived of as a large matrix that has a cell for each hour of the week and each level of EMS system resource consumption. In each cell is a set of instructions about where to position EMS system resources for that hour and resource-level combination. Under SSM, a system status controller (usually in a dispatch center, such as RESCOM) is responsible for constantly monitoring the system and figuring out how to redeploy the available units to comply with the system status plan.

The advantage of SSM is that it allows a service to cover a greater area with fewer units and it strives to ensure the fastest response time at all levels of resource availability. While SSM can produce excellent results in some settings, it has its drawbacks as well. Doing SSM well requires a well-managed database of EMS call activity and a plan that is continually updated and refined. Data collection requirements can be monumental.

However, collecting and managing the data are the least of the drawbacks. SSM is stressful on personnel and vehicles. Theoretically, each dispatch can produce a cascade of redeployments. In busy SSM systems, personnel are accustomed to being moved around in the middle of the night. Often, the optimal placement of an EMS resource is not in (or near) a fixed facility. One of the biggest complaints of personnel in SSM systems is that they "live" out of the cab of their ambulances. Often, units get posted to street corners or 7-11 parking lots because those locations offer the optimal placement given the number of resources available and the time and day of week. Unfortunately, such posting is hard on people, and it is almost totally unacceptable for use with volunteers. Further, the constant shifting of resources in the system means that vehicles are subject to greater wear and tear (this is also true because vehicles spend less time garaged and more time outdoors).

SSM would probably cause a migration of EMS resources toward the center of the county during busy periods. This might require longer response times than would be

acceptable to the communities outside of the center. Again, SSM is not suitable for use with volunteers, and hence is not a viable option for Wake County.

County Provides All Advanced Life Support

Another option would be for the County to provide all ALS. This would have two major advantages. First, it is easier for a volunteer organization to staff at the BLS (or intermediate life support, ILS) level than at the ALS level. By reducing the staffing commitment to BLS, the VRSs could reduce their expenses (especially if they could increase their volunteer coverage). Second, this option would help ensure that paramedics in rural areas did not face skill degradation through disuse (especially since WCEMS paramedics rotate assignments on a regular basis). Overall, this would help assure the quality of care delivered.

There are two ways to accomplish this outside of the response districts for which WCEMS is now responsible (the County now provides paramedics for half of the VRSs).

Under the first method, the County could provide all equipment and personnel, while the VRSs provided BLS (or ILS) ambulances. To accomplish this, the County could either station its personnel in certain VRS facilities (as is done now in Holly Springs, Wendell, Knightdale, and Zebulon) or provide them in single-person quick response vehicles (QRVs). The latter has the advantage of being able to cover more area with fewer personnel (but has the disadvantage of sometimes having longer response times, although second-duty response is always at the ALS level).

The second method would be for the County to station ALS ambulances alongside VRS BLS units in selected stations in the county (e.g., Fuquay-Varina). This is much more expensive than the QRV model, as it requires two personnel and an ambulance (which can cost as much as $50,000 more than a QRV). The advantage to this method is that a WCEMS ALS ambulance is transport-capable, whereas a QRV is not.

Use of Volunteer Paramedics

One of the reasons that the Option #2 and Option #3 VRSs wish to become paramedic-level services is that they want to be able to use their volunteer paramedics at

the paramedic level. Volunteer paramedics could provide ALS under a system in which WCEMS provided all ALS services. In essence, people who wished to volunteer as paramedics would volunteer for WCEMS and be assigned to the VRS of their choice. According to the State Office of EMS, this would be permissible as long as they had all the same training, continuing education, quality assurance, etc. that is required of paid WCEMS personnel.

An advantage of this system is that the EMS Medical Director could temporarily rotate a volunteer paramedic to a busier unit if it was felt that the volunteer paramedic had not had enough patient contact. Theoretically, since volunteer paramedics presently work under the aegis of the EMS Medical Director, he could now require that any paramedic in the system to rotate to a higher-volume unit. Therefore, this would not really constitute much of a change – it would simply formalize the relationship and clarify the applicability of the WCEMS quality assurance measures to volunteer ALS providers.

The one drawback of a system in which the County provides all ALS is that paid WCEMS employees could not be volunteers. This is actually the case right now – federal court decisions surrounding the Fair Labor Standards Act have tended to prohibit people from volunteering where they work. In many counties across the United States where paid county firefighters also have been members of volunteer fire departments, those county employees have had to stop volunteering. Because the VRSs receive County subsidies, the same stricture would most likely right now, but almost surely would apply to any WCEMS personnel wishing to volunteer as a paramedic. This does not affect the ability of WCEMS personnel to work as paid employees of the VRSs.

Tiered Response System

Wake County should convert to a tiered response system. This could be done in conjunction with other options previously discussed. A tiered response system would work best if EMS resources were decentralized (i.e., units from multiple-unit stations were redeployed to attain wider coverage). This decentralization effort should attempt to complement the changing geography of the population.

It was noted earlier that 46.9 percent of the calls to the Wake County EMS system were identified from call type as requiring ALS. According to Jack Stout, one of the

acknowledged experts on EMS system design in the United States, "[w]hen paramedic crews respond, 20 percent to 30 percent of 9-1-1 medical requests are found to require paramedic skills."[43] Sending a full paramedic unit to every first-duty call is an over-response. Clearly, not all calls warrant the specialized skills of a paramedic.

Presently, a paramedic unit can be sent on a first-duty call that turns out to be a BLS call (e.g., broken leg). Meanwhile, a second-duty call for the same area is received. This time, it is for a heart attack. If the patient is unlucky enough to be in Knightdale, Wendell, Fuquay, or Holly Springs, he or she will receive a lower level of care because the second-duty unit is not staffed at the paramedic level, and the first-duty unit, a paramedic-staffed ambulance, is unavailable. The inequity of this system is obvious. Likewise, in districts that are covered by first- and second-duty paramedic units, an expensive and sophisticated medical resource is sitting idle for most of the time (as in the case of Rolesville) or is being used for BLS calls. The solution is not to put paramedics everywhere, but rather to use them more judiciously.

Table 9. 1997 Call Distribution by Unit Assignment

	1st Duty	*2nd Duty*	*3rd Duty*	*4th Duty*	*Total*
Apex	1254	275	33	*n/a*	1562
Cary	2400	860	150	42	3452
Fuquay	*n/a*	599	83	7	689
Garner	2119	746	138	*n/a*	3003
Holly Spgs	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
Knightdale	1179	171	12	*n/a*	1362
Rolesville	566	45	*n/a*	*n/a*	611
Six Forks	1620	240	1	*n/a*	1861
Wendell	963	164	39	1	1167
Zebulon	996	179	11	*n/a*	1186

Source: AJC EMS Consultants, *Wake County Ambulance Placement Study*, 1998

Overall, however, the number of second-duty calls is low. Table 9 compares the number of first- and second-duty calls received by VRS units in 1997. It is plain to see that, on average, except for the two busiest second-duty units in the county (Cary and Garner), no second-duty unit in the county runs two second-duty calls per day. There is

[45] Stout, J. "System Design" in Kuehl, AE (ed.), Prehospital Systems and Medical Oversight, (Mosby Lifeline:St. Louis), 1994, p. 87.

excess ALS capacity in the system. Staffing all the first-duty units at the paramedic level doesn't make sense. By extension, staffing second-duty units beyond the BLS level doesn't make sense – especially when second-duty calls are such a rare occurrence.

