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This is our report entitled, Management Audit: Emergency Medical Services Transport System of the Nashville Fire Department. This project was performed jointly by TATC Consulting and the Abaris Group. The Abaris Group specializes in emergency and outpatient services and TATC Consulting specializes in research and evaluation studies that support informed decision-making. On-site work for this project started in March 2007 which concluded with the issuance of this report.

The consultants determined the existing system cannot sustain the escalating request for emergency medical services. Significant changes will need to occur with the existing emergency medical services system to maintain the status quo. The report identified 37 recommendations to improve emergency medical services related to capacity development, demand management, and financial and management enhancements.

The audit was not performed in accordance with generally accepted government auditing standards. However, the audit was conducted by subject matter experts using TATC Consulting's Applied Research Methodology. This methodology is similar to generally accepted government auditing standards, but this has not been verified.

I appreciate the courtesies and cooperation extended to us during the audit.

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Enclosure: Audit Report

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Management Audit: Emergency Medical Services Transport System of the Nashville Fire Department



Metropolitan
Nashville/Davidson County
Tennessee



January 2008

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ABARIS GROUP

Nashville Fire Department EMS Transport System Management Audit

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Executive Summary

Audit Scope and Objectives

In September 2006, the Internal Audit Division of the Metropolitan Government of Nashville and Davidson County (Metro), at the request of Metro Fire Chief, issued a Request for Proposals (RFP) for a management audit of the Emergency Medical Services (EMS) transport system of the Nashville Fire Department (NFD).

The primary objectives of the audit included:

- Evaluation of the EMS transport system, Fire Department resources, and their impact on response times to emergency scenes
- Assessment of EMS Bureau operations
- Analysis of resource allocation, including utilization of personnel and equipment
- Comparison of the EMS transport system of NFD to peer departments
- Identification of strengths and weaknesses
- Development of recommendations for improvements

In March 2007, TATC Consulting and The Abaris Group began the on-site work, including:

- Evaluation of the workload and performance data of the EMS delivery system for the Fire Department
- Interview of the stakeholders and key individuals with the NFD, Local Union, Metro Emergency Communications Center (ECC), and the NFD Medical Director
- Conduct of ride-along observation sessions with NFD ambulance crews and chief officers
- Analysis of major processes and daily operations through direct observation and data review
- Review of relevant reports, policies, and documents surrounding operating performance and personnel

After completing a comprehensive evaluation of current operations, the findings were used to frame recommendations to improve the current EMS delivery practice and standards.

EMS Transport System Overview

Nashville and Davidson County are home to nearly 600,000 people with minimal daytime commuters from other counties. The NFD services an area approximately 533 square miles. The NFD EMS Bureau is primarily a single-tiered, Advanced Life Support (ALS) system that maintains 16 ALS ambulance transport units each staffed by 1 paramedic and 1 Emergency Medical Technician (EMT), with an occasional unit staffing by 2 paramedics. Crews work 12-hour shifts with a total of four shifts in the EMS Bureau. Crew schedules alternate between two-day (6am-6pm) shifts to two-night (6pm-6am) shifts to four days off.

The number of transport units is increased on certain days by up to three “work load units” to provide additional resources during peak service demand levels. The peak units are available for 14-hour shifts and the scheduled times are based on historical peak demand. The ability to place three additional units in service depends on staffing levels available for the day. Typically, 1 work load unit is deployed daily and a second unit about 50% of the time. Personnel assigned to the work load units work three shifts per week. At times, one or two rapid triage units (non-transport, ALS) might also be placed in service, subject to staffing levels on each shift.

The NFD Fire Bureau also provides non-transport EMS with both Basic Life Support (BLS) and ALS levels of care. All engines, trucks, and rescue units are staffed by BLS-trained EMTs who deliver service as first responders. Twelve of the 39 engine companies provide ALS care by cross-trained firefighter/paramedics who staff those engines. In addition, the Fire Bureau provides ALS first response using a Sport Utility Vehicles (SUV) in the two busiest districts to reduce the wear and tear on the fire engines.

Commendations

NFD has been a leader and innovator of many practices worth acknowledging. Among the most noteworthy items are:

- **Fire First Response** – Recognizing the value of rapid care, NFD implemented Fire first responders more than 20 years ago and began training its fire fighters as Emergency Medical Technicians (EMTs). The fire academy now includes EMT training as part of its regular program for all fire personnel.
- **Paramedic Engine Companies** – Beginning in 2001, in an effort to reduce advanced life support response times, NFD began the upgrading of its basic life support (BLS) engine companies to advanced life support (ALS) service by adding dual-role, cross trained paramedic/fire fighters. Today, 12 out of the 39 engine companies have been upgraded to ALS service.



- **System Status Management** – Beginning in 1997, NFD recognized the value in shifting resources to provide the best coverage to its service area. Dispatchers have the ability to move units as needed to evenly balance the supply of resources over coverage area.
- **Dynamic Deployment** – Also ten years ago, the addition of daytime peak work load units were added to match the heavier demand periods, which was a very innovative step. This approach is more commonly utilized by private ambulance providers than fire departments, with only a few other fire departments in the country using the peak deployment practice. The scheduling of EMS units based on historical demand is a best practice clinical and financial approach.
- **Traveling Staff** – There are six to eight personnel who are not assigned to a particular unit, but “travel” between different units and shifts depending on injuries, vacation, and sick calls. This is an excellent way to control overtime costs.
- **Electronic Quality Improvement** – The Bureau’s electronic Quality Improvement (QI) process using employee email is an industry-leading concept that has not been seen elsewhere. NFD is encouraged to publish this excellent program so other jurisdictions may benefit.
- **Fire Advanced Support Team (FAST) Cars** – To reduce the wear and tear on fire engines, two SUVs are outfitted with ALS equipment at the busiest firehouses. The engine paramedic drives the SUV to medical calls that do not require full engine response. This keeps the engine in service and reduces its workload and wear and tear.
- **Patient Bill of Rights** – Starting in 1999, NFD prepared a “bill of rights” which is a summary of what every patient is entitled to receive, from a courteous crew to a clean ambulance. This mentality is embraced by the field crews and the patients receive excellent care.
- **Data Sharing** – While the Nashville Fire Department will need to add additional data metrics to its management information system, its data is shared nationally with other EMS systems and the media so that comparison analysis can be made. NFD like other quality EMS systems generously shares its data with any system or media that requests it. Nashville’s EMS system data has appeared in such publications as USA Today.

Overall Observations and Recommendations

The City of Nashville should be proud of its Fire Department first response and EMS delivery system, for its history of good performance, and for the development of many industry best practices. Within every EMS delivery system are opportunities for improvement. Key to NFD is the capacity development, demand management, and financial and managerial enhancements that will meet the increasing call volume of the system. NFD should strive to develop a performance-based delivery system with additional performance indicators.



The RFP identified options provided by NFD to either shift personnel or reduce revenues (attachment 12). While shifting personnel may offer short term fiscal solutions, it provides a “band aid” approach only. Other NFD recommendations contained in the RFP will cause revenue loss. While it is almost

Major Recommendations
<ul style="list-style-type: none">• Create additional critical indicators to track performance• Upgrade to the implementation of a formal system status plan to improve response times• Establish response time goals based on region and priority• Match unit scheduling to call volume demand• Add additional ambulances to keep pace with call volume growth• Reevaluate 24-hour shifts as a component of unit scheduling• Establish a unit hour utilization rate that balances system efficiency with response time performance• Increase EMS field supervision through delegation of office duties• Reassign ambulances on non-emergency calls to higher priority calls• Require crews to get billing information from the hospitals• Ensure mileage rates are commensurate with expenses, comparable to the region, reviewed annually, and adjusted as necessary

certain that Metro will require additional costs to improve its EMS performance, there are many other actions and initiatives which can improve performance, reduce costs and increase revenue. Data provided by the NFD shows that the 9-1-1 ambulance system has experienced a 33% increase in demand for service over the past 4

years challenging existing resources, endangering ambulance availability, and increasing transport unit response times. Over the past 6 years, Metro has made significant fiscal investments in its EMS system, resulting in 12 BLS engine companies being upgraded to paramedic status, 2 additional ALS medic transport units and 2 FAST cars being placed in service. To staff these additional resources, Metro has added 87 positions at an annual cost of approximately \$4,350,000 in salary and overtime. In addition to these increases, since late summer of 2006, NFD has been paying overtime to maintain two additional ALS transport units. Trending five years of historical call volume, the demand will increase 5% to 7% annually, further taxing the existing resources unless changes and improvements are made in a timely manner.

As is true in most metropolitan EMS transport delivery systems, comprehensive changes cannot occur overnight and are not solved by a single change, but are best accomplished through a series of strategic initiatives designed to improve and increase the levels of service. The project team recommends a number of items that will add capacity to the system, decrease the demand for service, increase revenue, and provide more oversight. The initiatives are focused into three areas: capacity development, demand management, and financial and management enhancement. Attachment 1 provides a summary chart of the items detailed in the observations and recommendations section.

Conclusion

The current emergency transport system cannot sustain the escalating requests for service. Just to maintain the status quo, response times and transports would require an additional \$1.8 to \$2.1 million in ambulance resources every year, based on the estimated costs provided by the NFD to staff 2.5 additional medic transport units. Significant changes will need to occur with the existing EMS system, and additional resources are required to meet projected demand on the system. Some solutions can be implemented immediately to optimize the current system while others will require the full participation and cooperation of Fire and EMS management, union leadership, and field personnel. Through a collaborative process, NFD can build upon its prior achievements and continue delivering excellent patient care and timely transportation.

Projection of Future Demand

Community Demographics

According to the US Census Bureau for 2005, there were 607,413 people living in Davidson County and a total of 270,516 households. The increase from 2000 was 6.6% for both population and households. By 2010, census tract data show the largest predicted change will be internally with a significant population moving from the suburbs to the rural regions of the county (see figure 1, attachments 2 & 3). Presumably, this population is attracted to more affordable homes, more land, and a better style of living. This shift in residents will place additional demand on the more rural and geographically-challenged zones. It will take ambulances longer to reach these regions, take longer to transport patients to core hospitals, increase the average length of an EMS call, and further impact utilization rates.

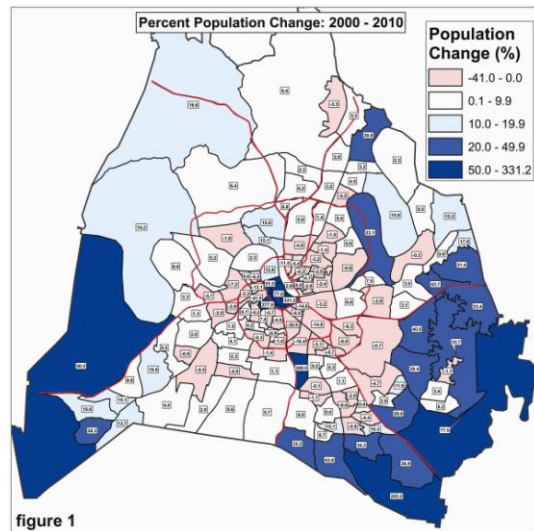


figure 1

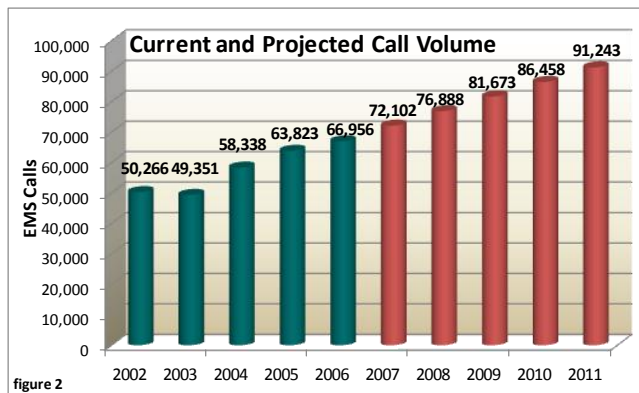


figure 2

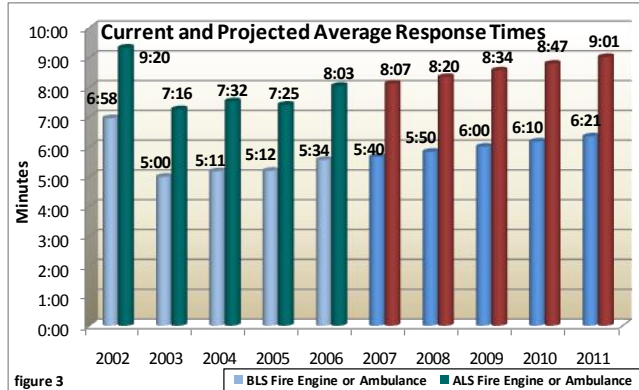


figure 3

Call Volume Analysis and Future Demand

Medical call volume has continued to increase (figure 2), reaching 66,956 events in 2006. This is a 33% rise in the last 4 years. With the current trend of 5% to 7% annual growth, the EMS call volume will surpass 90,000 calls by 2011. Overall (i.e. fire engine and ambulance) response times have also increased steadily since resources were last added in 2003 (figure 3). Ambulances are 21% busier than 2004 and response times have increased 7% for ALS resources. Because there are 12 ALS engines (engines do not transport patients) as of 2006, it is likely that they are offsetting longer ALS ambulance response times by stopping the clock sooner.

Just to maintain the same unit hour utilization rate, and presumably response times, 30 additional unit

hours per day would be required each year. Without another influx of resources, optimization of current ones, or a combination thereof, average ALS and BLS response times will reach 9:01 and 6:21, respectively, when trended over the next five years.

There has been a corresponding increase in unit hour utilization (UHU) rates, which represents the productivity of the transport units (i.e. ambulances) and is a critical performance indicator in most systems. Unit hours are usually defined as the number of unit hours per day that a staffed ambulance is in service and available to respond to calls. For example, if a system had 10 units on duty 24 hours a day, it would produce 240 “unit hours” during that day. The productivity measure consists of dividing the total number of calls, say 80, by the unit hours during that same period. This scenario delivers a UHU of 33%, assuming every call takes one hour to complete. In other words, there is one 9-1-1 call for every three unit hours. EMS systems’ UHU rates vary greatly due to population density, service area, hospital locations, and other factors.

UHU Example	
9-1-1 Calls per Day	80
Transport Units	10
<u>Times Hours per Day</u>	<u>x 24</u>
Unit Hours	= 240
<u>Calls divided by Unit Hours is</u>	
Unit Hour Utilization =	33%

In Nashville, the UHU has increased from 33% in 2004, to 37% in 2005, and 40% in 2006 with minimal change in annual unit hours. The main problem with an increasing unit hour utilization is that it results in longer response times to emergency scenes. This means that, in some life-threatening situations, some patients may wait an extended period of time to receive medical care and transport to the hospital. It also places a strain on the system with the ambulance crews constantly in motion during their shift. A highly-efficient urban EMS system can maintain a stable level of service at a 40% utilization rate. However, the 533 square mile coverage area combined with suburban and rural zones creates a situation in which a lower utilization is essential to ensure prompt service. A reasonable and effective unit hour utilization rate for NFD would range between 30% and 35%.

Uncompensated Care

There has been a measurable increase in households living below the federal poverty level, from 10.2% in 2000 to 11.8% in 2004. These figures are 1.0 and 1.8 points higher, respectively, than the national averages. This could impact the amount of uncompensated care provided by NFD ambulances. However, the 2002-2005 payor mix does not show any increase in Medicaid/TennCare or “self pay”, typically an indicator of lower or unreimbursed transports. In fact, there has been a slight decrease in both payor types.

Benchmarking

Part of the performance audit process is a comparison, or peer review, with similar systems. This analysis provides a tool for NFD as well as identifying

System	Comparable Call Volumes	Comparable Geographic Size	Comparable Resident Population	Regional Comparison	Considered Industry Leader/ Best Practice
Boston, MA			✓		
Fairfax County, VA	✓				
Houston, TX		✓			✓
Memphis, TN				✓	
Montgomery County, MD	✓	✓			
Phoenix, AZ		✓			✓
Pinellas County, FL (St. Petersburg/Clearwater)					✓
San Diego, CA					✓
Seattle, WA	✓		✓		✓
Washington DC			✓		

figure 4

best practices that may be locally applicable. The project team selected ten EMS systems for this peer review process (figure 4). Nashville/Davidson County is unique in that it covers 533 square miles and handles 67,000 medical calls annually. There are comparable systems in the benchmark cities for service area or call volume, but not both. Other characteristics considered included similar resident populations, geographical proximity, and industry leaders with best practices relevant to NFD. Each of the selected cities/counties was asked for call and population demographics, service area, staffing model, level of service for first responders and ambulances, annual budget, goal and actual response times, cardiac arrest survival rates, and any best practices.