Given the difficulties and expense of staffing an EMS system with paramedics as compared to basic-level EMTs, it makes sense to use the lower-level providers whenever possible. A tiered response system would send either a BLS, an ALS unit, or both, to a call, based on the nature of the incident as it is identified in the dispatch center. In some cases, this means two units will need to respond on a call, but in most cases, an EMD system (such as MPD™) will be able to correctly differentiate the level of response required and just send one unit (see "Level of Service Provided," page 47). Under a tiered response, BLS units would primarily handle "alpha" and "bravo" 9-1-1 calls (the lower priority calls under MPD™. ALS units would mainly handle the "charlie" and "delta" 9-1-1 calls – serious or life-threatening calls.

The fundamentals are in place for Wake County to convert to tiered response. Doing so makes sense given the composition of the EMS demand and the resources available to meet that demand. Careful planning will be necessary to implement a tiered response system, and an "ironing-out period" will be required to get the system operating smoothly and efficiently. One of the big changes of this "ironing-out period" will be for EMS personnel to become accustomed to sending the closest *appropriate* resource – not necessarily the *closest* resource. At times, this may mean that a low priority patient has to wait slightly longer than he would have under the current system. The tradeoff is that the most sophisticated medical resources will be preserved in the community for the greatest amount of time and not used simply because it is the "first-duty" unit.

The primary benefits to the taxpayer and the users of the EMS system are that fewer paramedics will be needed and that paramedic resources will be used more efficiently. The primary benefit to the EMS system will be a lower cost of operation, but there is an additional benefit to having a tiered response –volunteers could assume a more meaningful role in a tiered response system because BLS ambulances are easier to staff with volunteers than ALS ambulances, and because the BLS ambulance becomes central to the operating philosophy of the system. For some VRSs (such as Fuquay), increased usage of the VRS' ambulance will result in greater patient revenues for the squad.

Suggested Deployment Plan

Under the tiered response concept as applied to Wake County, all second-duty VRS units would be staffed at the basic level (although VRSs could provide staffing at the intermediate level, if they desired). The ambulance in Holly Springs would continue to be staffed with WCEMS paramedics under the present arrangement. A new QRV would be stationed at Wendell Fire Department Station #2 to cover the eastern portion of the county. One of the two District Supervisors located at Station #1 would be based out of the Fairview Fire Department Station #2.[44]

This is just a suggested initial deployment plan. Naturally, the most workable deployment plan will be discovered gradually over time. Finding the best location for resources will take careful monitoring of the usage of ambulances under a system where the resources are decentralized and where the community is growing in areas that have previously been undeveloped. This is a dynamic process, not a static one.

Non-Traditional EMS

In recent years, there has been a lot of discussion about expanding the EMS function to include "non-traditional" services. The concept started in New Mexico and Alaska, in remote (i.e., transport distances of greater than 40 miles to the nearest hospital) and/or medically under-served communities (i.e., no resident physicians). The paramedics in these programs received advanced training in primary care and community health that is outside of the standard paramedic training curriculum (e.g., advanced wound care, suturing, primary care check-ups, administration of prophylactic drugs, etc.).

The basic concept behind these programs was to have paramedics deliver community-based primary care during the "down time" between calls. This has three advantages. First, it brings primary care into settings where it often is unavailable. Second, it makes efficient use of paramedics' time. Finally, it keeps the assessment and treatment skills of the paramedics sharp, preventing the "rust-out" that often accompanies low call volumes.

[44] To use District Supervisors as QRVs might require creating some means to reduce the frequency with which they must physically be at Station #1 for paperwork or other routine administrative functions. Increased reliance on the Wake County Intranet could be one means of attaining such reduction.

The programs have been well received, and their success has caused many communities to examine the need for and wisdom of instituting such a program. While these programs have their benefits, they are not without their problems. First, enabling legislation (or regulations) often need to be passed at the state level because many of the skills used in such programs are beyond the scope of practice defined for paramedics in state law or regulation. This is the case in North Carolina. Further, these programs tread close to the vocational "turf" of physicians' assistants and nurse practitioners. Because of this, these groups sometimes lodge political opposition to legislation that allows paramedics to undertake these medical procedures.

Another problem is that expanded-scope programs are very expensive to implement and even more expensive to maintain. Training personnel, both on an initial and an on-going basis, is costly and time-consuming. The initial training and implementation grant from the U.S. Department of Health and Human Services to the New Mexico expanded-scope project was about $450,000. The training program was 350 hours of instruction above that normally required of paramedics. In a review of the program for the New Mexico State Legislature, the New Mexico State EMS Director wrote, "There are still significant challenges to the [expanded]-EMS demonstration project in Red River. Most critical is the cost and difficulty associated with providing additional CHS-Paramedic training for new personnel. Currently, there is no readily available or affordable training mechanism to support [expanded]-EMS."[45]

Eventually, an expanded-scope program may make sense in the rural areas of Wake County, where lengthy transports for relatively minor medical conditions could be eliminated by the presence of a more highly trained paramedic. The first priority for these areas, however, must be to get the EMS system to function efficiently.

The high cost of such an expanded-scope program, the comparatively high call volume of the Wake County EMS system, and the relative proximity of four hospitals militate against implementing such a program in Wake County. Also, the retention problems that WCEMS and the VRSs face would need to be solved before it would economically advisable to invest such large sums in training. The EMS Medical

[45] Wolff, B and Fleming, T. "Response to Senate Joint Memorial #44: A Study of Expanded-Emergency Medical Services," New Mexico Department of Health, November 1, 1995, p. 10.

Director, the WCEMS leadership, and other concerned EMS system participants should complete a needs assessment before undertaking an expanded-scope EMS program.

WCEMS Shift Length

TriData was asked to determine the best schedule for WCEMS personnel from among three options – 8-hour shifts, 12-hour shifts, and 24-hour shifts. Obviously, one of the primary considerations in choosing a shift is the bottom line cost – different work schedules create different patterns of overtime consumption and, therefore, different bottom lines.

Several factors in addition to cost need to be considered in making a determination of the optimum work schedule. These include ease of scheduling, usage of part-time personnel, availability of personnel to fill schedules, fatigue and its impact on safety and medical care, and effect on morale.

Bottom-line Comparison

WCEMS personnel currently work a schedule commonly referred to as "three 24s." Shifts are 24 hours long. Each shift worked is followed by 24 hours off duty. The 24-on/24-off pattern is repeated three times, but after the third 24-hour shift the employee gets four days off. This results in a workweek that fluctuates between 48 hours and 72 hours in length. The Fair Labor Standards Act mandates overtime for employees who work more than 40 hours in a given period, so all employees who do not take leave of any kind accrue either eight or 32 hours of overtime each week.

An eight-hour shift pattern is analogous to a standard workweek. Three shifts of employees cover the 24-hour day. Since no employee would be scheduled for more than 40 hours per week, employees do not collect overtime on a regular basis – they usually get only administratively uncontrollable overtime (i.e., overtime for calls that extend past a scheduled shift change or other unexpected occurrences).

Workers on a 12-hour shift split the day with another shift. Generally, workers on a 12-hour shift work days one week followed by nights the next (or some permutation

thereof). Overtime is minimized by scheduling personnel only for four shifts per week. This means that all workers will accrue eight hours of overtime a week.

Table 10 compares the bottom line costs of the three shift plans. The number of shifts an employee could work is calculated by deducting the maximum possible consumption of annual and sick leave from the maximum number of shifts it is possible to work. The number of shifts it is possible to work is then multiplied by the length of the shift to determine the maximum number of hours of coverage a given employee could contribute to the 8,760 hours of coverage needed per year for one position on an ambulance. The staffing factor is the ratio of the maximum hours of coverage one person can contribute to the total number of hours needed (8,760). It represents the number of full-time equivalents needed to fill one position around the clock. The staffing factor is rounded up to the next whole number to represent the actual number of personnel needed. The comparison assumes an annual paramedic salary of $31,000 – for comparison purposes only. The base salary and overtime costs shown are computed according to the County's overtime policy.

Table 10. Comparison of WCEMS Shift Options

	24-hour	*8-hour*	*12-hour*
Shifts Scheduled/Week	3	5	4
Hours Worked/Shift	24	8	12
Shifts/Year Possible	121.67	260	208
Annual Leave/Year (in shifts)	5.33	10	10
Sick Leave/Year (in shifts)	4	12	8
Shifts/Year Worked	112.33	238	190
Total Hours/Year Worked	2,696	1,904	2,280
Total Hours/Year of Coverage Needed	8,760	8,760	8,760
Staffing Factor	3.25	4.60	3.84
Total Number of FTEs Needed/Position	77.98	110.42	92.21
Base Salary Cost of EMT-Ps	$2,417,448	$3,423,025	$2,858,526
EMT-P Overtime Costs	$317,677	$0	$238,211
TOTAL PERSONNEL COST	$2,735,126	$3,423,025	$3,096,737

Note: The personnel costs shown are for the purpose of comparison only. The actual budget figures will higher because of differences in personnel tenure and annual leave accrual and because retirement contributions are not shown.

The 24-hour shift costs the least given the County's leave and overtime policies. Although the 8-hour shift does not require the use of administratively controllable

overtime, the higher staffing factor required pushes the costs of the 8-hour shift higher than the other two options.

Additional Factors for Consideration

Were cost the only factor in choosing a shift schedule, the choice would be clear – the 24-hour shift would prevail. However, as noted earlier, other factors need to be considered in determining the best shift for the County to choose.

Both 8- and 12-hour shifts are more difficult to schedule than a 24-hour shift because they require more coordination of the annual leave, sick leave, and other emergency leave requests of the WCEMS employees. There are more headaches involved and more administrative time consumed in managing 8- or 12-hour shifts.

WCEMS uses part-time personnel to substitute for full-time personnel who take leave. This reduces consumption of administratively controllable overtime. Both 8- and 12-hour shifts necessitate having a larger cadre of part-time personnel for such purposes.

Another consideration is that of the effect of fatigue on shift workers. Concern has been expressed in many communities about the quality of medical care rendered by paramedics toward the end of 24-hour shifts. Similar concerns prompted limitations on the number of consecutive hours that interns may work on-call in hospitals. This probably would apply only to personnel assigned on the busiest units in downtown Raleigh, and it accounts for the policy of rotating calls among the units at Station #1. It should be noted that none of the people with whom TriData spoke ever directly complained about poor care due to tired paramedics, but it is a possibility that it occurs, especially since many WCEMS paramedics moonlight with the VRSs.

There are also problems with fatigue associated with shift work. Studies of the effects of shift work on the health of the workers have tended to confirm that interruption of the physiological circadian rhythms produces "maladaptation and negative health effects."[46] Because workers on 12-hour shifts generally spend one or two weeks working days and then the switch to nights, they are subject to these stressors. Further, Glazner

[46] Glazner, LK. "Shift Work and Its Effects on Fire Fighters and Nurses," *Occupational Health and Safety*, July 1992, p. 45.

(1992) points out that interruptions in sleep combined "with the need to work at the low point of the circadian cycle, raise the possibility of a degree of drowsiness in night nurses which may make them less efficient in carrying out their duties."[47] The analogy to night shift paramedics is obvious. In addition to the ill health effects and possible proneness to treatment errors, tired emergency personnel may be more susceptible to make errors in safety at dangerous scenes. While personnel on 24-hour shifts may have their sleep interrupted, they are not staying awake all night and sleeping all day for days on end as 12-hour shift workers are.

The final consideration is the effect on morale that a shift from a 24-hour shift to a 12-hour shift might have. To many of the WCEMS paramedics, one of the more attractive aspects of the job is the 24-hour shift. Many WCEMS personnel are employed as paramedics elsewhere on their days off. Some paramedics structure childcare responsibilities around being able to work opposite shifts with a spouse. Conversion from a 24-hour shift to a 12-hour shift could interrupt lifestyle choices that employees have made as a result of the availability of 24-hour shifts. Undoing those arrangements could cause a deterioration of morale (and possibly some attrition).

The cost savings of the 24-hour shift over either of the other shifts would be enough to make a decision solely on the bottom line. In light of the cost savings and the factors discussed above , TriData recommends staying with the 24-hour shift.

[47] Ibid., p. 57.

VI. EMS SYSTEM FINANCING ALTERNATIVES

One of the directives of the EMS Task Force was to explore possible alternative financing mechanisms for the EMS system. This section discusses several options that have been proposed, including whether the EMS subscription program should be continued, and if so, what the subscription fee should be.

At present, the EMS system is funded through three main components – taxes, fee-for-service, and EMS subscriptions. This is probably the best mix of funding sources, as it addresses health care market forces while also addressing market imperfections inherent in providing EMS to some of Wake County's relatively poorer and less central communities. The VRSs also obtain some degree of funding from charitable fundraising activities; however, unlike in decades past, VRSs are unable to rely solely on donations for their operating funds.

County Tax

The EMS system is primarily funded through tax subsidies. In fact, in 1998, tax expenditures for the EMS system totaled just above $7 million. Patient revenues (fees-for-service) returned just $1.7 million to the County (of which, over $735,000 was subsequently redistributed to the VRSs).

Almost every EMS system relies on tax subsidies to some extent. The degree to which this happens is a matter of legislative choice and practical revenue recovery efficiency. Tax funding provides a stable base of support for an EMS system. In many cases, it is the only means of assuring the desired level of EMS response given the revenue-generating potential of a system.