Nashville is similar in population to Boston, Seattle, and Washington DC, but does not have the daily

System	Resident Population	Daytime Population ²	Service Area (Square Miles)	Density		
				Urban	Suburban	Rural
Houston, TX	1,900,000	3,000,000	622	50%	35%	15%
Phoenix, AZ	1,470,000	2,200,000	540	90%	10%	
San Diego, CA	1,250,000	1,250,000	320	60%	39%	1%
Fairfax County, VA	1,050,000	1,400,000	407	80%	20%	
Pinellas County, FL ¹	1,000,000	1,000,000	280	95%	5%	
Montgomery County, MD	960,000	960,000	497	38%	24%	38%
Memphis, TN	850,000	1,000,000	350	75%	25%	
Nashville/Davidson County, TN	607,000	721,000	533	35%	45%	20%
Boston, MA	590,000	1,200,000	49	100%		
Seattle, WA	585,000	1,500,000	83	50%	50%	
Washington DC	582,000	992,000	61	100%		

Notes: ¹ Winter population reaches 1,400,000

² Daytime population is estimated

Source: Interviews with peer agencies, US Census data

figure 5

commuter influx of any of the three (figure 5).

According to the 2000 US Census, non-Davidson County commuters account for 113,710 each weekday.

In square miles of service area, Nashville

is closest to Phoenix followed by Montgomery County, and Houston. For population density, Davidson County is most similar in characteristics to Houston and Montgomery County. Overall, Nashville/Davidson County is closest in size, population, and population density to Montgomery County,

Maryland. However, Montgomery’s population is 50% greater and has a large (30%) volunteer firefighter program that understates the true financial picture of its system.

Fairfax County, Seattle, and Montgomery County have the most similar call volumes (figure 6). Only Memphis had a lower percentage of non-transports at 19% in 2006. However, Nashville’s dry run rate was 17% in 2005, the lowest of any city

SYSTEM	CALLS	TRANSPORTS	DRY RUNS (NON-TRANSPORTS)
Houston, TX	232,286	147,341	37%
Pinellas County, FL	170,000	118,000	31%
Phoenix, AZ	128,726	56,689	56%
Washington DC	117,380	75,186	36%
San Diego, CA	100,000	75,000	25%
Boston, MA	100,000	68,000	32%
Memphis, TN	93,000	75,000	19%
Montgomery County, MD	80,000	56,800	29%
Nashville, TN	66,956	53,382	20%
Fairfax County, VA	62,038	43,333	30%
Seattle, WA	62,000	36,684	41%

figure 6

reviewed and significantly lower than the 31% average identified in the 2006 *Journal of Emergency*

Medical Services (JEMS) Top-200 City Survey.

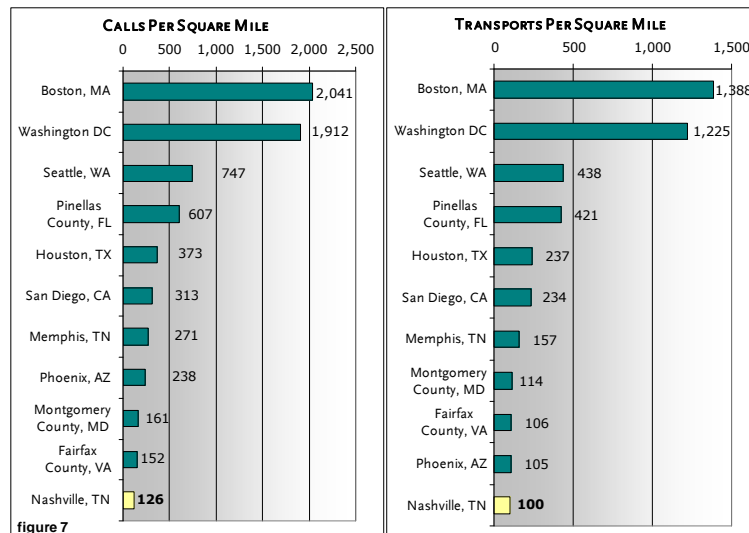


figure 7

Per square mile, NFD has the fewest number of calls or transport of any EMS region compared (figure 7).

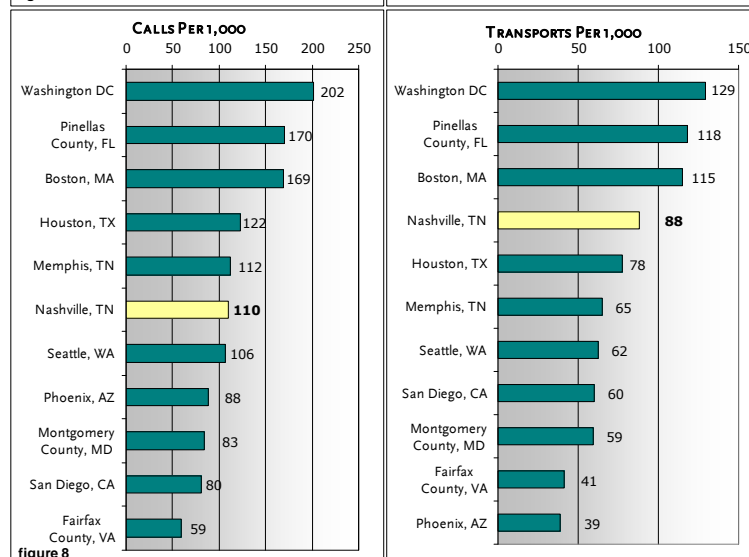


figure 8

Initial review of per capita data suggests an average to above average number of calls and transports per 1,000 residents (figure 8). However, many of the higher per capita regions have a greater daytime population due to commuters.

This artificially inflates the population percentages. Factoring in this variable, Nashville is second to Pinellas County for the highest number of transports and is third in calls, behind Pinellas County and Washington DC, based on daytime populations.

The Nashville Fire and EMS budget was \$105 million last year. This equates to \$173 per resident and \$146 per capita based on daytime population (figure 9). On a per capita basis, NFD spends less than six of the nine peer review regions for fire and EMS services.

SYSTEM	EMS/ FIRE BUDGET	PER RESIDENT CAPITA	PER DAYTIME CAPITA	EMS BUDGET	PER RESIDENT CAPITA	PER DAYTIME CAPITA	COST PER TRANSPORT	AMBULANCE FEES	NOTES
Boston, MA	\$185M	\$ 314	\$ 154	\$38M	\$ 64	\$ 32	\$ 559	Bill for services	
Washington DC	\$170M	\$ 292	\$ 168	Combined budget					Charges are lower than most other systems reviewed
Seattle, WA	\$136M	\$ 232	\$ 91	\$11M	\$ 19	\$ 7	\$ 1,509	ALS- none, BLS- AMR bills for transports	Fire receives funds from EMS levy through general fund, ALS portion \$10.5M, Budget does not include AMR
Houston, TX	\$373M	\$ 196	\$ 124	Combined budget				Bill for services	
Montgomery County, MD	\$178M	\$ 185	\$ 185	Combined budget				None	Funded through property taxes, 400 active volunteers offset personnel expenses (estimated savings \$8M)
San Diego, CA	\$220M	\$ 176	\$ 176	\$40M	\$ 32	\$ 32	\$ 533	Covers > 100% of \$40M	EMS Budget includes cost of FRALS equipment, any surplus funds split equally by Fire-Rural/Metro partnership
Nashville, TN	\$105M	\$ 173	\$ 146	\$22M	\$ 36	\$ 31	\$ 412	Bill for services	\$11M in net revenue to general fund
Phoenix, AZ	\$247M	\$ 168	\$ 112	\$14M	\$ 10	\$ 6	\$ 247	bill for services, full service recovery model	
Fairfax County, VA	\$170M	\$ 162	\$ 121	Combined budget				Bill for services	
Memphis, TN	\$129M	\$ 152	\$ 129	\$23M	\$ 27	\$ 23	\$ 307	Bill for services	
Pinellas County, FL ¹	not applicable			\$63M	\$ 63	\$ 63	\$ 534	Bill for services, covers 100% of EMS budget	\$26M for private amb.provider, \$29.4M for ALS first responder, \$5M Admin, \$1.3M Med Dir, \$0.5M Training, no fire budget available as served by 17 fire agencies

Notes: ¹ Pinellas County winter population is 1,400,000

figure 9

Each EMS region studied employs unique methods in staffing and managing its ambulances (figure 10). Overall, the most efficient systems use system status management allowing dynamic deployment

of resources to meet the high number of calls with the most cost effective approaches. Because the NFD EMS Bureau utilizes some system status management and dynamic deployment of one to three ambulances during peak demand, it is more efficient than systems that practice neither; however its performance falls short of those EMS regions that have more comprehensively embraced both programs.

System	Max Units	Min Units	Avg Daily Unit Hours	Calls/ Unit Hour	System Status Mgmt
Pinellas County, FL ¹	45-50 ALS	12 ALS	662	0.70	Yes
Boston, MA ²	20 BLS 6 ALS	11 BLS 3 ALS	480	0.57	Minimal, dispatcher discretion
Seattle, WA ²	7 ALS 8 BLS	7 ALS 4 BLS	312	0.54	ALS is static, BLS is dynamic
Phoenix, AZ ²	20 BLS 13 ALS	16 BLS 5 ALS	648	0.54	Some static, some dynamic
San Diego, CA ²	29 ALS	21 ALS	600	0.46	Yes
Nashville, TN	18 ALS	16 ALS	412	0.45	Minimal, dispatcher discretion
Washington DC	37.5 ALS & BLS	37.5 ALS & BLS	900	0.36	No
Houston, TX ²	54 BLS 22 ALS	54 BLS 22 ALS	1,824	0.35	No
Memphis, TN ²	33 ALS	33 ALS	792	0.32	No
Montgomery County, MD	24 BLS 18 ALS	22 BLS 18 ALS	984	0.22	No
Fairfax County, VA ²	43 ALS	42 ALS	1,020	0.17	No

Notes: ¹ 9-1-1 and inter-facility units are combined

² estimated average daily unit hours based on minimum & maximum units

figure 10

SYSTEM	CARDIAC SURVIVAL RATE (UTSTEIN)
Seattle, WA	67% to ED 45% to home
Pinellas County, FL	44.5% to ED 22% to home
Fairfax County, VA	37%
Nashville, TN	29% to ED 8% to home
Washington DC	12% to ED
Montgomery County, MD	11%
Phoenix, AZ	9%
Memphis, TN	not tracked
Houston, TX	not tracked
San Diego, CA	not tracked
Boston, MA	not tracked

figure 11

When USA Today published an article on “the best and worst places to have heart attack,” it brought natural attention to cardiac arrest survival rates. While certainly not the only way to measure the clinical quality of an EMS region, it has certainly become the most popular. The Utstein method was established in 1992 to provide a universal approach to reviewing data from multiple systems throughout the United States. Not all systems track cardiac arrest survival rates, but

six of the ten benchmark systems do, as well as Nashville, which falls in the middle of the results. It should be acknowledged that many large EMS systems do not share their data externally for fear of public review, but NFD does so as demonstrated by this article. Seattle’s EMS program leads the reviewed EMS systems in cardiac saves and credits a strong public CPR program as well as large deployment of public-access defibrillators throughout its service area. Interestingly, Seattle has no ALS first responders, only BLS engines w/ defibrillators and ALS ambulance average response times of seven minutes.¹

While the value of rapid ALS assessment and care is debated by clinicians, the general public typically believes that faster response times equate to better care and most EMS systems put a heavy emphasis on a rapid response. Private ambulance providers often have a performance contract to assure the delivery of certain response times.

Rural areas are typically afforded a longer response time due to lack of call volume and the difficulty of the terrain to serve. Interviews with NFD personnel indicate that the Department uses the National Fire Protection Association (NFPA) 1710 standards as a guide. NFD did not provide a document of standards

Department	Fire Dept First Response Time Goals		Ambulance Response Time Goals		Notes
	Actual	Goal	Actual	Goal	
Boston, MA	35 minutes avg (cardiac arrests, vehicle accidents only)	none set	not provided	85% < 8 min for priority 1P 85% < 9 min for priority 1 85% < 15 min for non-priority	Includes dispatch time for ambulances
Montgomery County, MD	60% 49% 27% 70% 95% 39%	65% BLS Response < 6 min Urban 45% BLS Response < 6 min Suburban 35% ALS Response < 6 min Rural 75% ALS Response < 8 min Urban 70% ALS Response < 8 min Suburban 60% ALS Response < 8 min Rural	not applicable	Combined with first responder	Their goal is to have either a first responder or ambulance arrive within the time allotted, includes dispatch time
Pinellas County, FL	97%	90% < 7.5 minutes	99.7%	90% < 10 minutes	
San Diego, CA	90%	90% < 8 minutes, Level 1 only	94.6% 92.5%	90% < 12 minutes 90% < 15 minutes (non-life threatening)	
Washington DC	not provided	90% < 4 minutes BLS 90% < 8 minutes ALS	96% BLS 90% ALS	90% < 13 minutes	Recently adopted NFPA 1710 standards
Fairfax County, VA	not provided	90% < 8 minutes for ALS	not provided	90% < 8 minutes for ALS	
Seattle, WA	4.5 minutes avg	none set	ALS 7 minute avg	ALS - none set BLS 90% < 10 minutes	BLS from private provider
Phoenix, AZ	not provided	4 minutes BLS 5 minutes ALS	not provided	90% < 10 minutes	
Houston, TX	5 minutes avg	none set	not provided	90% < 8 minutes	
Memphis, TN	not provided	none set	4-5 minutes avg	90% < 8 minutes	
Nashville, TN	5 minutes avg 90% < 9 minutes	90% < 4 minutes	6.5 minutes avg, 90% < 12 minutes	90% < 8 minutes	

Figure 12

The other EMS regions surveyed have set clear goals for ambulance response times and 60% have goals for fire department first responders as well (figure 12). Some follow the NFPA recommendations of 4 minutes for first responders and 8 minutes for ambulances at least 90% of the time. If first response units have ALS capability, the ambulance goals often increase by two to five minutes. When available, actual response times achieved were included in the comparison of EMS systems. Some systems, especially for first responders, still track average response times instead of 90th percentiles (i.e. the time it takes to arrive at 90% of the calls). For comparison purposes, the 90th percentile is close to double the average. The experience of most local governments is that clearly defined performance goals will result in better overall performance--measured in terms of both services

¹ It should be noted that the Seattle cardiac arrest survival rates begin with only those patients in ventricular fibrillation and thus this slightly overstates their benchmark data.

delivered and the efficiency of the delivery—if those goals are adopted as a statement of public policy and are appropriately funded and implemented.

Leading Edge Practices

Beyond the best practices and protocols already discussed, two systems have developed truly “leading edge” practices that have yet to be adopted elsewhere. Seattle Fire sends a BLS engine and an ALS ambulance to all life-threatening emergencies, similar to most systems. However, non-life threatening calls receive only a BLS engine. The engine then decides whether an ALS or BLS ambulance is necessary. If ALS, they dispatch a Fire ALS ambulance. For BLS, they have contracted with American Medical Response (AMR) to provide a BLS ambulance within ten minutes, 90% of the time. Seattle Fire has no response time goals and averages 4.5 and 7.0 minutes for engines and ambulances, respectively. Life-threatening calls can also be downgraded by the ALS ambulance to a BLS unit. ALS units only transport 20% of the total patients. Seattle has one of the highest non-transport rates (41%), presumably due to the triage performed by the BLS engine company prior to ambulance dispatch. Some critics might have concerns about patient care, but the Seattle Fire Department points to its leading cardiac arrest survival rate as an indication of success.

The Phoenix Fire Department is about to change its approach to EMS. Phoenix currently has a combination of ALS and BLS engines and ambulances. Soon, it will move to 100% ALS engines as first responders and 100% BLS ambulances for transportation. During BLS transports, the ALS engine will return to service immediately from the scene and, during ALS transports, the BLS ambulance will be available soon after arriving at the hospital; leaving the paramedic to finish the paperwork. Since all personnel are cross-trained as EMT/firefighters at a minimum, an ambulance EMT/firefighter could theoretically move to the engine during ALS transports maintaining the suppression staffing levels on the engine at all times. The engine may even maintain its ALS status, depending on whether the engineer or captain is certified as a paramedic, which is becoming more prevalent. At the hospital, the EMT and paramedic would switch back to the normal configuration.

Some EMS regions not included in the peer survey are trying to address inappropriate use of the 9-1-1 system. Richmond, Virginia and Montreal, Canada have placed registered nurses in the dispatch center to triage calls that are not life-threatening. Less is known about Montreal, but Richmond has been running its program for the last two years. The first year was only observation and refinement of the

protocol period. During the past year, the nurse has actively triaged 9-1-1 calls. As a result, they are deferring one call per day on average (Richmond averages 109 medical calls daily). Currently, the nurse triage program operates with a nurse Monday through Friday during the daytime.