Wake County has many areas – primarily rural in nature – that simply would be unable to provide EMS at the service levels currently expected without tax subsidies. This is due to the fact that providing the minimum level of coverage costs more than can be collected from donations, town subsidies, or patients (either because there are not enough calls or because the payer mix does favor a suitably high reimbursement rate).

The reality is that the EMS system needs to receive some level of tax subsidy in order to operate at the level desired by the citizens of the Wake County. Changes in the county's demography, increased public expectations for medical sophistication, increased equipment costs, and a higher call volume have combined with low reimbursement rates to rule out the possibility that EMS can be delivered solely using the community-based volunteer rescue squads.

Fee-for-Service

Fee-for-service is the traditional health care model in the United States. Simply put, health care consumers (in this case, EMS users) are sent bills for service, which are then forwarded on to insurance carriers for payment. In some cases, the consumer is responsible for payment of a portion of the bill (the "co-payment" amount).

It has only been in the last decade or so that many EMS systems (especially volunteer groups) have begun to bill patients under a traditional fee-for-service arrangement. Many EMS agencies were loath to bill for fear that billing would lead to a decline in donations or charges that the local government was "double-dipping" (i.e., taxing and billing for the same service). Recently, however, greater numbers of EMS agencies have begun to realize that not billing for service leaves money on the table – money that insurance carriers are committed to paying but are all too happy not to pay if not requested. "Revenue recovery" has become the mantra of many EMS agencies and local governments seeking to offset tax subsidies.

Wake County EMS should continue to bill on a fee-for-service basis. In fact, as discussed earlier, it should endeavor to contract out its EMS billing function in order to maximize its fee-for-service revenue recovery.

EMS Subscription Program

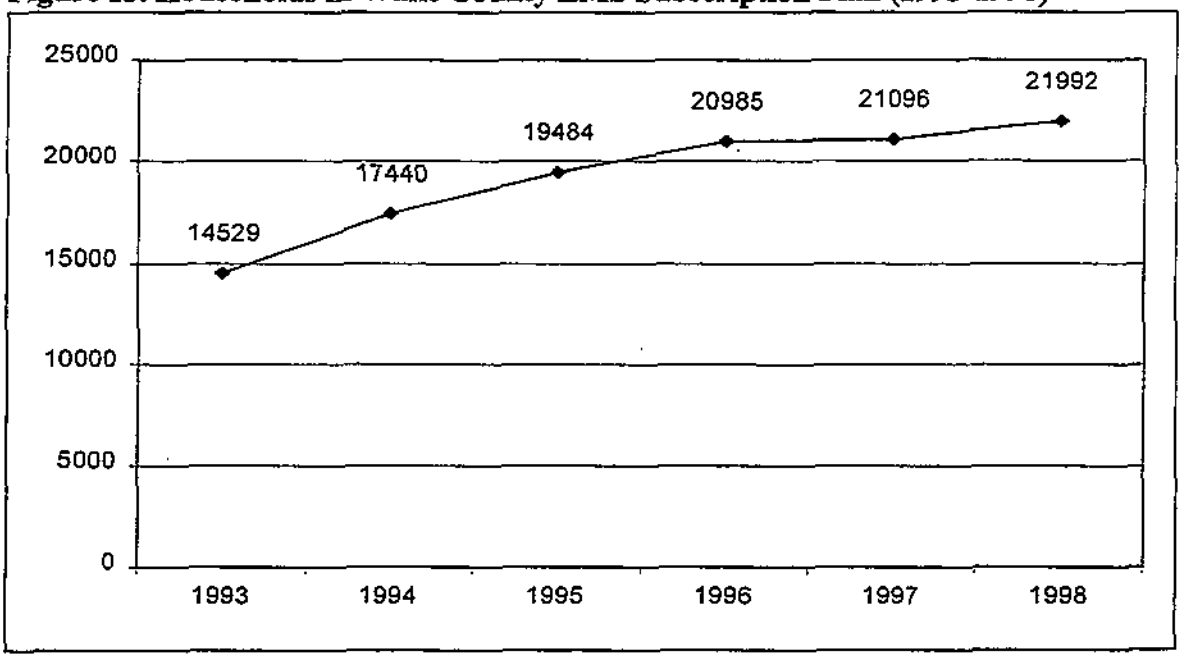
In general, EMS subscription programs offer members a flat annual fee that guarantees all members of a household[48] will receive in-county ambulance service without having to pay out-of-pocket expenses during the subscription period. In other

[48] A "household" is defined as a group of people covered under the same tax return (i.e., filer plus dependents). The Wake County Planning Department uses an estimate of 2.5 persons per household.

words, subscriptions are once-a-year pre-payments of the co-payment portion of an ambulance bill (i.e., that portion that is not covered by a patient's health insurance).

The Wake County EMS subscription program offers memberships to county residents for $50 per year. Figure 13 shows the increase in the number of households subscribing to the plan since 1993. While there has been an overall increase in the number of households subscribing, some VRSs (such as Zebulon) are reporting declines in their respective memberships.

Figure 13. Households in Wake County EMS Subscription Plan (1993-1998)



At present, approximately 9.2 percent (21,192) of the 238,114 households in the county are members of the EMS subscription program.

The primary advantage of the subscription program is that it infuses the VRSs (and WCEMS) with revenue from the subscriptions generated within the agency's ambulance district. Subscription membership fees generally account for about a quarter of a VRS' total revenue; however, they can constitute as much as a third (in the case of Knightdale). Table 11 illustrates the 1997 subscription revenues generated for the VRSs.

Table 11. 1997 Subscription Revenues Generated

Agency	*Households Subscribing*	*Revenues Generated*
Apex	1,709	$85,450
Cary	4,476	$223,800
Fuquay	1,376	$68,800
Garner	2,241	$112,050
Knightdale	1,219	$60,950
Rolesville	577	$28,850
Six Forks	1,823	$91,150
Wake County EMS	4,678	$233,900
Wendell	1,061	$53,050
Zebulon	1,002	$50,100

Source: Wake County Revenue Department

Aside from the overhead costs of administering the program (which are borne by the County)[49], the primary fiscal downside to an EMS subscription program is that ambulance usage by subscribers tends to be higher than that of non-subscribers. Current thinking is that subscribers use EMS at a rate about *double* that of non-subscribers. This estimate turns out to work very well in Wake County, as utilization rates for non-subscribers and subscribers are 4.4 percent and 7.9 percent respectively.

Table 12 illustrates the various revenues generated under the EMS subscription program, assuming that the current percentage of households (9.2 percent) in Wake County subscribed. As the table indicates, when both revenue streams of the subscription program (membership dues plus patient revenues) are compared against the fee-for-service revenues of non-subscribers, the subscription program brings in $416 more per 1,000 residents (refer to the revenue comparison in the lower half of the table).

The main failing of the Wake County EMS subscription program is that collections for subscribers are abominably low. Depending on the department involved, subscriber collections are 5.1 to 19.7 times lower than they are for non-subscribers. Table 13 details the average collections for subscribers and non-subscribers and the size of the difference, by department, for the period 1993 to 1998.[50] The apparent cause for the extremely low collections rate for subscribers is that the Wake County Department of

[49] As an example of just one of the identifiable program costs, WCEMS spent about $105,000 in producing and mailing the subscription program brochure this year.

[50] Table 13 excludes Holly Springs because relevant data were unavailable for the time period in question.

Revenue is unable to bill subscribers' insurance carriers directly. The low revenues must reflect payments from insured subscribers who have submitted their bills to their carriers.

Table 12: Subscription Program Revenue Calculations

	Non-Subscribers	*Subscribers*(*)
GENERAL INFORMATION		
Households	216,122	21,992
Fee per Household	$0	$50
Subscription Fees Generated	$0	$1,099,600
Patients Transported	23,603	4,321
Utilization Rate	4.4%	7.9%
Avg. Billing per Patient	$253	$268
Avg. Collected per Patient	$93	$19
Total	$2,195,079	$1,181,699
REVENUE COMPARISON PER 1,000 PERSONS		
Population	1,000	1,000
Utilization Rate	4.4%	7.9%
Patients Transported	16	3
Collection per Patient	$93	$19
Patient Collection Revenue	$1,488	$57
Number of Households	363	37
Fee per Household	$0	$50
Membership Fee Revenue	$0	$1,847
Total Revenue	**$1,488**	**$1,904**

Source: TriData research; Wake County Revenue Department; (*) Assumes 9.2% subscription rate

Table 13. Comparison of Subscriber and Non-subscriber Collection Rates

Agency	*Avg. Subscriber Collection Rate*	*Avg. Non-subscriber Collection Rate*	*Magnitude of Difference*
Apex	8.4%	42.7%	5.1
Cary	5.5%	56.4%	10.3
Fuquay-Varina	6.4%	36.8%	5.8
Garner	6.1%	42.4%	7.0
Knightdale	4.4%	41.2%	9.4
Rolesville	6.9%	36.3%	5.3
Six Forks	3.3%	65.0%	19.7
WCEMS	3.1%	35.0%	11.3
Wendell	5.5%	33.6%	6.1
Zebulon	5.1%	27.1%	5.3

Source: Wake County Revenue Department

There is little reason to raise the subscription rate. Doing so would probably scare off subscribers. Dennis Murphy, Chief of the Springfield (OR) Department of Fire and Life Safety (and the "father" of EMS subscription plans) says that "the ambulance [billing] rate for non-members must be six to 10 times higher than the membership fee, or the rational consumer will not consider joining."[51] ALS bills are a little more than six times the subscription rate; BLS bills are only about four times the subscription rate. Using Murphy's logic, an increase is probably ill advised. It would be best to conduct a market survey to determine whether an increase would be palatable to residents. An obvious risk of increasing the membership fee is not only that new subscribers might not join, but also that current subscribers might not renew.

EMS subscription memberships constitute a substantial portion of VRS revenues; however, the program could be even more beneficial if the following were done:

1. Conduct a well-publicized membership recruitment drive. The VRSs would have a special interest in signing up residents from their district, as they would receive the membership fees outright.

2. Conduct an intensive public education campaign to reduce unnecessary usage of the EMS system.

3. Implement a billing system or contract out EMS billing so that revenues are received from the insurance carriers of insured subscribers.

As Table 12 indicates, the EMS subscription program produces $416 more revenue per 1,000 population than normal fee-for-service billing. The program is producing much-needed funds for the VRSs – despite potential revenues that are going uncollected right now. Outsourcing EMS billings should make the program even more financially sound.

[51] Murphy, D. "Public Sector Ambulance Membership," *Journal of Emergency Medical Services,* September 1987, Vol. 12, No. 9, p. 78.

EMS Taxing Districts

Until recently, fire districts in Wake County had the ability to levy taxes and keep what they collected. At present, fire taxes are collected by the County and redistributed to the various fire companies. Some have suggested that this would be a good way to fund the EMS system.

Examining the model of the fire tax districts would suggest that EMS tax districts would infuse much-needed revenues into the various VRSs. Unfortunately, this would be less beneficial than it appears at first. The rescue squads that currently have the most difficulty with funding are also the ones that have large low-income populations. An EMS tax would likely be regressive and create even wider disparities in funding.

In all likelihood, EMS taxes would need to be redistributed in order to produce the necessary funding for squads that cover less affluent communities. This runs counter to the logic for having an EMS taxing district and essentially creates an earmarked tax.

Political opposition to earmarking taxes for specific purposes generally stems from two concerns. First, it creates funding "silos" that reduce overall legislative control of the funding process, making the County Commission unable to redirect revenues as needed. Second, it adds an uncontrollable element into the overall tax burden of citizens. In other words, although the County Commission can control the tax rate for the general fund, the tax district would control the EMS tax rate. In some communities across the United States, special tax districts have shown little regard for the impact their tax hikes have had on the overall tax burden of taxpayers.

Given the stated political opposition and the prospect of creating further inequities in the EMS funding system, creation of special EMS tax districts is not recommended.

User Fees

The County currently charges $40 per hour for stand-by service at special events. This is a user fee. It covers service not normally anticipated as needed but specially requested by an individual or entity.

The current WCEMS budget is about $6.2 million. WCEMS staffs 12 ambulances (and soon will be staffing 13 ambulances). This means that the County's unit-hour cost is $59.44. User fees should be set to ensure that costs of providing the service are fully recovered. Accordingly, the $40 per hour user fee should be raised to at least $59.44 per hour.

One user fee the County might consider instituting would be for the provision of extrication services. When fire departments perform extrication, the cost is borne by fire taxes. There are no such taxes supporting the provision of rescue services by the VRSs. Since extrication is expensive to equip and train for, one could justify adding a surcharge to EMS bills for such service. Medicare and Medicaid will not reimburse for extrication; however, many third-party automobile insurance policies will pay such claims. The user fee could be included as a covered cost in the subscription program. A fee of $100 for extrication services would probably not seem unjustified.

Some might argue that an extrication user fee might dissuade people from calling for assistance when they need it. This is the logic that the U.S. Coast Guard has followed in not charging for rescues at sea. The logic seems less applicable to cutting people out of wrecked automobiles, as no real alternative to calling for assistance exists. Besides, the person pinned in an automobile rarely makes the 9-1-1 call.

If a user fee for VRS extrication services is not instituted, the County ought to consider making a subsidy to those rescue squads that provide extrication. As mentioned earlier, extrication services are expensive to provide. If fire departments are unwilling to undertake the provision of such services with their fire tax dollars, the EMS agencies that then must provide extrication by default should be assisted in some manner to do so.

Development Impact Fees

One means of generating some additional funding for EMS to cope with the additional demand that will accompany increased development is to institute a development impact fee. These fees are charged developers for each new structure or sub-division they build. The fees are used to offset the costs of providing fire and EMS protection to the new housing areas.