Observations and Recommendations

Capacity Development

OBSERVATION 1.1

There is a significant volume of information available, but additional key performance indicators are needed, including average ambulance call length, off-load times, and other metrics. These indicators can point out performance issues early and lead to quicker solutions.

RECOMMENDATION

The EMS Bureau has a large amount of data, but some critical data points are not being captured. Create a dashboard of critical metrics to review regularly. In addition to capturing first responder and ambulance separated response times, on-scene times, off-load times, unit hour utilization, non-transport rate, and out of service hours will provide valuable information to optimize the transport system. The NFD's tracking of ambulances unavailability (i.e. level zero) is an excellent example of a key performance indicator.

IMPLEMENTATION

Fortunately, the raw data are being captured for most dashboard metrics. New queries and reports should be created to capture the data and produce relevant results. Items such as out of service hours and reasons for off-load delays may require changes to dispatch procedures and coding.

FISCAL IMPACT

By tracking critical data, the EMS system can be monitored closely. If on-scene times or hospital off-load times increase dramatically, these will be caught quickly and corrected. Otherwise, system performance suffers and additional transport resources would be needed to maintain the same level of service.

OBSERVATION 1.2

The current system status management plan (SSP) is informal and subject to individual experience and judgment. During the site visit, there were three ambulances in one district and none in the other two districts for a period of time; creating significant gaps in ambulance coverage. It was also observed that once a unit is dispatched to a call, it is not normally diverted to a higher priority call nor will the call be reassigned if a closer unit becomes available. While it was not observed regularly, this practice increases response times and limits system performance when it occurs. Subsequent to the site visit, a paramedic has been assigned the responsibility of retroactively moving units to cover the districts and reassigning units to higher priority calls. This position is staffed Monday through Friday, daytime. NFD is reporting success with this system.



RECOMMENDATION

The newly adopted solution will improve system performance and proper distribution of ambulance units through the county. However, it still relies on the subjective assessment of an individual instead of a comprehensive plan to manage resources with input from all stakeholders. It may also create conflict between the dispatchers, the SSP paramedic, and the field crews receiving assignments from different sources. In most systems, the main dispatcher is responsible for selecting the most appropriate ambulance for each call with recommendations from the Computer Aided Dispatch (CAD) system. This dispatcher should reassign ambulances responding to non-emergency calls to life-threatening calls, which typically requires the manual review of system units. Similarly, when units become available, the main dispatcher should determine if they are closer to any active calls before posting the unit to its station or other location. EMS systems with similar call volumes are able to perform this level of dispatch efficiency. The primary recommended solution is to implement whatever changes are necessary within the dispatch center to assign units as needed, whether procedural, personnel, or software purchase. Should this not be feasible, the current system using a SSP paramedic may be the best solution, but only if combined with a comprehensive plan developed by a SSP manager and respective committee.

Regardless, the final solution should ensure three goals are achieved and maintained:

1. Repositioning available ambulances to maintain balanced zone coverage were applicable
2. Post dispatch ambulance redirect, where a closer ambulance becomes available after the initial dispatch
3. Reassignment of ambulance units responding to non-emergency calls to life-threatening calls

IMPLEMENTATION

1. Hire a full-time SSP manager with experience in comparable-sized departments to develop a plan, which optimally places units throughout Davidson County based on probable call statistics and other pertinent factors
2. Review other dispatch centers and EMS systems to determine the best way to implement a SSP
3. Work cooperatively with the EMS chiefs and dispatch supervisors to develop coverage areas for units based on system levels, predicted call volume, geographic obstacles, traffic concerns, weather conditions, political challenges, and other variables
4. Establish a system status committee comprised of the SSP manager, dispatchers, ambulance personnel, and EMS district chiefs to provide on-going refinements to the plan
5. Orient ambulance crews to the new SSP; continue to encourage them to interface with Dispatch, particularly in peak-demand periods, to notify of status changes they believe will place them closer than the dispatched ambulance

Elements of an efficient SSP

Currently in place at NFD

- Evaluate historical call volume by season, day and hour
- Use data to schedule work load units

Necessary components to be added

- Hire full time SSP manager with comparable-system experience
- Establish system status committee
- Develop ambulance posting plan based on system level, day of week, and time of day
- Determine the best way to implement SSP
- Refine plan based on feedback and historical data

6. Continue on-going adjustments to the system based on changing call patterns and system variables
7. When the CAD technology becomes available that allows reassignment of units to higher priority calls, it should be implemented pending a successful test period

FISCAL IMPACT

This recommendation requires hiring a full-time system status manager with an estimated salary of \$65,000 plus benefits. The system status plan should improve system efficiency and response times. By sending closer units to higher priority calls, mileage is decreased and the transport system is more efficient. There may be a slight savings in maintenance costs due to the decrease in miles.

OBSERVATION 1.3

The work load unit schedule does not efficiently match the call volume demand. This creates surplus resources at night and strains scarce resources during the day.

RECOMMENDATION

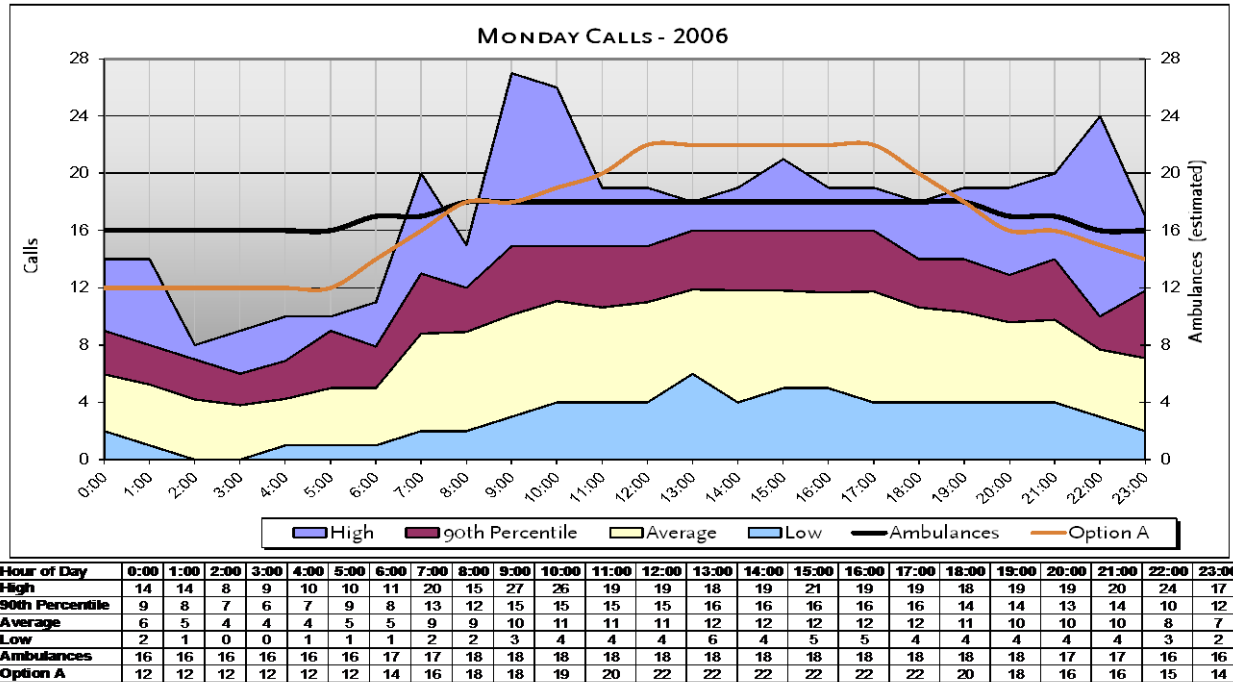
Adjust the work load units to shorter shifts, such as 8 to 12-hour shifts, and more days per week. This would provide additional units during the peak periods of the day. Consider the addition of one or more power cars (transport units) that complete a set number of calls and then go home. In busy systems, such as Nashville's, a power car would be assigned a standard shift, such as eight hours, but would be released after completing a certain number of calls, such as six, regardless of the number of hours actually worked. This balanced scheduling of ambulances in relation to hourly call volume also creates consistent resources at any time of the day. Then, if a major storm, heat wave, or other large-scale incident occurred at the peak hour, there would be more ambulances available.

IMPLEMENTATION

1. The SSP manager (Observation 1.2) would use historical call data to deploy a dynamic staffing schedule that corresponds to the service demands by day of week, hour of the day, and possibly seasonal variations
2. Work load personnel should change from 14-hour shifts to 8 to 12-hour shifts, depending on the results of the dynamic deployment review
3. These shifts should not follow the current 12-hour time frames, needing to overlap instead to provide additional coverage during peak demands
4. Determine if additional ambulances and equipment are needed for a greater number of concurrent units during peak periods

Example: Develop a system that uses all 12-hour ambulance shifts, but adjusts the start times to cover the peaks in call volume. This scenario demonstrates the fluctuation in call volume for Mondays during 2006 (figure 13). While it is unrealistic to staff to the "high" over a 52-week period, the "90th percentile" is a generally accepted standard. In this example, Option A has 408 scheduled unit hours, less than the 2006 daily average of 412 unit hours. A full-size copy of figure 13 and examples for the remaining days of the week are included as Attachments 4-10.





FISCAL IMPACT

While this recommendation does require more ambulances than the current peak of 19, NFD will have 33 ambulances by the end of this year. Most agencies maintain a reserve fleet of 25% to 35%. Assuming a conservative reserve fleet of 35%, there would be 5 additional ambulances available for a peak total of 24 ambulances during the busiest times. While it is not anticipated, if the system status plan identifies the need for even more peak units, the cost for ambulances and equipment is estimated at \$205,000 - \$220,000 initially and \$15,000 annually for each unit. No additional employee expense is projected as the same numbers of employees are being reallocated to match call demand.

OBSERVATION 1.4

Crews are currently working 12-hour shifts to provide 24/7 coverage; 24-hour shifts provide 25% more unit hours with the same number of personnel.

RECOMMENDATION

24-hour shifts are a common component in the fire service, including fire-based EMS transport programs. Of the 10 peer agencies benchmarked in the report, 5 (50%) use 24-hour shifts exclusively and 4 (40%) in combination with peak load (8, 10, and 12-hour) shifts to provide EMS service. Overall, 90% of the agencies use some level of 24-hour staffing to fill their ambulances; the only exception is Boston. One of the peer agencies, Memphis Fire Department, is located in Tennessee and has been very

24-Hour Shift Advantages

- 56 vs. 42 hours per week per employee
- Better employee lifestyle through less commuting, e.g. can live farther away
- Easier scheduling with less shifts per day
- More staff available for overtime
- Fewer shift changes each day
- Match fire suppression scheduling for improved working relationship

successful using 24-hour shifts exclusively. As a cross-trained department, the Memphis ambulance crews rotate with the engine crews 12 hours into the 24-hour shift. This approach shares the EMS transport burden fairly and evenly between personnel as well as meeting the Fair Labor Standards Act (FLSA) standards.

NFD should reevaluate 24-hour shifts as they can place more units on the street at the same cost as 12-hour shifts. These 24-hour shifts were originally discontinued due to the high volume of calls, lack of

Sample Month of Shift Schedules							
24 Hour Shifts	Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 A	2 B	3 C	4 A	5 B	6 C	7 A
	8 B	9 C	10 A	11 B	12 C	13 A	14 B
	15 B	16 C	17 B	18 C	19 A	20 B	21 C
	22 A	23 B	24 C	25 A	26 B	27 C	28 A
	29 B	30 C	31 A				

12 Hour Shifts	Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 am A pm B	2 am A pm B	3 am C pm A	4 am C pm A	5 am D pm C	6 am D pm C	7 am B pm D
	8 am B pm D	9 am A pm B	10 am A pm B	11 am C pm A	12 am C pm A	13 am D pm C	14 am D pm C
	15 am B pm D	16 am B pm D	17 am A pm B	18 am A pm B	19 am C pm A	20 am C pm A	21 am D pm C
	22 am D pm C	23 am B pm D	24 am B pm D	25 am A pm B	26 am A pm B	27 am C pm A	28 am C pm A
	29 am D pm C	30 am D pm C	31 am B pm D				

resources, and overtime costs. With the right safeguards on utilization rates, 24-hour shifts can provide more unit hours, fewer shift changes during peak demand periods, less commuting and better lifestyle for personnel, as well as improved response times.

It takes eight personnel to staff four 12-hour shifts, but only six to staff three 24-hour shifts. Each shift type provides the necessary personnel for one ambulance to be available 24 hours a day, 7 days a week. Therefore, 25% fewer EMTs and paramedics can deliver the same number of transport units using 24-hour shifts instead of 12-hour. Using these available personnel to staff extra units would add four more ambulances each day. The Unit Hour Utilization (UHU) rate would drop from 40% to 30% overall (a 25% decrease). In addition to the monthly chart included, attachment 11 provides a table of 12 and 24-hour shifts over a 24-week period.

Looking at it another way, if the current number of positions were redistributed from four to three shifts, the number of personnel for each shift would increase from 42 to 56. Assuming the number of personnel on vacation or injured remained consistent (14 per day currently), it would provide 42 personnel for deployment on 21 ambulances instead of 16 ambulances. With the addition of the work load units,

peak staffing could reach 24 ambulances in service without hiring any staff. The chart below demonstrates the impact 24-hour staffing would have on maintaining future UHU and response times with escalating call volume. While two to three units would need to be added each year under the 12-hour model, no additional 24-hour units would be needed until 2010. The system savings equates to more than \$8M over the next five years.

Resources needed to maintain current 45% UHU & 8:03 minute average response times						
Shift Type	2007	2008	2009	2010	2011	Total
12-hour	\$2,005,597	\$1,864,834	\$1,864,834	\$1,864,834	\$1,864,834	\$9,464,932
24-hour	\$0	\$0	\$0	\$ 442,749	\$ 766,790	\$ 1,209,539
<i>note: assumes \$760,000 and \$625,000 per 12 and 24-hour unit, respectively</i>						

IMPLEMENTATION

Changing the ambulance staffing from 12-hour to 24-hour shifts would require the review of several

Implementation Hurdles
Employee support
Union support
FLSA compliance, if needed
Monitored UHU to ensure crew safety and clinical standards

factors. An advisory group should be established with union and management participation to evaluate this option and explore the concept fully. For example, unless the personnel assigned to these units were cross-trained as firefighters, similar to Memphis, there would be an FLSA impact on overtime pay. However, that is not required in order to have 24-hour shifts. Non-fire public agencies and private ambulance companies do not have the ability to use the 24-hour staffing exemption provided by FLSA and must pay overtime.

Typically, they determine an hourly rate based on scheduled overtime that equals the same annual salary as someone working 12-hour shifts. This may be an option for NFD. Vacation time accrual and other benefits may need to be modified to meet the change in work hours.

Safeguards should be established to ensure that the work load does not exceed an acceptable level to ensure crew safety and quality of patient care. Significant research has recently been released that details the increase in medical errors and driving accidents with prolonged sleep deprivation. To mitigate these risks, many fire departments, third party agencies, and private providers, use a combination of shift types to ensure 24-hour crews are not routinely running calls for 24 consecutive hours. System status plans are often customized to provide some protection to these crews and zones with the greatest call volume may not have a 24-hour unit assigned to it relying on work load units to cover it. The utilization rate of each 24-hour unit would need to be monitored monthly and additional resources added to maintain an efficient and safe number of calls per shift.