In some areas of the county, prior development will have necessitated the provision of public safety services long ago. However, in areas that have been primarily rural, the addition of a nursing home or housing development can create a demand for services that never existed in that area before. The development impact fee can help pay for the necessary public safety infrastructure or help provide on-going operating funds.

The County should consider levying development impact fees in certain areas to help offset the provision of ambulance coverage to those areas.

Rescue Squad Subsidies

Rescue squads receive two forms of County subsidy in addition to 100 percent of the subscription memberships and the patient billing collections that are generated from within a given VRS' district. One form of subsidy is based on the service option chosen by the VRS, and the other is a $30 per transport fee paid by the County to the VRS.

These subsidies account for much of the total revenue of a VRS. Including the in-kind subsidy of a WCEMS paramedic (and equipment) on some ambulances, subsidy levels range from 20 to 85 percent of a VRS' overall budget. The VRSs with the five lowest percentages of their operating budget from County subsidy are the five Option #1 agencies. The in-kind subsidy with WCEMS personnel accounts for at least 55 percent, but as high as 85 percent, of the revenues of Option #2, #3, and #4 departments.

With the exception of Rolesville EMS, the Option #1 squads are well-funded because of large town subsidies, large subscription bases, or high collections (presumably due to a payer mix that is heavily skewed toward private insurance). This is a classic case of the "rich" getting "richer" and the "poor" getting "poorer."

Throughout our discussions in Wake County, TriData repeatedly heard the call for a "better" system of subsidies – one that was "fairer," "more equitable." The system of subsidies needs to be revised, beginning with the rationale for subsidies.

Wake County has endeavored to make subsidies the same between squads for similar participation in the EMS system. This has lead to disparities such as Cary and Garner (squads that run in excess of 3,000 calls per year) receiving the same base subsidy

that Rolesville (a squad that runs 700 calls a year) receives. The rationale for this is that all three squads have exhibited the same level of commitment to the EMS system and therefore, should receive the same level of subsidy.

Subsidies ought not to be rewards for VRS participation at a given level, but rather a means to ensure that the gap between the level of service an area needs and the level of service an area can afford is suitably bridged. A subsidy should be a leveler, a support. The rationale for using a subsidy as a support is that the EMS system is evolving toward a "seamless" system of care in which a patient may be assisted by any Wake County EMS system unit anywhere in the county. Further, because citizens move about the county without respect to the ambulance district lines, they should not be afforded lesser care in one section of the county as opposed to another.

TriData tried, but was unable to come up with a funding "formula" that captured the subsidy philosophy or seemed intrinsically "fair." Rather than attempting to create such a formula, we offer some commentary on three possible alternatives for a subsidy package, in order to frame the debate. The alternatives are:

1. **Leave the subsidy package at the status quo** – The primary benefit of this package is that the base subsidy is pegged to the organizational commitment to the level of EMS delivered. Additionally, the package reflects the fact that beyond the cost of running the first call, that it is proportionally more expensive to run more calls. The primary drawback to the present subsidy package is that it contains built-in inequities for squads with low call volumes and less affluent patients. Overall, the package heavily favors those squads that need the least assistance while it does little for those squads that need the most assistance. There is no "leveling effect."

2. **Create a flat subsidy for all rescue squads** – This subsidy method stresses equity from the standpoint of the level of the distribution. Because the level of the subsidy is the same regardless of the organizational commitment to participation in the EMS system, those squads that are participating at a higher level (e.g., Option #1) will not feel that the subsidy is equitable because they are doing comparatively more for their funds than a squad at another level.

3. **Decide on subsidy levels through a collaborative, consensus process** – Using a board or committee, decisions could be made that were non-formulaic. The board would conduct a needs assessment and apportion the pool of subsidy funds according to its judgment about the level of support that was needed by each squad. This would allow each squad to make a case for a share of the subsidy funds and would allow balanced deliberation instead of arbitrarily applying a funding framework. The board or commission would need to be composed of people who were external to the EMS system. To avoid charges of political favoritism, these board members could come from out of the county or from areas served solely by WCEMS.

As mentioned earlier, TriData was unable to identify an optimal subsidy scheme. This is one topic where a consultant's expertise does not necessarily guarantee a solution. TriData believes that the third option, a consensus process, would be best for the EMS system as a whole.

VII. SUMMARY OF RECOMMENDATIONS

This section summarizes the recommendations made elsewhere in the report. Recommendations are shown in rough priority order.

Recommendation #1: Erase the geopolitical boundaries that define EMS delivery within the county. Institute proximity-based dispatch. The closest appropriate resource should be dispatched automatically, irrespective of the service area in which the call occurs.

- ***Recommendation #1a:*** Keep ambulance service district lines only for the purposes of defining who maintains operational authority over a given incident or where a VRS may conduct grassroots fundraising efforts.

- ***Recommendation #1b:*** Uncouple VRS subsidies from call volumes. Ensure that VRSs do not have a financial interest in the number of calls they run.

Recommendation #2: Uncluster EMS resources to lower response times and increase coverage to underserved areas of the county (especially those areas that are experiencing growth/development).

- ***Recommendation #2a:*** Co-locate EMS units with fire departments or other facilities to share costs/housework and facilitate interagency coordination at the scene of emergencies.

Recommendation #3: Implement a two-tier response system. Send BLS ambulances on "alpha" and "bravo" calls and reserve ALS units for "charlie" and "delta" level dispatches (whenever possible). Allow VRS units to take first-duty calls when they are the closest, most appropriate EMS resource.

- ***Recommendation #3a:*** Implement *ProQA*™ (the computer-assisted version of Medical Priority Dispatch™) in order to integrate a scripted interrogation protocol into the work flow of every EMS dispatch.

- ***Recommendation #3b:*** Convert second-duty units to BLS ambulances. Ensure paramedic-level response, as necessary, for second-duty calls using quick response vehicles. Use District Supervisors in their originally intended roles to provide staffing for the quick response vehicles.

- ***Recommendation #3c:*** Add one new quick response vehicle at Wendell Fire Department Station #2 to cover second-duty ALS calls for Zebulon, Wendell, Knightdale, and Rolesville.

- ***Recommendation #3d:*** Relocate one District Supervisor from the Raleigh area to Fairview Fire Department Station #2 to cover second-duty ALS calls for Holly Springs, Fuquay-Varina, and the southern portions of the Apex and Garner districts.

- ***Recommendation #3e:*** With Cary EMS, conduct a pilot study of the provision of non-emergency transport by VRSs.

Recommendation #4: Replace the outdated Unisys CAD in RESCOM with a state-of-the-art CAD.

- ***Recommendation #4a:*** Integrate Proximity-based dispatch with the new CAD.

- ***Recommendation #4b:*** Integrate AVL with the new CAD.

- ***Recommendation #4c:*** Integrate IVN with the new CAD.

Recommendation #5: Defer action on Medicare-related issues until the Negotiated Rule-Making (now underway) is completed and its results are known.

Recommendation #6: Contract out the EMS billing function with a vendor that specializes in EMS billing.