Paying non-firefighters on 24-hour shifts			
	Rate/hour	Subtotal	Annual Salary
12 hour shifts			
Regular	\$22.00	\$48,048	48,048
24-hour shift			
Regular	\$10.42	\$10,115	48,048
Overtime	\$15.63	\$7,586	
Doubletime	\$20.84	\$30,346	

Example: 67,000 annual calls averages 184 calls a day and assumes an average call length of 60 minutes

12-Hour Shifts				
Units	Staff/Day	Shifts/Day	Calls/Shift	UHU
16	64	32	5.8	.48
16 + 3 work load	70	35	5.3	.44

24-Hour Shifts				
Units	Staff/Day	Shifts/Day	Calls/Shift	UHU
20	40	20	9.2	.38
21	42	21	8.8	.37
21 + 3 work load	48	24	7.7	.34

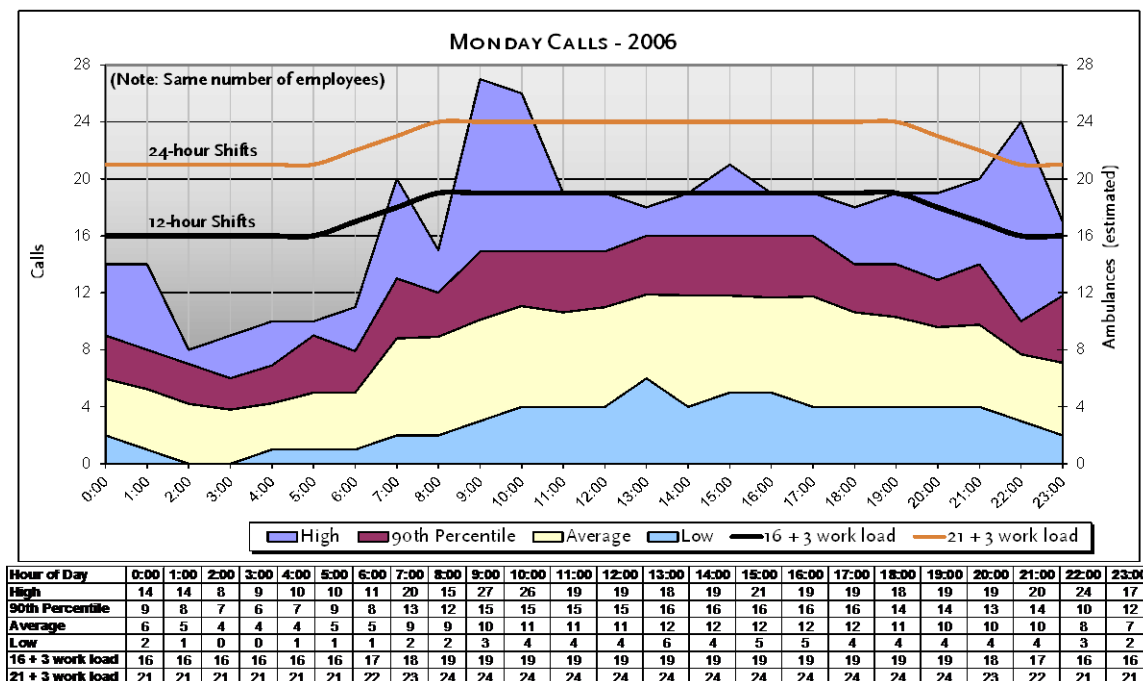
The process to change from 12 to 24-hour shifts would require implementation over a long period of time designed to identify issues, develop solutions, and evaluate the benefits. The proper placement analysis of 24-hour ambulances would review historical call volume per zone and projected UHU for

each unit. Because 45% of Davidson County is suburban and 20% is rural, ambulance stationed in these zones would not typically see high utilization rates that could impact safety. The urban areas would require the most due diligence before changing the staffing patterns.

Should NFD choose to shift to 24-hour units in concurrence with merging the Fire and EMS Bureaus, there would be significant expense to not only cross-training the EMS personnel, but also the overtime necessary to cover their shifts while training, additional fire personal protective gear, and the possible higher salaries required due to the expanded job requirements. While not necessary for implementation of 24-hour units and meeting FLSA requirements, it does offer many advantages. These are covered until Observation 1.25. Some current employees may choose not to transition to firefighter status and that option would need to be addressed in the overall plan for staffing. Based on current call volume, there is a demand for work load units; these could remain an option for current “EMS only” personnel. Through attrition, “EMS only” personnel could be replaced by cross-trained personnel.

Currently the State of Tennessee has no law that requires firefighters to complete any minimum training. Under the Rules of the Tennessee Commission of Fire Fighting Personnel Standards and Education a recruit firefighter must serve in this classification for 12 months or complete two-hundred forty (240) hours of formal entry level training. There are no clear statutes that determine the amount of time an employee must spend on an annual basis to be classified as a firefighter.

The main focus of implementing 24-hour shifts versus the current 12-hour shifts is to decrease the unit hour utilization of the service without increasing staffing. Without increasing the quantity of available units, the number of times all NFD ambulance resources are committed on calls without an ambulance to respond will continue to rise.



FISCAL IMPACT

Because the number of employees would remain constant, there would be no additional labor costs, assuming a favorable approach to paying 24-hour shifts. Without increasing the number of new employees, the staffing of up to five additional ambulances is provided with current staffing, upon full implementation of the 24-hour shifts. This assumes that the EMS personnel are not cross-trained as firefighters in conjunction with implementation.

Should NFD determine that the best way to provide 24-hour ambulance units is through merging the two bureaus, there would be significant direct and indirect training expenses. This includes paying for training, covering the overtime incurred, providing personal gear and equipment necessary for firefighting, and possibly paying a higher salary for cross-trained employees. One creative option for eliminating the \$2.2M in overtime to cross-train EMS personnel would be to implement the 24-hour scheduling immediately and use the 14 (56 minus 42) hours gained each week through the new staffing schedule to attend the training academy. It would take 18 weeks to meet the 256 hours specified for the academy. Based on the size of the group needing training, it is presumed there would need to be additional dedicated academy classes just to accommodate the cross training.

Cross-training EMS Personnel		
EMS personnel	298	
80% request cross-training	238	
Hours/week	16	
Weeks	16	\$2,238,495
Est. overtime	\$36.74	
Fire clothing	\$2,000	\$476,000
Total		\$2,714,495

The total number of physical ambulances in service concurrently is 24 in the example provided, which does not require purchasing additional ambulances and maintains a 35% reserve fleet standard. With the anticipated decreased work load per unit the in-service life of each unit may increase slightly allowing for an adjustment in the replacement time period. Additionally, the decreased daily work load per unit should decrease the maintenance costs annually. This increase in cost savings may fund the purchase of additional units for future expansion of additional units depending on daily staffing of units.

OBSERVATION 1.5

Interviews with NFD personnel indicate that National Fire Protection Association (NFPA) 1710 standards are used as a guide. NFD did not provide a document of standards coverage. This is a significant gap and not typical of the peer comparisons performed. NFD would benefit greatly from establishing response time goals for suburban and rural zones.

RECOMMENDATION

Establish response time goals for first responders and ambulances with consideration for urban, suburban, and rural service areas as well as medical priority. The project team’s recommendation is an emergency ambulance response time goal of 8 minutes in urban, 12 minutes in suburban, and 20 minutes in rural zones at least 90% of the time. Non-emergency ambulance response times are recommended at 12, 18, and 30 minutes, respectively; that is, 50% longer than emergency response times.

IMPLEMENTATION

1. Adopt the response time goals and include as a dashboard metric (Observation 1.1)
2. A system status plan (Observation 1.2), dynamic unit deployment (Observation 1.3), and 24-hour shifts (Observation 1.4) will improve response times dramatically
3. Hire additional personnel and purchase enough ambulances and equipment to attain the goal

Example: To implement response time goals, the call volume regional distribution needs to be established as well as a breakdown of the priority. Montgomery County, MD has the closest regional demographics and its historical call volume for urban, suburban, and rural zones were used to create a model for Davidson County.

Regional Call Distribution by Priority				
	Urban	Suburban	Rural	Total
Land Volume	35%	45%	20%	100%
Call Distribution	75%	22%	3%	100%
Emergency Calls	36,156	10,606	1,446	48,208
Non-emergency Calls	14,061	4,124	563	18,748
Total Calls	50,217	14,730	2,009	66,956

Note: Call distribution estimated by region using Montgomery County data
 28% of calls are classified as non-emergency by dispatch

90 th percentile Response Time Goals				
	Urban	Suburban	Rural	Average
Emergency Calls	8:00	12:00	20:00	9:14
Non-emergency Calls	12:00	18:00	30:00	13:52
Weighted Average				10:32

Note: Average 2006 ALS response time was 8:03 minutes
 Estimated 90th percentile ALS response time is 14:29 (avg * 2 * 90%)

Once an appropriate distribution of calls is projected, a weighted average response time goal can be calculated— 10:32 minutes. This represents the amount of time, regardless of region or priority, it should take to arrive at 90% of all medical calls. This can be compared to the current response times to approximate the additional resources necessary to reach the new response time goals. It is important to note that ALS response times are not tracked by ambulance or fire engine, only overall response times. For the purposes of this model, the assumption is that the response times are similar. The 2006 average ALS response time was 8:03 minutes. By doubling this time and multiplying by 90%, the project team can estimate the amount of time it currently takes to arrive at 90% of all calls— 14:29 minutes. Therefore, it is necessary to improve response times by almost four minutes (27%) based on the goals established. Through the implementation of dynamic deployment and system status management, ambulance resources can be optimally located and scheduled to reach this response time goal. For instance, transitioning to 24-hour shifts would immediately add 25% more unit hours with the existing personnel and ambulance fleet.

FISCAL IMPACT

The fiscal impact of reaching the response time goals will vary based on the number of recommendations implemented. However, the increasing annual call volume will negatively impact response times and additional resources will be necessary at some point to maintain effective utilization rates and performance standards. See Observation 1.6 for a detailed explanation of the fiscal impact of call volume growth.

OBSERVATION 1.6

The current unit hour utilization continues to increase as the same number of ambulances runs more calls each year. This causes response times to increase and results in periods of time when there are no ambulances available.

RECOMMENDATION

Establish a unit hour utilization rate that maintains efficient use of ambulance resources while also delivering acceptable response times. Industry standards range from 17 to 57% utilization rates. NFD covers a very large geographic area that is not densely populated; this combination makes a highly efficient system infeasible. A reasonable unit hour utilization for NFD would range between 30 and 35%. Maintain this utilization rate as call volume increases to ensure the integrity of the EMS transport system.

IMPLEMENTATION

1. Determine the optimal shift schedule for the dynamic deployment of ambulance resources
2. Approve the response time goals for emergency and non-emergency response times
3. Allocate appropriate additional resources to meet the goals
4. Calculate the unit hour utilization rate that achieves the response time goals and establish that rate as the system benchmark
5. Budget for additional ambulances, equipment, and personnel each year to maintain utilization rate

FISCAL IMPACT

The capacity development recommendations will improve utilization and response times for the current call volume. However, call volume is increasing and additional resources will be necessary to keep pace with this demand. Based on the current trending, 30 additional unit hours a day are required each year just to maintain current utilization rates. This equates to 2.5 more ambulances (30 hours/12-hour ambulance shifts) each year for the next five years. The NFD provided estimated personnel costs of \$500,000 to \$600,000 for each 12-hour medic

Estimated Costs	Minimum	Maximum
Personnel per unit	\$500,000	\$600,000
Ambulance/Equipment	\$205,000	\$220,000
Total per unit	\$705,000	\$820,000
Needed units	2.5	2.5
Total cost	\$1,762,500	\$2,050,000
Estimated Revenue	2007	2008
Forecasted Call Change	5,146	4,785
Average Gross Bill	\$667.49	\$667.49
Gross Billed	\$3,434,904	\$3,193,940
Current Collections	34.8%	34.8%
Net Collected	\$1,195,346	\$1,111,491

transport unit plus \$205,000 to \$220,000 for the ambulance and necessary equipment. Based on these costs, NFD will need to increase its budget \$1.8 to \$2.1 million annually to meet the escalating call volume demand, based on current staffing model and equipment. This expense will be offset by \$1.1 to \$1.2 million in net revenue from the new transports, assuming no change in billing charges and payor mix. Changes in staffing, such as 24-hour shifts, and substituting lighter weight ambulance chassis could reduce expenses by up to \$0.8 million to be more in line with new revenue.

OBSERVATION 1.7

Field supervision is lacking due to the other responsibilities of EMS district chiefs, providing limited support and clinical oversight of patient care.

RECOMMENDATION

EMS district chiefs need to be in the field as much as possible on all levels of calls to provide greater direct supervision of field crews performance and monitoring of each ambulance's status while on calls and at the hospital. They would be able to better evaluate the level of advanced pre-hospital care and assist crews on complex medical incidents. The oversight for implementation of new equipment and EMS supplies orientation would be available directly to the crews that work with them. These chiefs would integrate better into the incident management system with the Fire District Chiefs on large-scale medical incidents. The EMS district chiefs could deliver feedback and reports on specific EMS performance benchmarks. Their reports would help in the quality improvement and review process.

Greater supervision in the field with first-hand knowledge and observation of patient-care delivery results in superior patient care. Employees know the difference between having their performance observed or someone reading the patient care report in the office long after the call occurs. Employees tend to perform at a higher level when a supervisor is present and there is less temptation to shortcut procedures or provide inferior patient care.

Increased field presence also can impact public relations as these chiefs can directly interact with the public and, in many cases, clear up issues before they escalate to senior Fire management or the city. EMS district chiefs should be empowered to deal with most of the issues with which they are confronted while on-duty.

It is especially important to have direct supervision when new employees are being oriented and during field training. They learn the Fire Department policies and procedures and medical protocols by observing the personnel they are working with. In addition to the field training officer or senior paramedic responsible for their training, they need to have direct observation by a command officer who can implement changes and corrections in a timely manner.

IMPLEMENTATION

1. Provide a laptop with wireless connectivity for email and to view the CAD in EMS district chief units, allowing for real-time oversight of the system from the field
2. Review the daily job functions to determine the obstacles to EMS district chiefs being in the streets, responding to calls, and overseeing patient care delivery first-hand



3. Limit administrative responsibilities that require office time and reassign duties that require it
4. Utilize conference calls for shift briefings
5. Senior management should promote and require at least 50% to 75% of work day is spent directly with crews, minimizing office time
6. Daily reports from EMS district chiefs should provide an overview of their shift activities

FISCAL IMPACT

Increased performance of crews and decreased out-of-service time should equate to more efficiency and cost effectiveness throughout the system. During the site visit, the project team determined that Mobile Data Terminals (MDT) had been approved and funds allocated to outfit the EMS district chief vehicles within 90 days.

OBSERVATION 1.8

At the time of the site visit, 9-1-1 call takers were required to complete all Emergency Medical Dispatch (EMD) questions prior to the medical call being dispatched. This practice increases the overall response time for first responders and ambulances. Subsequent to the visit, NFD changed the policy allowing call takers to send the calls to the dispatcher at certain points during the call-taking process and under certain circumstances.

RECOMMENDATION

EMD is a great tool and should be utilized concurrent with the dispatch of first responders and ambulances. While the personnel are responding to their units, the call taker can continue to gather pertinent information. Crews can then be updated as needed on the Standard Operating Channel (SOC) about staging requirements and call details. The average time to dispatch a life-threatening call was roughly 1:30 minutes in 2006; this is a significant improvement from 2004 and 2005, when average dispatch times consistently exceeded 2:00 minutes. However, the industry benchmark for most dispatch centers is 1:00 minute at least 90% of the time for emergency calls. The estimated 90th percentile for NFD is 2:42 minutes. Moving to concurrent call-taking and dispatch should reduce the dispatch time significantly and bring it in line with industry standards. The dispatch center should establish a goal of dispatching 90% of all life-threatening calls within 1 minute. Meeting this goal will reduce response times by more than a minute, from time of call to first unit on scene.

IMPLEMENTATION

1. Develop procedures in conjunction with the dispatch center that allow dispatchers to send units as soon as enough information is obtained and continue the EMD process during unit dispatch
2. Establish a time goal for dispatching units after determination of an address and general nature of the call, typically one minute or less 90% of the time
3. After units are sent, if additional information is available, the responding units can be updated by the dispatcher over the radio and eventually the MDT
4. Track the dispatch time goal as a dashboard metric
5. Address EMD concerns through specific and random call review utilizing a QI approach



FISCAL IMPACT

None.

OBSERVATION 1.9

The amount of time units are out of service each day is not tracked. Without knowing the number of hours and the reason dispatched, they go unchecked and uncorrected.

RECOMMENDATION

Track the reason ambulances are out of service. Each day, units are unavailable due to maintenance, lack of supplies, special details, and other needs. Understanding where unit hours are being lost will help the EMS Bureau identify the challenges and implement changes to minimize out of service hours.

IMPLEMENTATION

Develop a tracking procedure through Dispatch to track out of service hours and the reason.

FISCAL IMPACT

Knowing where unit hours are being lost is the first step in reducing this loss of productivity in the system. Each hour out of service is worth \$146 (annual budget/annual unit hours) in personnel and ambulance cost.

OBSERVATION 1.10

The 25 minute limit on hospital off-load times has become the standard for the majority of ambulance crews and increases the average time it takes to complete a medical call.

RECOMMENDATION

Reduce the off-load times at hospital emergency departments. Setting a maximum time limit can artificially create an "expected" or minimum off-load time. With approved extensions, crews can take up to 35 minutes before returning to service. Nationally, the average time for a unit to arrive at a hospital and return to service is 23 minutes according to a 2007 report of 100 EMS systems conducted by Washington DC Fire and EMS. NFD's goal should be to reduce off-load time by five minutes.

IMPLEMENTATION

1. Identify the historical average for off-load times, prior to implementation of any cap
2. Establish a Department benchmark for time out at the hospital based on the needs of the service
3. Implement a procedure that makes the time out at the hospital less during peak demand times



4. Track hospital off-load times by shift and crew to gather statistics and encourage specific crews to meet established benchmarks
5. Establish a dispatch procedure that requires dispatchers to use a "first in, first out" guideline for ambulances at the hospital to return in service when the status level drops to one or zero units available
6. EMS district chiefs need to more closely monitor ambulance hospital times and notify crews when to return in service, should the number of available units reach a critical point
7. Analysis of the amount of out of service time that is really needed by units would better determine what the actual time out of service standard should be for the Fire Department
8. When only one or no ambulances are available, those that have been at the hospital the longest should be instructed to return to service and be available for response to emergencies

FISCAL IMPACT

Ambulance resources that return to service faster save unit hours in the system. A 5-minute decrease in the average off-load time at the hospital would add 10.9 hours a day to ambulance availability, almost a new 12-hour shift every day. This equates to 3,965 additional ambulance hours per year. At a current unit hour cost of \$146, NFD would save \$580,000 annually. In terms of productivity, unit hour utilization would decrease from 40% to 37%, based on an estimated 67 minutes average ambulance call length (i.e., the time from dispatch to being available for next call).

OBSERVATION 1.11

Experienced EMS Bureau personnel who cross-trained as fire fighters and have been transferred to the Fire Bureau are not available to work for the EMS Bureau once they have transferred due to current NFD policy. At times, overtime payment in EMS may be offset by detailing (traveling) on-duty, cross-trained personnel in the Fire Bureau back to EMS if the Fire Bureau is above minimum strength for that time period. Unverified data provided by the Fire Bureau identified 96 days in the last fiscal year when it may have been possible to detail personnel back to EMS to offset overtime. It is unknown exactly how many qualified personnel were available from the Fire Bureau pool to handle the EMS Bureau openings.

RECOMMENDATION

Fire Bureau personnel should be able to staff ambulances when the fire suppression schedule is full.

IMPLEMENTATION

1. Develop a policy for allowing Fire Bureau personnel to work ambulance shifts
2. Ensure the adequate staffing of suppression equipment prior to shifting resources between Bureaus
3. Use EMS certified personnel within the Fire Bureau to provide additional transport resources



FISCAL IMPACT

The sharing of existing staffing between Bureaus ensures adequate ambulance staffing with no additional regular or overtime staffing expense. Assuming 1 EMT and 1 paramedic shift could be filled by Fire Bureau personnel during each of the 96 days when minimal Fire staffing was exceeded, this would save \$1,763 each day in salaries, or \$170,000 annually.

OBSERVATION 1.12

During the morning and evening shift change, EMS district chiefs reassign units in order to get crews off-duty on time and avoid overtime, increasing response times and complicating dispatch.

RECOMMENDATION

1. Ambulance crews should go on and off-duty at staggered times to avoid the rush to get 16 ambulances off-duty within a very short window
2. If additional units were available to be staged at fire stations, on-coming crews could place themselves in-service without waiting for the on-duty crew to return to quarters
3. If 24-hour shifts were re-implemented (Observation 1.4), it would eliminate the evening shift change, which is the biggest problem due to the concurrent call volume peak.

IMPLEMENTATION

1. Develop a schedule for units to start/finish their shifts at different times
2. Improve mid-shift restocking of supplies (Observation 1.24) to ensure a smooth transition to the next crew
3. Utilize any additional ambulances for crews to go into service without waiting for the off-duty crew to return
4. Establish an "off-duty status" procedure (Observation 1.18) to protect units during the end of their shift to return to their station and exchange crews when the system has sufficient ambulances to permit it

FISCAL IMPACT

Getting crews off-duty on time avoids overtime. Assuming two ambulance crews work an extra hour at each morning and evening shift change, there would be eight hours of overtime. The estimated daily overtime incurred would be \$294; in addition, the on-coming crew is on the clock waiting for their ambulance at an estimated cost of \$196. Over one year, the total expense would be almost \$180,000.

OBSERVATION 1.13

The Automatic Vehicle Locator (AVL) system is slow, and the project team's observation over 10 hours and interviews with dispatch personnel, both indicate that the dispatch system does not on a regular basis view the AVL screen for recommendations to send the closest ambulance.

RECOMMENDATION

Add Mobile Data Terminals (MDTs) with other computer or telecommunication equipment and Global Positioning System (GPS) capabilities to all ambulances and EMS district chief vehicles. Establish Computer Aided Dispatch (CAD) recommended dispatching based on GPS information. AVL systems require the satellite to locate the vehicle and can be time-intensive. A GPS system can report the unit location through the MDTs at any interval set.

IMPLEMENTATION

1. MDTs have been approved and should be fully deployed very soon
2. Dispatch will need to update its CAD software to accept the new GPS information and automatically recommend the closest unit

FISCAL IMPACT

The MDTs have already been budgeted. The software update cost for dispatch is unknown. Long term, the recommendations will improve system efficiencies and lower staffing needs.

OBSERVATION 1.14

Ambulances are experiencing growing delays turning over patients to the emergency departments, keeping them out of service longer than necessary.

RECOMMENDATION

The NFD should address the problem with the hospitals and implement solutions that decrease the time ambulances have to wait at the emergency department.

IMPLEMENTATION

1. With input from the NFD Medical Director and cooperation from the hospitals, determine the best method/solution to collaboratively expedite hospital turn-around
2. Meet with the affected hospitals to determine the best course of action when bed availability creates a delay in ambulance patients being transferred to an emergency department room, waiting area, or hospital bed
3. Implement a critical level notification to EMS District Chiefs when the problem occurs
4. Track hospital delays through dispatch (if possible) to maintain statistics that will support further study and corrections of the problem
5. Capture off-load times as a performance metric
6. Consider protocols to automatically place hospitals on divert if off-load times exceed a critical level



FISCAL IMPACT

Ambulance resources that are able to turn over patients faster to the emergency department save unit hours in the system. A 5-minute improvement in the average time to transfer the patient to the hospital staff would add 10.9 hours a day to ambulance availability, almost a new 12-hour shift every day. This equates to 3,975 additional ambulance hours per year. At a current unit hour cost of \$146, NFD would save \$580,000 annually. In terms of productivity, unit hour utilization would decrease from 40% to 37%, based on an estimated 67 minutes average ambulance call length (i.e., time from dispatch to being available for the next call).

OBSERVATION 1.15

Hospital diversions increased 36% from 2005 (7,124) to 2006 (9,692), causing longer transport times due to bypassing closer hospitals.

RECOMMENDATION

Review monthly statistics on hospital diversions and monitor the impact on each field unit's availability and transport times. Establish a standard that meets the needs of the NFD to provide patient transport to hospitals, especially during high demand times.

IMPLEMENTATION

1. Share industry reports documenting how hospital diversion produces negative patient outcomes due to extended transport times
2. Work with the Medical Director to positively impact diversion hours
3. Limit hospital diversion in outlying areas to prevent prolonged transports and extended return to service times

FISCAL IMPACT

The increase in ambulance diversion to other hospitals creates longer transport times and leads to a loss in productivity. Based on 2006 data, there is a hospital on diversion 11% of the time (versus 8% in 2005). A conservative estimate would be 11% of transports are extended due to diversion, or 14.3 transports a day (130 transports/day * 11%). Diversion is normally greater during the peak demand periods and probably affects a larger quantity of transports. Assuming the diversion adds 10 minutes to each transport, there is an annual loss of 1,034 ambulance hours or \$150,000 in unit hours. If diversion were reduced by 50%, 8.5 transports would go to their first choice and save \$75,000 annually through a more efficient allocation of personnel and equipment resources.



OBSERVATION 1.16

Patients are taken to any hospital requested even if there is no insurance preference or need for particular medical care, such as trauma or cardiac catheterization. For example, during the site visit, one patient selected a more distant hospital based on its food quality. This decision extends transport times when the same level of care is available closer and negatively impacts the system, especially during periods of peak demand.

RECOMMENDATION

Implement a transport policy that directs patients to the closest hospital that has the greatest capacity to handle the case and tracks those decisions in the Quality Improvement (QI) process.

IMPLEMENTATION

1. Implementing the “transport of patients to the closest hospital” procedure may not need to be a full-time requirement, but rather applied based on a set benchmark for the number of available units
2. Crews would be notified by Dispatch when the procedure is in effect and advised when the patient’s choice is again permissible
3. The decision for transportation destination would take into consideration all factors in a patient’s condition and issues related to their care
4. Crews could be given some latitude to override closest-hospital decisions if they felt another hospital was medically advisable
5. EMS District Chiefs would oversee the override decisions and work with the crews to deliver optimal service levels while maintaining quality patient care

FISCAL IMPACT

If patients were transported to closer hospitals, the ambulance would be available sooner. Assuming this policy was in effect 50% of the time, it would affect 65 transports per day. If 5 minutes could be redeemed by transporting to the closer hospital, 5.4 unit hours would be saved. Over the course of a year, 1,971 unit hours or \$288,000 in unit costs could be reallocated to better serve the public.

OBSERVATION 1.17

During the site visit, the project team observed that two paramedics can bid together to staff a particular shift instead of the standard staffing of one paramedic and one EMT. This creates higher salary expenses. Since the field work, the department has issued a policy to prevent it from happening in the future.

RECOMMENDATION

NFD should enforce the new policy and ensure that paramedics do not bid together unless for training or other approved reason.



IMPLEMENTATION

1. Enforce the new policy that details the bid process for single paramedic units
2. When developing the shift schedule, staffing should follow a matrix for the maximum number of ALS units with one paramedic and one EMT

FISCAL IMPACT

Two-paramedic staffing is more expensive as paramedics receive a higher salary than EMTs. The average paramedic receives 10%, or about \$5,000 annually, more than the average EMT.

OBSERVATION 1.18

Interviews indicate that work load units do not run as efficiently as regular units with delays at the beginning of shifts and during hospital off-loads.

RECOMMENDATION

Establish guidelines for regular and work load units related to the start and end of a shift. Track performance at hospitals (Observation 1.18) and counsel work load units not meeting the benchmark.

IMPLEMENTATION

1. Create guidelines that detail the procedures for work load units to be available at the start of their scheduled shifts
2. Develop a procedure that places any unit within 30 minutes of the end of shift into an “off-duty status” when system levels allow. The unit would be available for calls if system levels drop, but the ambulance should, at that time, begin driving to its home station
3. Educate the crews about the guidelines and importance of being ready to run calls at the beginning of the shift
4. Late shift starts should be documented by Dispatch and reported to the appropriate EMS District Chief for review and possible corrective action

FISCAL IMPACT

Ambulances starting their shifts on time equate to more resources for the system at no additional expense. The “off-duty status” procedure helps units at the end of their shift avoid costly overtime.

OBSERVATION 1.19

The triage car arbitrarily selects which calls to run and which zones to cover. It is not effective in its current role. Subsequent to the site visit, NFD eliminated the triage car program.



RECOMMENDATION

This unit was poorly staffed, not well utilized by Dispatch, and did not significantly benefit the system. Most often, triage or quick-response vehicles are implemented to “stop the clock” in systems with performance-based contracts in which financial penalties are incurred. The move by NFD to disband the triage car is supported by the project team. To meet the triage function, the EMS District Chiefs can cover specific zones during low system levels.

IMPLEMENTATION

1. The triage function should transition to the EMS District Chiefs during low system levels, multi-casualty incidents, and large capacity incidents
2. There may be special events or other times during which a triage car would be beneficial; the unit could be staffed for these specific situations

FISCAL IMPACT

The triage car paramedic is now available to fill ambulance shifts, saving personnel costs. The average paramedic makes roughly \$55,000 annually plus benefits.

OBSERVATION 1.20

Calls are assigned to dispatchers unevenly and without regard to geography, creating greater radio traffic congestion and an unbalanced workload for the dispatchers.

RECOMMENDATION

Adopt one Standard Operating Channel (SOC) for each of the three districts, allowing Fire and EMS personnel and Chiefs to monitor their districts without radio congestion.

IMPLEMENTATION

1. Work with the Dispatch Center to redeploy existing resources to more evenly share the dispatching duties and identify an organized approach to tracking units geographically
2. Track and monitor this change for efficiency and effectiveness in the overall dispatch operations
3. Adjust procedures to improve overall communication between the Dispatch Center and the field units

FISCAL IMPACT

Currently, there is a minimum of four dispatchers on duty at all times, so there should not be a fiscal impact to this recommendation.



OBSERVATION 1.21

The CAD cannot easily page crews or chiefs through the system, limiting dispatch efficiencies, creating redundant communication, and negatively impacting system performance.

RECOMMENDATION

This paging feature has been budgeted and approved, but not implemented. If implemented, it would allow Dispatch to work more efficiently with the field staff and provide another type of communication should there be a radio/MDT failure. The EMS Bureau should consider having crews paged with calls as well as over the radio.

IMPLEMENTATION

A request to install the software should be made to the Dispatch Center to install the necessary software. Crews would need to provide an employee number or identifier when they go in service so Dispatch knows which pagers are on each unit.

FISCAL IMPACT

None.

OBSERVATION 1.22

The backup Dispatch Center cannot import address (ANI/ALI) data into the CAD system. This prevents sending the fire engine and ambulance to an incorrect location should the dispatcher mistype the address.

RECOMMENDATION

The backup center was in operation during the site visit and has been used frequently in the last year for primary dispatch as well as training, and it should be as seamless a transition as possible. Caller location captured by the ANI/ALI system should be automatically imported into the CAD.

IMPLEMENTATION

Request that Dispatch establish the hardware/software link necessary to connect the two systems.

FISCAL IMPACT

None.

OBSERVATION 1.23

Calls are dispatched using a combination of codes and clear text that can complicate the dispatch process and crew interpretation of calls.

RECOMMENDATION

The National Fire Protection Association (NFPA) recommends clear text whenever possible to eliminate confusion.

IMPLEMENTATION

1. Advise NFD personnel that Dispatch will no longer be using codes for medical aids
2. Request that Dispatch use only clear text when communicating with field crews

FISCAL IMPACT

None.

OBSERVATION 1.24

Travel to and from the EMS office or maintenance yard to retrieve supplies and equipment is removing ambulances from the system that could otherwise be running calls.

RECOMMENDATION

Establish a new procedure for re-stocking supplies and equipment for units during a shift that minimizes out of service time.

IMPLEMENTATION

1. Analyze the current mobile logistics procedures and evaluate for any inefficiencies
2. Catalog which items are most often requested mid-shift during a two week period
3. Explore alternative ways to get supplies or equipment to crews
4. Consider EMS District Chiefs stocking a larger cache of supplies and some replacement equipment in their vehicles
5. Consider the establishment of an EMS supply locker at every or strategically-located fire stations
6. Evaluate different logistics staffing options that could deliver items to crews at the hospital or fire station

FISCAL IMPACT

Fewer out of service hours equate to increased productivity and efficiency for the EMS transport system, saving money. Currently, the hours lost due to units being out of service is not being tracked. However, estimating that available ambulance hours would increase 5 hours/week, at a cost of \$146 per unit hour, the annual savings would be \$38,000 in ambulance resources.

OBSERVATION 1.25

There is redundancy in the Bureaus' current management structures as well as a loss of efficiency with single-role personnel.

RECOMMENDATION

Currently, both Bureaus within the NFD provide high quality services to the citizens of Nashville and Davidson County. The consolidation of these Bureaus would further enhance the operations of the Fire Department through the creation of a single management structure, cross-trained staff, and a more efficient fire service organization.

IMPLEMENTATION

1. A consolidation of this nature is developed around a strategic plan to bring together resources and personnel in a practical and efficient manner, requiring involvement from all aspects of the Fire Department
2. The formation of an advisory working group to develop the implementation steps should be comprised on senior members of the Fire Department with significant involvement from the labor union, field personnel, and other affected positions
3. An independent facilitator should be retained to maintain the objectives and ensure a fair process
4. A recommendation study from outside the organization may be needed to assist in the process, depending on the ability of the advisory group to reach consensus on the ultimate organizational structure
5. The goal of any consolidation is the marriage of two equal services that will result in greater department synergies, reduced costs, improved supervision, easier scheduling, and decreased Bureaucracy; not the dissolution of one service inside another
6. Because of the possible change in work classification for EMS personnel (assuming cross-training as firefighters), a financial determination report will be required to address the impact on overtime, benefits, and other employee expenses
7. The labor union would be involved since the consolidation and cross-training would affect members' wages and working conditions
8. For EMS personnel not wishing to cross-train as firefighters, single-role positions should be maintained and gradually discontinued through attrition
9. EMS District Chiefs would maintain and expand their clinical supervisory role to ensure excellent patient care by all field personnel and actively support a continuous quality improvement process
10. Review other Fire/EMS service consolidations to avoid pitfalls and develop an implementation plan

FISCAL IMPACT

The reduction of duplicative supervisory personnel and efficiencies of dual-role personnel would allow for savings in salaries budgeted. A detailed analysis of the consolidation savings would be determined by the advisory group as the new organization is formed.