- ***Recommendation #6a:*** Ensure that the billing contractor is able to send bills directly to insurance carriers so as to increase patient revenues from membership program subscribers.

Recommendation #7: Increase the EMS stand-by fee from $40 per hour to $60 per hour to ensure the unit-hour cost of operation is covered.

Recommendation #8: Institute an extrication user fee of $100.

Recommendation #9: Consider institution of development impact fees to offset the cost of increased service demands in previously undeveloped areas.

Recommendation #10: Automate ambulance call report writing using a pen-based or optical mark reader computer system.

- ***Recommendation #10a:*** Establish an electronic data interface between the ambulance call reporting system and an EMS billing vendor to facilitate the generation of patient bills.

Recommendation #11: Modify franchise contracts to create performance standards based on response zones (i.e., urban/suburban, rural, hindered access).

- ***Recommendation #11a:*** Modify franchise contracts to express response time standards in seconds rather than minutes and seconds.

- ***Recommendation #11b:*** Consult with the County attorney regarding creation of separate franchise agreements for VRS provision of non-emergency transport service, once Cary EMS has demonstrated the viability of the concept.

- ***Recommendation #11c:*** Continue the franchise contract with Holly Springs as is. Do not place a second staffed unit in Holly Springs.

- ***Recommendation #11d:*** Implement interim franchise agreements with Wendell, Knightdale, or Fuquay-Varina to upgrade those VRSs to paramedic-level services, as described in the section "Future Provisions for Other Rescue Squads" on page 75.

Recommendation #12: Hire a full-time, dedicated quality assurance coordinator.

Recommendation #13: Link automated ambulance call reporting into quality assurance audit system.

Recommendation 14#: Make public education, information, and relations a higher priority. Establish a speakers' bureau. Prepare lesson plans and instructional aids to support the speakers in the presentation of such programs.

- ***Recommendation #14a:*** Designate and train a WCEMS public information officer for each shift.

Recommendation #15: Create a contract for a full-time EMS Medical Director. Include provisions for EMS Medical Director (or designee) to be on call 24 hours a day for medical command during a disaster and for after-hours guidance on certain medically related incidents.

- ***Recommendation #15a:*** Consider equipping EMS Medical Director with emergency equipment for use in responding on calls. Encourage EMS Medical Director to respond on calls with field providers.

Recommendation #16: Ensure an adequately sized classroom/meeting facility is built for EMS in the proposed Public Safety Training Facility.

Recommendation #17: Increase communications between WCEMS Training Division and VRS training officers to minimize conflicts with and cancellations of classes scheduled for volunteers.

- ***Recommendation #17a:*** Explore alternatives to conventional classroom delivery of essential continuing education programs so that they will be more accessible to volunteers.

- ***Recommendation #17b:*** Ensure that training activities remain available to volunteers, especially on nights and weekends.

Recommendation #18: Rectify communications infrastructure problems that cause inability to give sufficiently timely radio reports to hospitals.

- ***Recommendation #18a:*** Establish a dialogue between the EMS Medical Director/WCEMS Training Division and representatives of the hospitals to determine a recommended format for a shorter radio report.

- ***Recommendation #18b:*** Explore areas of the EMS system standing orders that can be made more permissive to reduce the frequency with which EMS personnel must call a base hospital for medical orders.

Recommendation #19: Review WCEMS salaries to ensure that they are commensurate with those of other large EMS systems in the southeastern United States. Continually monitor salaries to ensure that WCEMS is able to attract experienced paramedics.

- ***Recommendation #19a:*** Establish a recruitment bonus for new paramedics with more than two years of emergency response experience.

- ***Recommendation #19b:*** Design a database to track the entry, longevity, and progress of personnel (both WCEMS and VRS) in the EMS system.

Recommendation #20: Hire a volunteer coordinator. Although it would be preferable to have this individual dedicated solely to EMS, it is conceivable that the volunteer coordinator could be shared with the Office of the Fire Marshal since fire service recruitment and retention issues are similar to those of EMS.

- ***Recommendation #20a:*** With or without a volunteer coordinator, intensify efforts to recruit and retain volunteers in the EMS system. This could be done in a number of ways, including:

    1. Advertise for volunteers on the WCEMS and Wake County web sites.

    2. Network with community service organizations such as United Way, Lions Clubs, Kiwanis, etc.

    3. Host a volunteer job fair.

    4. Advertise for volunteers in movie theaters.

5. Produce a short public-service announcement for airplay on local and closed-circuit TV channels.

6. Permit volunteers to access the County Employee Assistance Program.

7. Seek corporate sponsors of volunteer appreciation days.

8. Provide volunteers access to County day-care services while they are attending training.

9. Recognize volunteers at the annual County Commissioners' awards ceremony.

10. Facilitate volunteer participation in EMS management and leadership classes at the National Fire Academy (or other training site).

11. Order and disseminate multiple copies of the U.S. Fire Administration report on volunteer recruitment and retention.

Recommendation #21: Work with RESCOM administration to rectify the turnover of RESCOM personnel.

- ***Recommendation #21a:*** If the turnover problem cannot be rectified, WCEMS should consider assigning personnel in RESCOM as dedicated EMS dispatchers.

Recommendation #22: Standardize ambulance vehicle specifications throughout the county. Induce VRSs to purchase ambulances off the County contract.

Recommendation #23: Standardize specifications for EMS capital equipment. Consider County purchase of all EMS capital equipment.

Recommendation #24: Implement overnight staffing in volunteer fire departments. Build "live-in" quarters in fire stations as an inducement to be around the fire station more at night (this is an attractive option for young firefighters without families who wish to live rent-free).

Recommendation #25: Ensure that first responders and EMS personnel train together in order to increase interagency coordination at the scene of emergencies.

Recommendation #26: Send personnel with responsibilities for planning and managing EMS coverage for mass gatherings to the National Fire Academy EMS Special Operations course. Send EMS District Supervisors to the National Fire Academy for the Management of EMS course. Encourage volunteer EMS officers and administrators to attend the National Fire Academy's special offerings for EMS volunteer administration (via the Internet and in condensed volunteer-friendly offerings).

VIII. IMPLEMENTATION PLANS

This study has outlined some specific items for action or change. Identifying and discussing those items is only the first step in building for the future of the EMS system. The next step is actual implementation of the recommendations contained in this report. This section of the report contains a suggested timeline for implementation of these recommendations. Items are categorized into either a specific plan to be accomplished in the next five years or a more general plan that covers the next 10 years.

Five-Year Plan

The most pressing recommendations should be started right away. Generally, these recommendations are the ones that create an infrastructure on which other recommendations or actions must rely. At the heart of what TriData is recommending is an integrated resource command and control/data collection and management system that creates a feed-back loop of information on which deployment, staffing, response, training, and quality assurance activities are based.

It should be noted that some recommendations that appear in the preceding section as "lower priority" are included here as early implementation steps simply because they are easily accomplished in a short time frame, and therefore can start having the desired effect early on.