Demand Management

OBSERVATION 2.1

Ambulances continue to travel to medical calls to document non-transport situations which first response engines have already determine a transport is not required; approximately 17% to 20% of all calls result in a non-transport and delay the availability of the ambulance for the next call.

RECOMMENDATION

Allow fire engine personnel to cancel the ambulance upon determination of a non-transport and collect necessary documentation. Ambulances will be available faster and will be able to respond to other emergencies.

IMPLEMENTATION

1. Determine the best method for documentation and medical control contact by working with the Medical Director to develop standards that allow BLS and ALS first responders to handle non-transport and cancel ambulances
2. Develop a quality improvement review process for non-transport incidents handled by first responders
3. Track the success of the program and implement changes where required

FISCAL IMPACT

Assuming half of the medical calls that are non-transport could be handled by first responders, this recommendation would affect 10% of the total call volume or 18 calls a day. Estimating that 15 minutes could be saved by cancelling the ambulance enroute to the call, it would return 4.5 unit hours a day to the system. Annual savings would be \$240,000 in unit hour costs, or 1,643 total unit hours. In productivity improvement, the 40.0% unit hour utilization would decrease to 39.5%.

OBSERVATION 2.2

A very high percentage of patients are transported to the hospital, regardless of the severity level or lack of need for transportation. NFD has one of the highest transport rates (80%-83%) in the country, well above the 69% national average. This leads to a less efficient EMS system.

RECOMMENDATION

Implement a transport policy that addresses the medical necessity for transport and use of Fire Department resources



IMPLEMENTATION

1. Determine the best methods/solutions for preventing system abuse by working with the Medical Director to develop standards that improve efficiency with transport services
2. Develop standards of care procedures that will assist EMS crews in the determination of medical necessity for ambulance transport
3. Adjust the Patient Bill of Rights to reflect the appropriateness of transport
4. Create an advisory group to develop alternative methods of transport for persons who have no medical emergency or necessity
5. Refer frequent users to appropriate agencies for proactive intervention (Observation 2.3)

FISCAL IMPACT

A decrease in the number of patients transported will result in a minor decrease in revenue for the City of Nashville. The precise magnitude depends on the exact numbers of non-transportations as well as the current collection rate.

OBSERVATION 2.3

Some members of the public, such as the indigent and people with unmanaged chronic diseases including diabetes, overuse the 9-1-1 system and utilize EMS resources excessively for non-emergency use.

RECOMMENDATION

NFD should refer any non-emergency patient seen more than four times in one month to the appropriate agency or provider for further assistance and case management. For the indigent population, this may include social services. NFD should contact the insurance or primary care provider for patients not receiving adequate care for chronic issues.

IMPLEMENTATION

1. Develop an internal system to identify people that are transported more than four times within a month.
2. Identify which agencies are available for various social problems, including homelessness, dementia, alcoholism/drug abuse, mental illness, and other frequent problems seen by ambulance crews
3. Make contact with the respective agencies, determine the resources available, and establish the best method for referring frequent 9-1-1 users to the appropriate care
4. Create a simple method for Fire and EMS crews to notify agencies about people needing help
5. Provide a point of contact within NFD for crews to contact related to excessive use



FISCAL IMPACT

Potentially, this will mean fewer transports; however, the net revenue from transporting homeless and indigent patients is probably minimal. San Diego, CA implemented a serial inebriate program that saved hundreds of ambulance transports and thousands of visits to emergency departments.

OBSERVATION 2.4

During the field work, traumatic full arrest patients were receiving a complete work-up, including transport to the hospital when there is no chance of survival. Subsequently, NFD has changed this practice and no longer transport traumatic full arrests.

RECOMMENDATION

Continue with the new protocol established by the NFD Medical Director discontinuing the treatment and transport of traumatic full arrests. These patients typically have blood volume loss or brain injury issues that indicate a low probability of survival. Treating for a cardiac situation will not improve their condition. Provide for quality improvement review of any traumatic full arrests that are treated or transported.

IMPLEMENTATION

1. Update the policy on when to pronounce patients to include traumatic full arrests
2. Ensure the policy has been distributed to fire and ambulance crews including the reason for withholding treatment
3. Ask the quality improvement committee to review all traumatic full arrests that receive treatment or transport for an initial period of time to ensure compliance with the new policy

FISCAL IMPACT

While there will be a decrease in revenue due to not transporting these patients, traumatic full arrests comprise a minimal amount of the system transports. A loose estimate is 0.5% of medical calls are traumatic full arrests, or 335 NFD patients during 2006. Using the \$667.49 average invoice for service and 34.8% reimbursement for the same year, the net revenue loss is \$78,000.

OBSERVATION 2.5

EMS District Chiefs are dispatched in a non-emergency response mode to medical calls for which the patient has been determined to be deceased using the Clawson Dispatch System. This is potentially dangerous if the person actually needs medical care.



RECOMMENDATION

Discontinue sending EMS District Chiefs to these calls. If the patient is actually in need of medical care, the non-emergency response and extended driving time would be inappropriate and potentially dangerous.

IMPLEMENTATION

1. Determine the best methods/solutions for handling calls of this nature by working with the Medical Director and the Medical Examiner to develop procedures that allow for alternative methods of pronouncement by police or other personnel
2. If it is likely that the person is not deceased, a normal, emergency response should be initiated by first responders and ambulance crews
3. First responders and ambulance crews should have the same ability to pronounce patients and turnover to police without EMS District Chief review
4. Should there be an extended response by the police to secure the scene, there should be leeway within the policy to have the Fire or EMS District Chief respond to the scene to release the first responders or ambulance crew

FISCAL IMPACT

None.

OBSERVATION 2.6

Only Fire or EMS District Chiefs can request a helicopter, increasing its response times and delaying the immediate transport of patients, especially trauma patients, to the hospital.

RECOMMENDATION

Certain rural areas, based on distance to the trauma center, should be identified as automatic dispatch for a helicopter. First responders and ambulance crews should be able to independently request a helicopter without District Chief approval. As the population shifts to more rural zones of the county, helicopter transportation will become even more vital.

IMPLEMENTATION

1. Conduct additional training for crews on medical necessity and request for helicopter transportation
2. Implement a policy that allows field personnel to request a helicopter in the absence of a District Chief, such as prolonged extrication, extended ambulance response times, and geographical considerations
3. Develop guidelines for field personnel to cancel a helicopter that was automatically dispatched based on patient condition



FISCAL IMPACT

There may be a slight decrease in transports to hospitals. However, ambulance crews can charge for transporting patients to the helicopter. In addition, transporting by helicopter immediately returns the ground ambulance to service. As most helicopter transports are from rural areas, the ambulance would have had an extended transport time, removing it from the system for a significant period of time and leaving a rural zone uncovered.



Financial and Management Enhancement

OBSERVATION 3.1

Prior to the electronic Patient Care Report (e-PCR), there was a significant emphasis on obtaining patient insurance information, including data from the hospital, which improves collection rates.

RECOMMENDATION

Reinstitute the requirement for patient insurance information and implement a system to collect hospital data, or input of this information into the e-PCR.

IMPLEMENTATION

1. Create a mechanism to collect patient face sheets or insurance information from crews
2. Establish a policy that all crews must obtain insurance information from the patient or hospital
3. Have EMS district chiefs follow up on crews having challenges collecting this information

FISCAL IMPACT

Obtaining key billing information earlier in the process should reduce average collection days and improve collections due to additional information available to the billing service.

OBSERVATION 3.2

In April 2007, NFD was charging five dollars per mile to transport a patient, which is below the Medicare allowable rate and the industry norm for mileage charges. Additional revenue is possible and the adoption of Metro Ordinance # BL2007-1444 took advantage of this by increasing the mileage rate to \$13.00 per mile effective July 2007.

RECOMMENDATION

The new billing rate for mileage is reasonable and more accurately reflects the high cost of medical transportation. The former billing rates were largely based on Medicare allowable charges. However, the Office of the Inspector General (OIG) recently reported that Medicare's reimbursement rates are 7% to 30% below costs depending on the region. The \$13.00 per mile rate will take full advantage of the current Medicare reimbursement of \$7.81 per mile for the urban areas of Tennessee. The mileage rate, as well as all charges, should be reviewed regularly to ensure that they properly represent the costs of medical transportation.

IMPLEMENTATION

1. Review mileage rates annually to ensure they are commensurate with expenses
2. Compare mileage charges to ensure parity with other local EMS systems
3. Adjust rates as necessary



FISCAL IMPACT

Revenue will increase based on billing a higher mileage rate. 45% (21,408) of ambulance transports were billed to private insurance, auto insurance, or worker's compensation in 2006, which are the most susceptible to rate increases. Assuming an average of 5 miles, the increase in revenue would be \$170,000 annually. Medicare allows up to \$7.81 per mile during 2007, less a regional adjustment of 88.1% and it will increase slightly each year with inflation adjustments. During 2006, Medicare represented 9,991 transports, or 21%, of the total transports. Adding a marginal \$1.88 per mile to the estimated 5 average miles transported, equates to an additional \$18,800 from Medicare each year. Medicaid/TennCare revenue would not improve as the allowable charges are even less than Medicare. Self-pay revenue would increase minimally as this payor type typically describes those patients without insurance or the financial means to pay for the ambulance transport.

OBSERVATION 3.3

EMS medical Quality Improvement (QI) is conducted through a paper process with fire medical QI done electronically, leading to redundant processes.

RECOMMENDATION

The EMS Bureau should implement the QI process that is followed by the Fire Bureau to improve the quality and efficiency of the review process for patient care reports.

IMPLEMENTATION

1. Utilize the Fire Bureau existing model to develop similar procedures for EMS Bureau personnel
2. Develop a combined approach, rather than separate Fire and EMS Bureau QI processes, that streamlines the review of patient care contacts
3. Review the new procedures for possible needed refinements or improvements

FISCAL IMPACT

As the electronic QI process already exists, there should be minimal costs to implement for EMS personnel as well. It will be more cost-effective than the paper system and less time-consuming to operate in the long-term.

OBSERVATION 3.4

The personnel assigned to the FAST car do not move back to the engine for a suppression or high-acuity medical call. This practice causes both vehicles to respond, eliminating the benefit of the FAST car.



RECOMMENDATION

The FAST car program is an excellent way to reduce wear and tear on the fire engines. However, having multiple vehicles driving with lights and siren is not recommended. Crew members should move back to the engine for suppression calls or during medical calls when the engine crew is responding as well. The firefighter protective clothing can be left on the engine or a backup set kept in the FAST car.

IMPLEMENTATION

Update the FAST car policy to avoid simultaneous response of both the engine and FAST car.

FISCAL IMPACT

Eliminate extra maintenance due to concurrent wear and tear on both vehicles.

OBSERVATION 3.5

Patients who are treated, but not transported (e.g., diabetic or asthmatic), are not charged a fee for service. This practice misses a potential revenue opportunity.

RECOMMENDATION

Any patient receiving an ALS intervention should be billed since this is a normal and legitimate charge for services rendered. Providing “treat-and-release” services actually saves both the insurance company and the patient money as an emergency department visit/bill is avoided.

IMPLEMENTATION

1. Ensure crews are properly documenting all non-transported patients who receive an ALS treatment
2. Have the outside billing service invoice these EMS calls

FISCAL IMPACT

Additional revenue will be collected. The exact amount is unknown since the reason for not transporting a patient is not tracked currently by the dispatch computer. Based on experience with other agencies, two to three percent of medical calls results in ALS care but no transport. Using a conservative estimate of 2%, there were a probable 1,339 calls in 2006 that could have been billed. Using the 2006 average invoice of \$667.49 and assuming a very low collection rate of 10%, due to the lack of for non-transport reimbursement, net annual revenue would increase by \$89,000.



OBSERVATION 3.6

Online training is currently available in the fire stations, but limited to one Continuing Education Unit (CEU) per year, limiting on-duty training and requiring more overtime to accomplish.

RECOMMENDATION

Lobby the state to remove the limitation on CEUs over the Internet for improved on-duty training and overtime avoidance.

IMPLEMENTATION

1. Establish a statewide task force of interested parties that would benefit from the change
2. Identify a favorable politician to introduce a bill removing the online CEU limitation
3. Lobby as many politicians as possible on the cost savings and convenience of online training

FISCAL IMPACT

There could be some initial expense to work with a lobbying firm, but long-term savings from on-duty training. Assuming 160 EMS Bureau personnel are all getting paid overtime to attend continuing education at an average hourly cost of \$34.91 for EMTs and \$38.57 for paramedics, each hour of training that can be accomplished on-duty saves \$5,900 in overtime. With EMTs needing 2 CEUs and paramedics needing 3 per year, the maximum savings opportunity is \$96,000 annually. Actual savings will be less, as not all training is available online and some employees will not take advantage of the opportunity. Assuming a 50% implementation rate, the overtime savings would be \$48,000 per year.



Attachment 1 Recommendations Summary

Item	Observation	Priority	Recommendation
Capacity Development			
1.1 Data	There is a significant volume of information available, but additional performance indicators are needed, including; average ambulance call length, off-load times, and other metrics	High	Create a dashboard of critical metrics to review regularly
1.2 System Status Plan	The current system status management plan (SSP) is informal and subject to individual experience and judgment increasing response times and limiting system performance	High	Hire a full-time SSP manager to develop a plan which optimally places units throughout Davidson County based on probable call statistics and other factors; ensure a system that allows for the efficient reassignment of calls based on priority and availability of units
1.3 Work Load Unit Scheduling	The work load unit schedule does not efficiently match the call volume demand. This creates surplus resources at night and tighter resources during the day	High	Adjust the work load units to shorter shifts and more days per week; consider the addition of one or more power cars (transport units) to increase utilization
1.4 24-Hour Shifts	Crews are currently working 12-hour shifts to provide 24/7 coverage; 24-hour shifts provide 25% more unit hours with the same number of personnel	High	Reevaluate 24-hour shifts as they can place more units on the street at the same cost as 12-hour shifts
1.5 Response Times	Interviews with NFD personnel indicate that NFPA 1710 standards are used as a guide; this is a significant gap and not typical of the peer comparisons performed	High	Establish response time goals for first responders and ambulances with consideration for urban, suburban, and rural service areas as well as medical priority
1.6 Utilization	Current utilization continues to increase as the same number of ambulances runs more calls each year, causing response times to increase and periods when no ambulances are available	High	Set a unit hour utilization rate between 30% and 35% that maintains efficient use of ambulance resources while also delivering acceptable response times

Item	Observation	Priority	Recommendation
1.7 Field Supervision	Field supervision is lacking due to the other responsibilities of EMS district chiefs, providing limited support and clinical oversight of patient care	High	EMS district chiefs need to be in the field as much as possible on all levels of calls to view ambulance crew performance first-hand and provide supervisory oversight when needed
1.8 Dispatch	At the time of the site visit, 9-1-1 call takers were required to complete all EMD questions prior to the call being dispatched increasing overall response times; a new policy allows call takers to opt out	High	First responders and ambulances should be dispatched concurrent with EMD questions; call takers should continue to ask all pertinent questions and the dispatchers should update the crews as needed
1.9 Time Tracking	The amount of time units are out of service each day is not tracked; without knowing the number of hours and the reason, they go unchecked and uncorrected	Medium	Track the reason ambulances are out of service
1.10 Hospital Off- Load Times	The 25-minute limit on hospital off-load times has become the standard, instead of the maximum, for the majority of ambulance crews	Medium	Reduce the off-load times at hospital emergency departments
1.11 Cross Staffing	EMS personnel who cross-trained and are serving as fire fighters are not available to work for the EMS Bureau due to current NFD policy	Medium	Fire Bureau personnel should be able to staff ambulances when the fire suppression schedule is full
1.12 Scheduling	During the morning and evening shift change, EMS district chiefs reassign units in order to get crews off-duty on time and avoid overtime; increasing response times and complicating dispatch	Medium	Ambulance crews should go on and off-duty at staggered times to avoid the rush to get 16 ambulances off-duty within a very short window
1.13 Ambulance Tracking	The Automatic Vehicle Locator (AVL) system is slow and observations indicated the dispatch system does not view AVL regularly for recommendations to send the closest ambulance	Medium	Add Mobile Data Terminals (MDTs) with Global Positioning System (GPS) capabilities to all ambulances and EMS district chief vehicles. Establish CAD-recommended dispatching based on GPS information

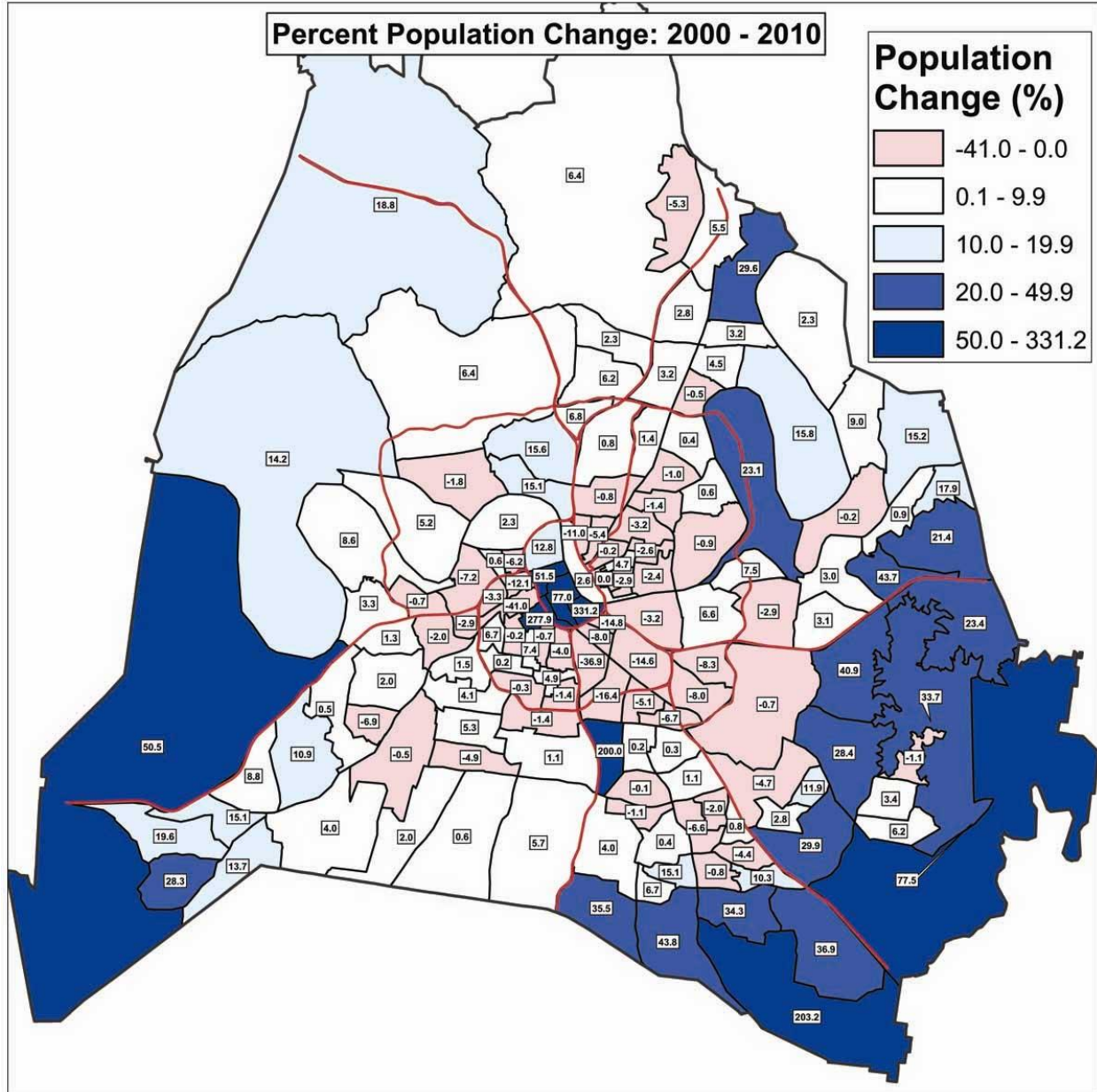
Item	Observation	Priority	Recommendation
1.14 Patient Turnover Times	Ambulances are experiencing growing delays turning over patients to the emergency departments, keeping them out of service longer than necessary	Low	The NFD should address the problem collaboratively with the hospitals and implement solutions that decrease the time ambulances have to wait
1.15 Hospital Diversion	Hospital diversions are increasing which impacts the availability of units	Low	Review monthly data on hospital diversions, monitor the impact on units' availability and transport times, and work collaboratively with local hospitals to solve the diversion problem
1.16 Destination Hospital	Patients are taken to any hospital requested even if there is no insurance preference or need for particular medical care	Low	Implement a transport policy that recommends patient transport to the nearest appropriate facility and tracks those decisions in the QI process
1.17 Bidding	During the site visit, the project team observed that two paramedics can bid together instead of the standard staffing of one paramedic and one EMT creating higher salary expenses; since then, a new policy prevents it	Low	NFD should enforce the new policy to ensure paramedics do not bid together unless for training or other approved reason
1.18 Work Load Units	Work load units do not appear to run as efficiently as regular units with delays at the beginning of shifts and during hospital off-loads	Low	Establish guidelines for regular and work load units related to start and end of shift
1.19 Triage Car	The triage car arbitrarily selects which calls to run and what areas to cover; it is not effective in its current role	Low	Disband the triage car in favor of EMS district chiefs covering specific zones during low system levels
1.20 Dispatch Radio Channels	Calls are assigned to dispatchers unevenly and without regard to geography causing radio congestion and dispatcher inefficiencies	Low	Adopt one standard operating channel for each of the three districts, allowing Fire and EMS personnel and chiefs to monitor their district without radio congestion
1.21 Dispatch Paging	The CAD cannot easily page crews or chiefs through the system; limiting dispatch efficiencies, redundant communication, and system performance	Low	Implement CAD paging; this has been budgeted and approved; consider having crews paged with calls as well for redundancy

Item	Observation	Priority	Recommendation
1.22 Backup Dispatch	The backup dispatch center cannot import address (ANI/ALI) data into the CAD system, which can lead to an incorrect call address	Low	Caller location captured by the ANI/ALI system should be automatically imported into the CAD
1.23 Dispatch Clear Text	Calls are dispatched using a combination of codes and clear text that can complicate the dispatch process and crew interpretation of calls	Low	National Fire Protection Association (NFPA) recommends clear text whenever possible to eliminate confusion
1.24 Resupplying	Travel to and from the EMS office or maintenance yard to retrieve supplies and equipment is removing ambulances from the system that could otherwise be running calls	Low	Establish a new procedure for re-stocking supplies and equipment for units during a shift that minimizes out of service time
1.25 Fire and EMS Bureaus	There is redundancy in the Bureaus' current management structures as well as a loss of efficiency with single-role personnel	Low	The consolidation of these Fire and EMS Bureaus would further enhance the operations of the Fire Department through the creation of a single management structure, cross-trained staff, and a more efficient service organization

Item	Observation	Priority	Recommendation
Demand Management			
2.1 Non- Transports	Ambulances continue to medical calls where the first response engines have clear non-transport situations to document the non-transport and delay the availability of the ambulance for the next call	Medium	Allow fire engine personnel to cancel the ambulance upon determination of a non-transport and collect necessary documentation. Ambulances will be available faster and able to respond to other emergencies
2.2 Medically Appropriate Transports	A very high percentage of patients are transported to the hospital, regardless of the severity level or lack of need for transportation; Nashville has one of the highest transport rates	Medium	Implement a transport policy that addresses the medical necessity for transport and use of Fire department resources
2.3 Frequent Users	Some members of the public, such as the indigent or chronic disease patients, overuse the 9-1-1 system and EMS resources for non-emergency use	Low	Refer any non-emergency patient seen more than four times a month to the appropriate agency or provider for further assistance and case management
2.4 Traumatic Full Arrests	During the field work, traumatic full arrest patients were receiving a complete work-up including transport to the hospital when there is no chance of survival; a new policy curtailed this practice	Low	Follow the new policy discontinuing the treatment and transport of traumatic full arrests and review for compliance as needed
2.5 Obvious Death Calls	EMS district chiefs are dispatched to medical calls where the patient has been determined to be deceased using the Clawson Dispatch System; which is potentially dangerous if the person actually needs medical care	Low	Discontinue sending EMS district chiefs to these calls; if the person is actually in need of medical care, the non-emergency response and extended driving time would be inappropriate and potentially dangerous
2.6 Helicopter Usage	Only Fire or EMS district chiefs can request a helicopter increasing its response times and delaying the immediate transport of patients	Low	Certain rural areas should be identified as automatic helicopter dispatch; first responders and ambulances should be able to independently request a helicopter

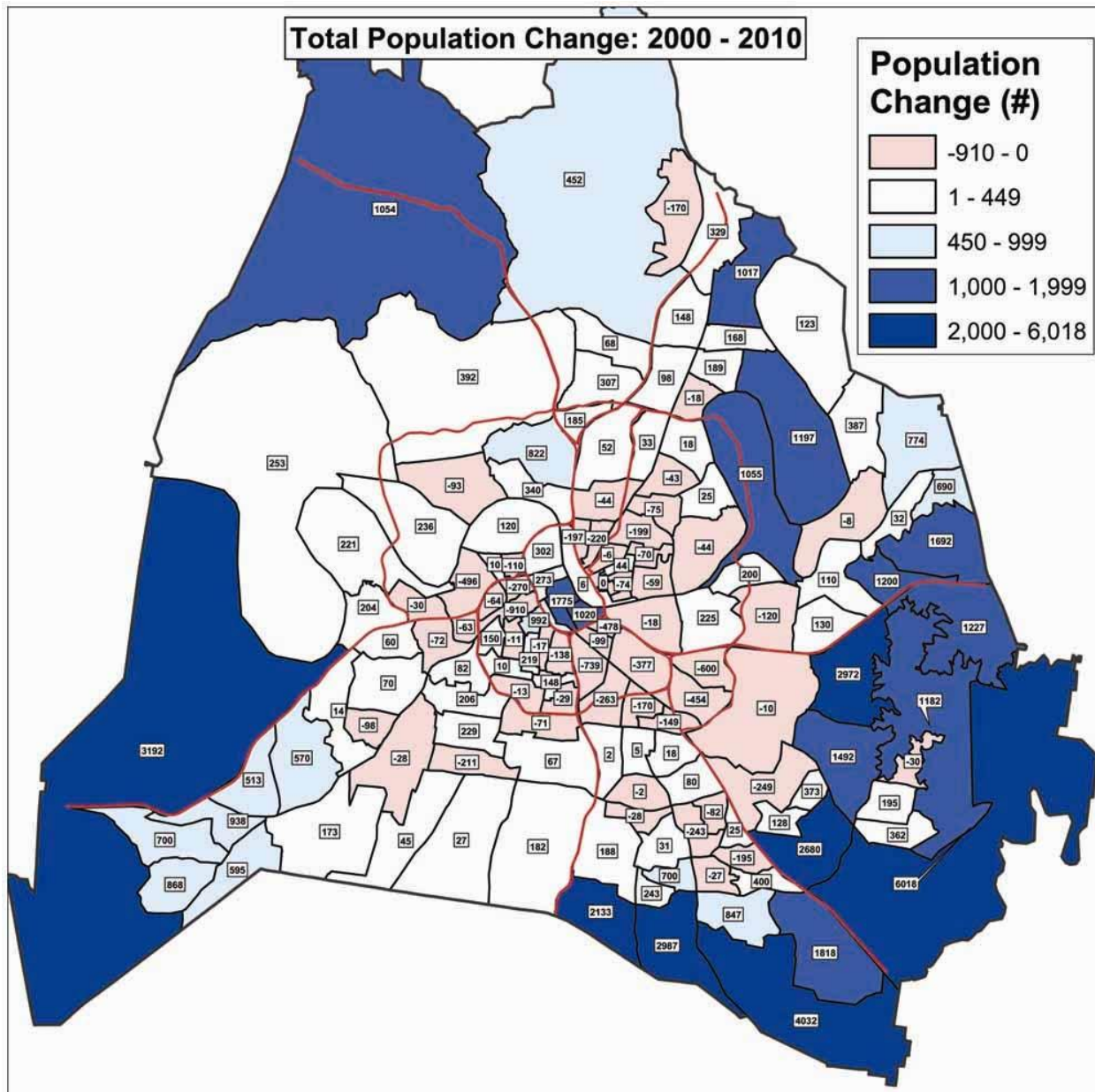
Item	Observation	Priority	Recommendation
Financial and Management Enhancement			
3.1 Billing Information	Prior to the electronic Patient Care Record (e-PCR), there was a significant emphasis on obtaining patient insurance information, including data from the hospital, which improves collections	High	Reinstitute the requirement for this information and implement a system to collect hospital data or input of said information into the e-PCR
3.2 Billing Rates	Mileage rates were below the Medicare rate in April 2007; additional revenue is possible and the recently passed ordinance should deliver more revenue	High	Ensure mileage rates are commensurate with expenses, comparable to the region, reviewed annually, and adjusted as necessary
3.3 Quality Improvement	EMS medical QI is conducted through a paper process with fire medical QI done electronically, leading to redundant processes	Medium	The EMS Bureau should implement the QI process that is followed by the Fire Bureau to improve the quality and efficiency of the review process for patient care reports
3.4 FAST Cars	The personnel assigned to the FAST car do not move back to the engine for a suppression call; this practice causes both vehicles to respond, eliminating the benefit of the FAST car	Medium	FAST crew members should move back to the engine for suppression calls or during medical calls when the engine crew is responding as well
3.5 Billing	Patients who are treated, but not transported (e.g. diabetic or asthmatic) are not charged, missing a revenue opportunity	Low	Any patient receiving an ALS intervention should be billed as this is a legitimate charge for services rendered
3.6 Online Training	Online training is currently available in the fire stations, but limited by the State to one Continuing Education Unit (CEU) per year	Low	Lobby the State to remove the limitation on CEUs over the Internet for improved on-duty training and overtime avoidance