Year 0 to Year 1

- Form a committee to explore redeployment of ambulances under a decentralized operational plan.

- Issue an RFP for a new CAD system that all three dispatch centers can use. Include in the specifications, a requirement that the CAD system share information amongst all three dispatch centers. Also include integration of AVL and IVN.

- Explore the communications systems specifications for data and voice transmissions required to implement proximity-based dispatch using a uniform CAD platform.

- Issue an RFP for automation of ambulance call reporting. Include in the specifications, a requirement that the automation system be able to accept CAD data.

- Issue an RFP for EMS billing services. Upon award of the contract, terminate County billing operation and convert to outsourced billing. Include in the specifications, requirements that the vendor be able to interface with the ambulance call reporting automation system selected and to bill insurance carriers directly.

- Hold meetings of EMS Medical Director, Associate EMS Medical Directors, and other interested parties to establish response protocols under a two-tiered response system (i.e., what type of call receives what type of response).

- Work with representatives of the three dispatch centers to establish countywide proximity-based dispatch protocols.

- Study VRS provision of non-emergency transport with Cary EMS. Investigate impact of NRM on Medicare reimbursement situation in North Carolina. Decide on best course of action once the Cary demonstration project and the NRM outcomes are known (possibly after Year 1).

- Increase the EMS stand-by fee to $60 per hour. Institute an extrication user fee of at least $100 per incident.

- Create a committee to establish response zones and ambulance performance standards for various areas of the county.

- Hire a dedicated, full-time quality assurance coordinator in WCEMS. This individual should have countywide responsibility. This individual should produce a quality assurance master plan for the EMS system as a top priority.

- Hire a volunteer coordinator to intensify recruitment and retention efforts.

- Designate and train WCEMS public information officers for each shift.

- Issue an RFP for a full-time EMS Medical Director. Include a specification that the individual (or a designee) will be available on call 24 hours a day for medical

command during a disaster or for after-hours guidance on certain medically related incidents. Award the contract.

- Open a dialogue between the WCEMS training division and the VRS training officers on means to facilitate training for volunteer personnel.

- Open a dialogue between the EMS Medical Director, the WCEMS training division, and representatives of the four emergency departments about what the hospitals would like in a patient radio report.

- Encourage/require first responders and EMS personnel to train together on a regular basis to increase interagency coordination at the scene of large-scale emergencies.

Year 1 to Year 3

- Bring new CAD on-line. Integrate proximity-based dispatch, AVL, and IVN.

- Convert to the proximity-based dispatch protocol developed in Year 1. Disregard former rescue district lines except for the purposes of fundraising and incident command at the scene of emergencies.

- Work with RESCOM to rectify its personnel turnover problem.

- Implement *ProQA*™. Begin process of accreditation of the three dispatch centers. (Accreditation will be necessary if the County desires to implement the *Omega* protocol at a later date.)

- Implement two-tier response system. Convert second-duty ambulances to BLS ambulances.

- Identify facilities throughout the county in which EMS units can be co-located.

- Begin to uncluster (decentralize) EMS resources. Assign EMS units to new locations in keeping with demonstrated demand and increased populations.

- Bring automated ambulance call reporting system on-line. Integrate with CAD for front-end loading of dispatch information. Integrate with billing vendor for back-end downloading of billing information.

- Negotiate and sign new franchises with VRSs to provide service according to the new performance standards established by the designated committee in Year 1.

- Link automated ambulance call reports to quality assurance audit system.

- Increase the public information, education, and relations activities of the EMS system. Establish a speaker's bureau and prepare lesson plans to support this effort.

- Implement recommendations that have arisen out of discussions about how to facilitate the availability of training for volunteer EMS personnel.

- Implement training on the revised radio reporting format as determined by discussions between the EMS system and the hospitals. Modify EMS standing orders as necessary to facilitate shorter radio reports/requests for orders.

- Conduct a salary review of both WCEMS salaries and VRS salaries to ensure that they are commensurate with what is being paid elsewhere, so as to prevent attrition of experienced EMS personnel for remunerative reasons.

- Design a database to track EMS system personnel tenure, activity, and training.

- Send personnel with responsibilities for planning and managing EMS coverage for mass gatherings to the National Fire Academy EMS Special Operations course. Send EMS District Supervisors to the National Fire Academy for the Management of EMS course. Encourage volunteer EMS officers and administrators to attend the National Fire Academy's special offerings for EMS volunteer administration (via the Internet and in condensed volunteer-friendly offerings).

Year 3 to Year 5

- In accordance with the construction plans for a new Public Safety Training Facility, build an adequately sized classroom/meeting facility for EMS personnel.

- Conduct a bi-yearly salary review of both WCEMS salaries and VRS salaries to ensure that they are commensurate with what is being paid elsewhere, so as to prevent attrition of experienced EMS personnel for remunerative reasons.

- Standardize ambulance procurement specifications throughout the county. Encourage the VRSs to purchase off the County contract whenever possible.

- Standardize specifications for EMS capital equipment. Consider County purchase of all EMS capital equipment.

- Identify EMS stations that will need to be moved or built in the next five to seven years.

- Continue to identify facilities throughout the county in which EMS units can be co-located.

- Continue to uncluster (decentralize) EMS resources. Assign EMS units to new locations in keeping with demonstrated demand and increased populations.

- Establish "live-in" programs for volunteer members of EMS and fire departments.

10-Year Plan

The 10-year plan is necessarily more nebulous than the five-year plan. It is simply harder to project needs and schedules out for 10 years than it is for five. Projects and steps to be undertaken in the 10-year plan require more planning and are more recurrent in nature than are most of the items in the five-year plan.

Year 5 to Year 7

- Conduct bi-yearly salary reviews of both WCEMS salaries and VRS salaries to ensure that they are commensurate with what is being paid elsewhere, so as to prevent attrition of experienced EMS personnel for remunerative reasons.

- Build/renovate EMS stations throughout the county in accordance with growth patterns evidenced in the county. Build "live-in" quarters in fire and EMS stations for live-in volunteers.

- Continue to identify facilities throughout the county in which EMS units can be co-located.

- Continue to uncluster (decentralize) EMS resources. Assign EMS units to new locations in keeping with demonstrated demand and increased populations.

- Investigate implementing the *Omega* protocol to screen calls that do not need an ambulance response into an alternative transport system. Accreditation of the dispatch center by the National Academy of Emergency Medical Dispatch is a prerequisite for implementation of the *Omega* protocol.

Year 7 to Year 10

- Conduct bi-yearly salary reviews of both WCEMS salaries and VRS salaries to ensure that they are commensurate with what is being paid elsewhere, so as to prevent attrition of experienced EMS personnel for remunerative reasons.

- Build/renovate EMS stations throughout the county in accordance with growth patterns evidenced in the county. Build "live-in" quarters in fire and EMS stations for live-in volunteers.

- Continue to identify facilities throughout the county in which EMS units can be co-located.

- Continue to uncluster (decentralize) EMS resources. Assign EMS units to new locations in keeping with demonstrated demand and increased populations.