Attachment 2 Percent Population Change



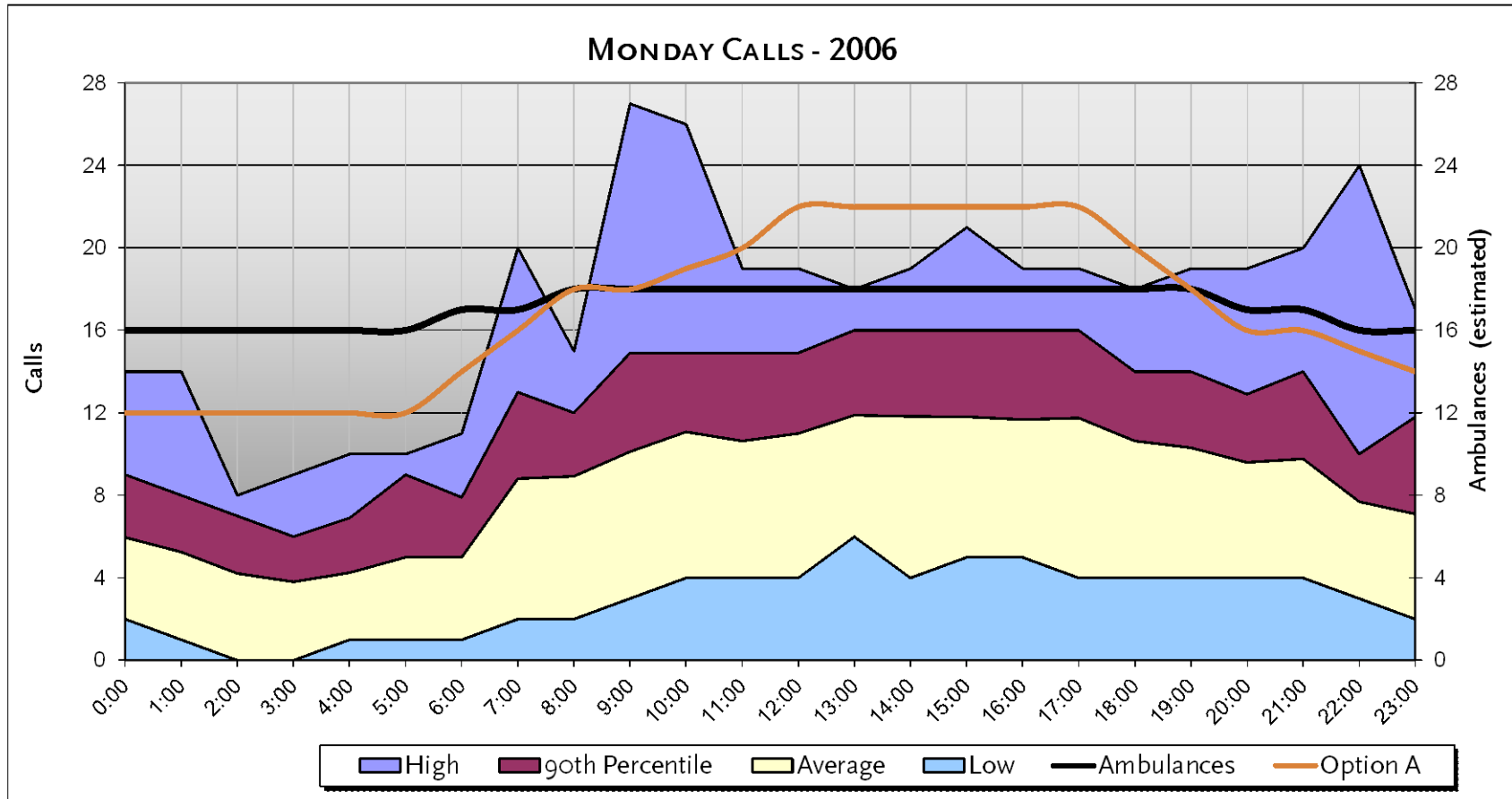
Source: US Census Tract

Attachment 3 Total Population Change



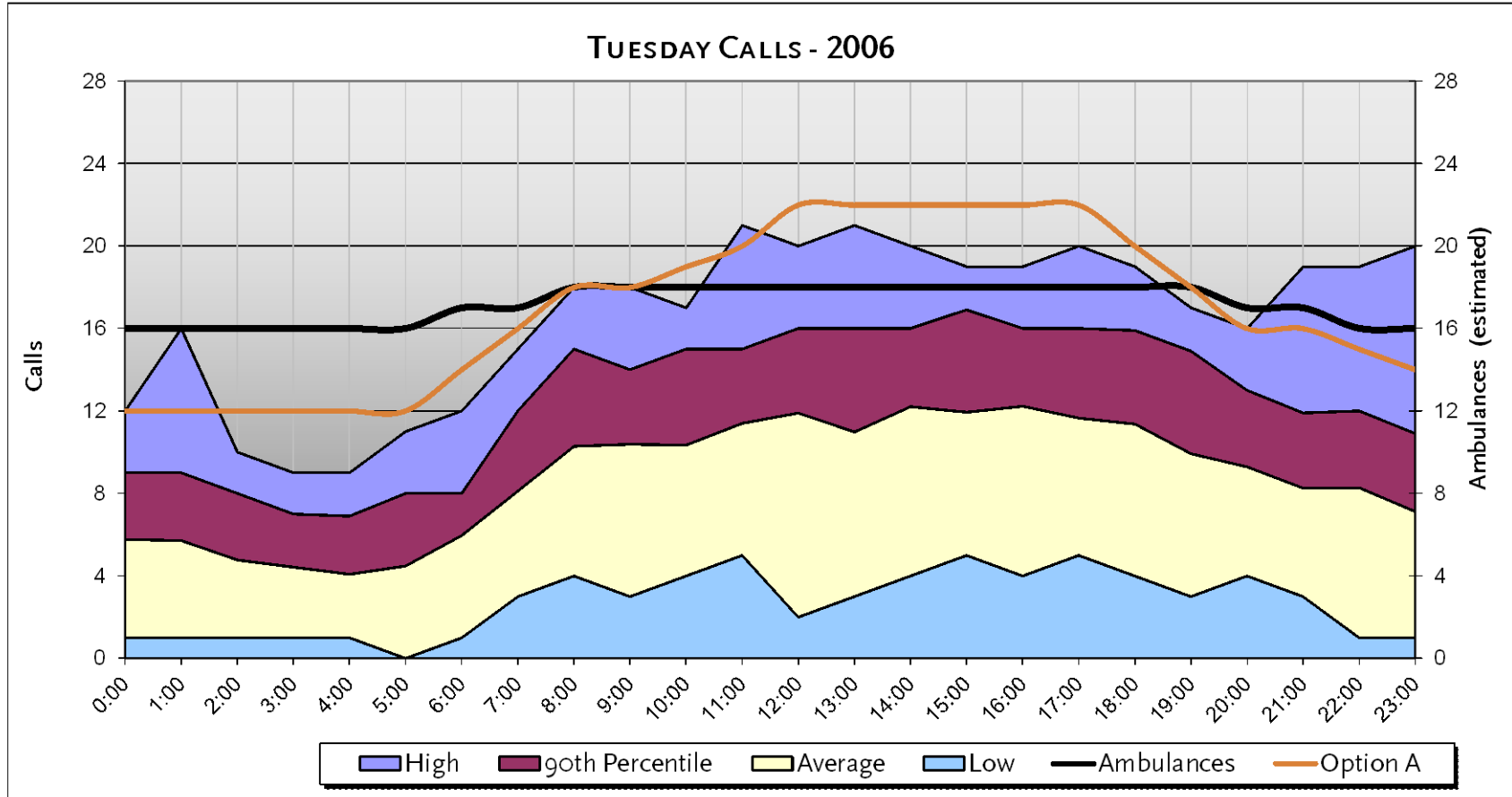
Source: US Census Tract

Attachment 4



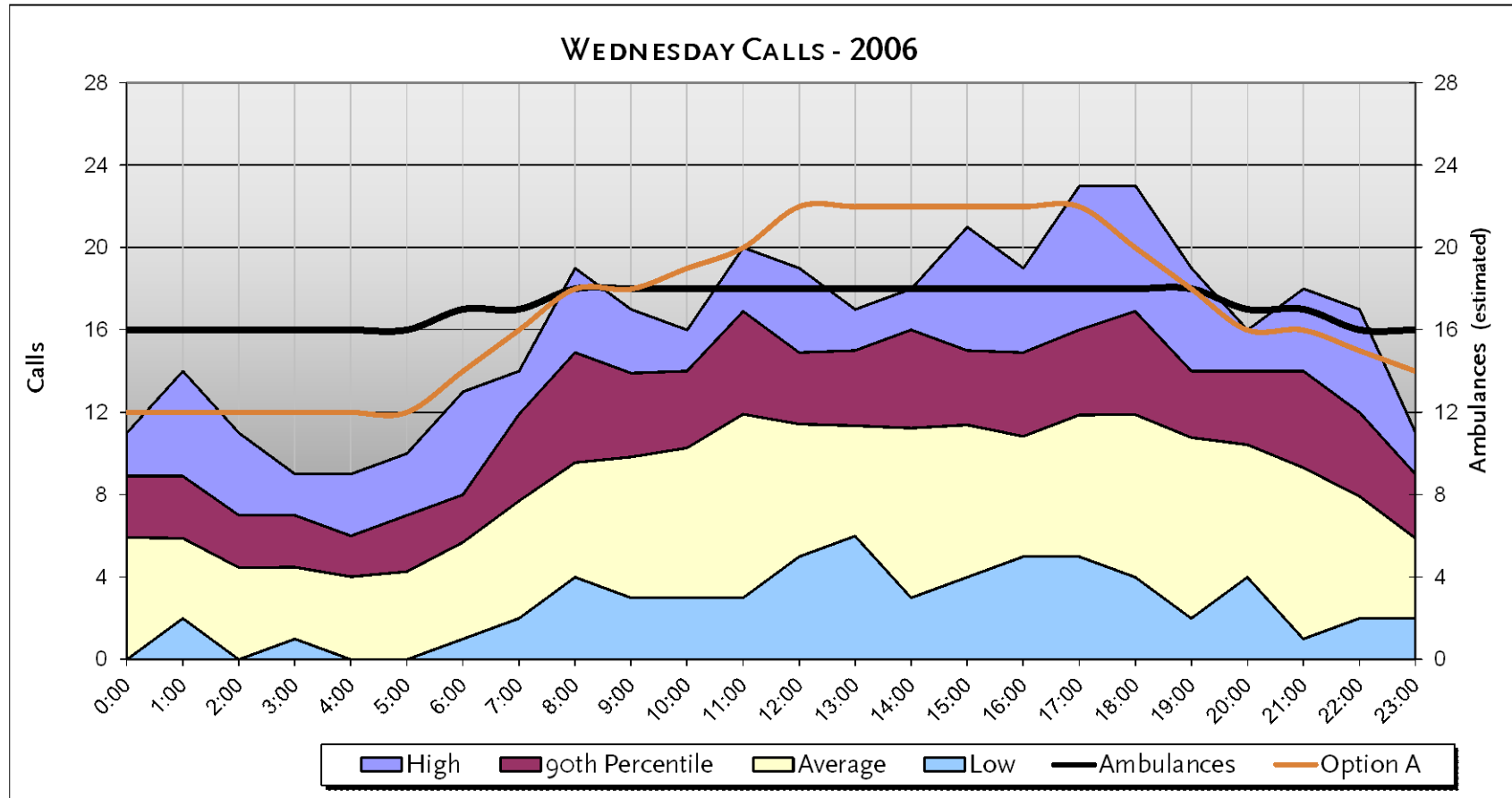
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Ambulances	16	16	16	16	16	16	17	17	18	18	18	18	18	18	18	18	18	18	18	18	18	17	17	16	16
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Attachment 5



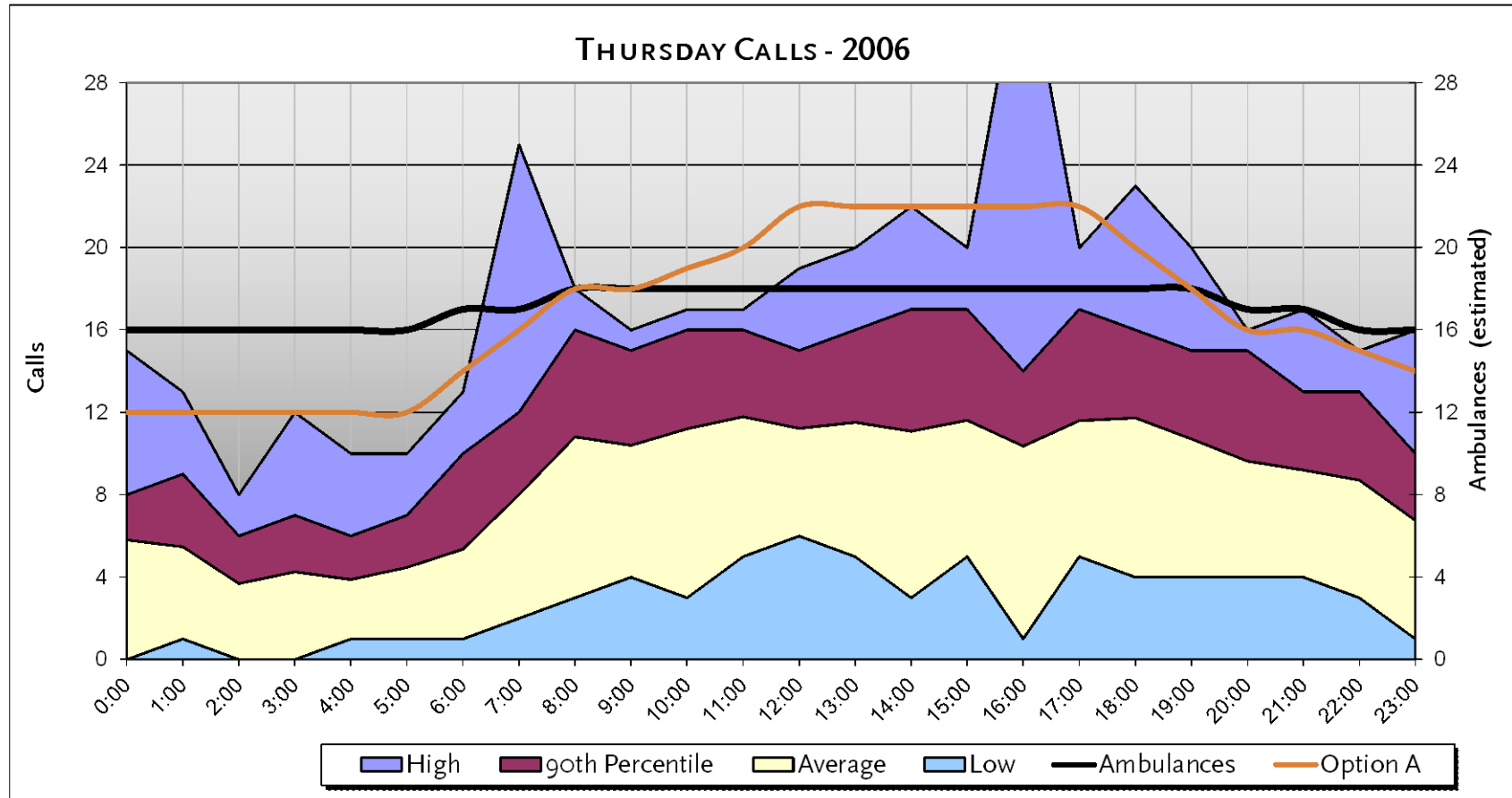
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Ambulances	16	16	16	16	16	16	17	17	18	18	18	18	18	18	18	18	18	18	18	18	18	17	17	16	16
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Attachment 6



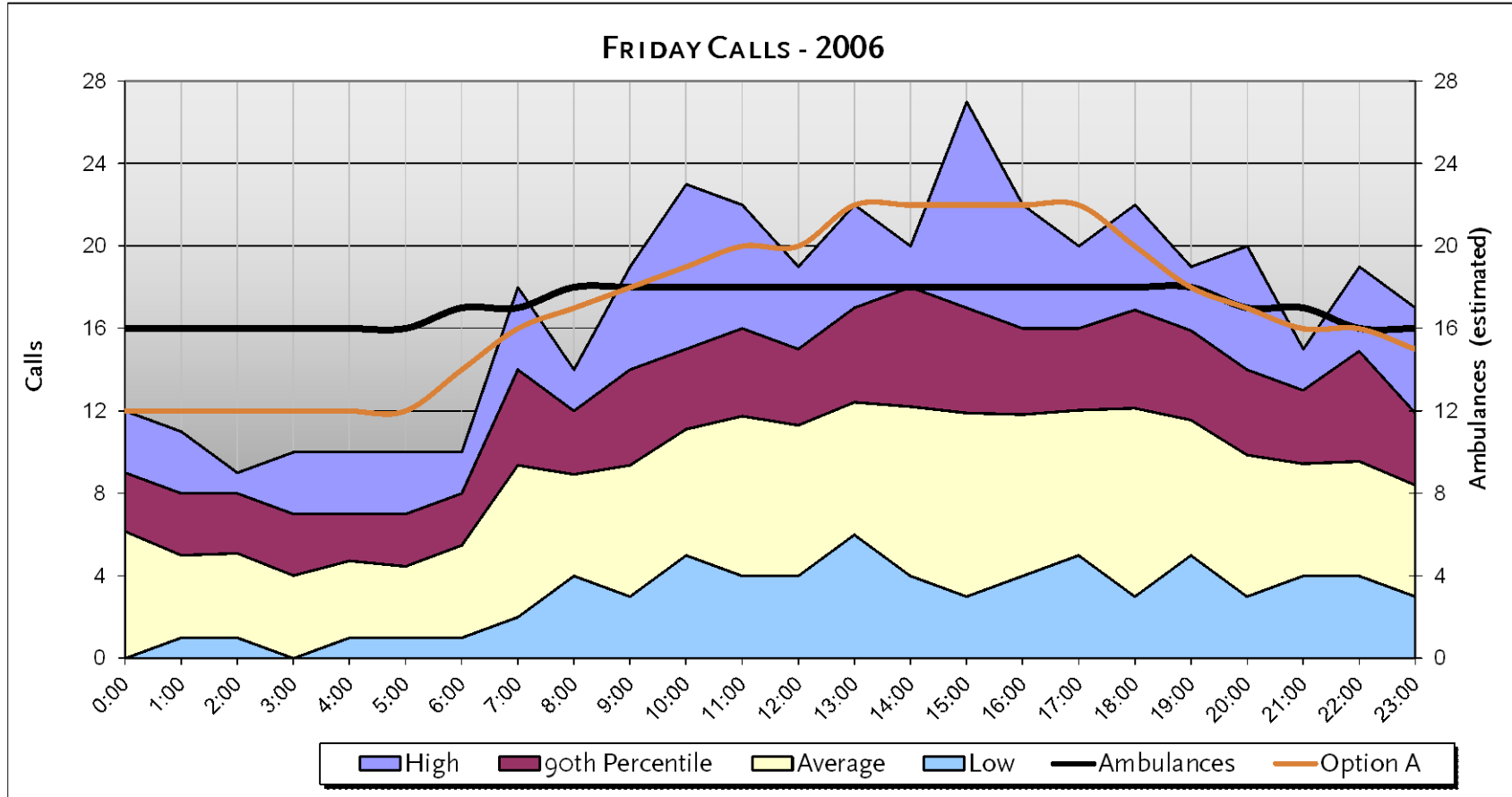
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90th Percentile	9	9	7	7	6	7	8	12	15	14	14	17	15	15	16	15	15	16	17	14	14	14	12	9
Average	6	6	4	4	4	4	6	8	10	10	10	12	11	11	11	11	11	12	12	11	10	9	8	6
Low	0	2	0	1	0	0	1	2	4	3	3	3	5	6	3	4	5	5	4	2	4	1	2	2
Ambulances	16	16	16	16	16	16	17	17	18	18	18	18	18	18	18	18	18	18	18	18	17	17	16	16
Option A	12	12	12	12	12	12	14	16	18	18	19	20	22	22	22	22	22	22	22	20	18	16	16	14

Attachment 7



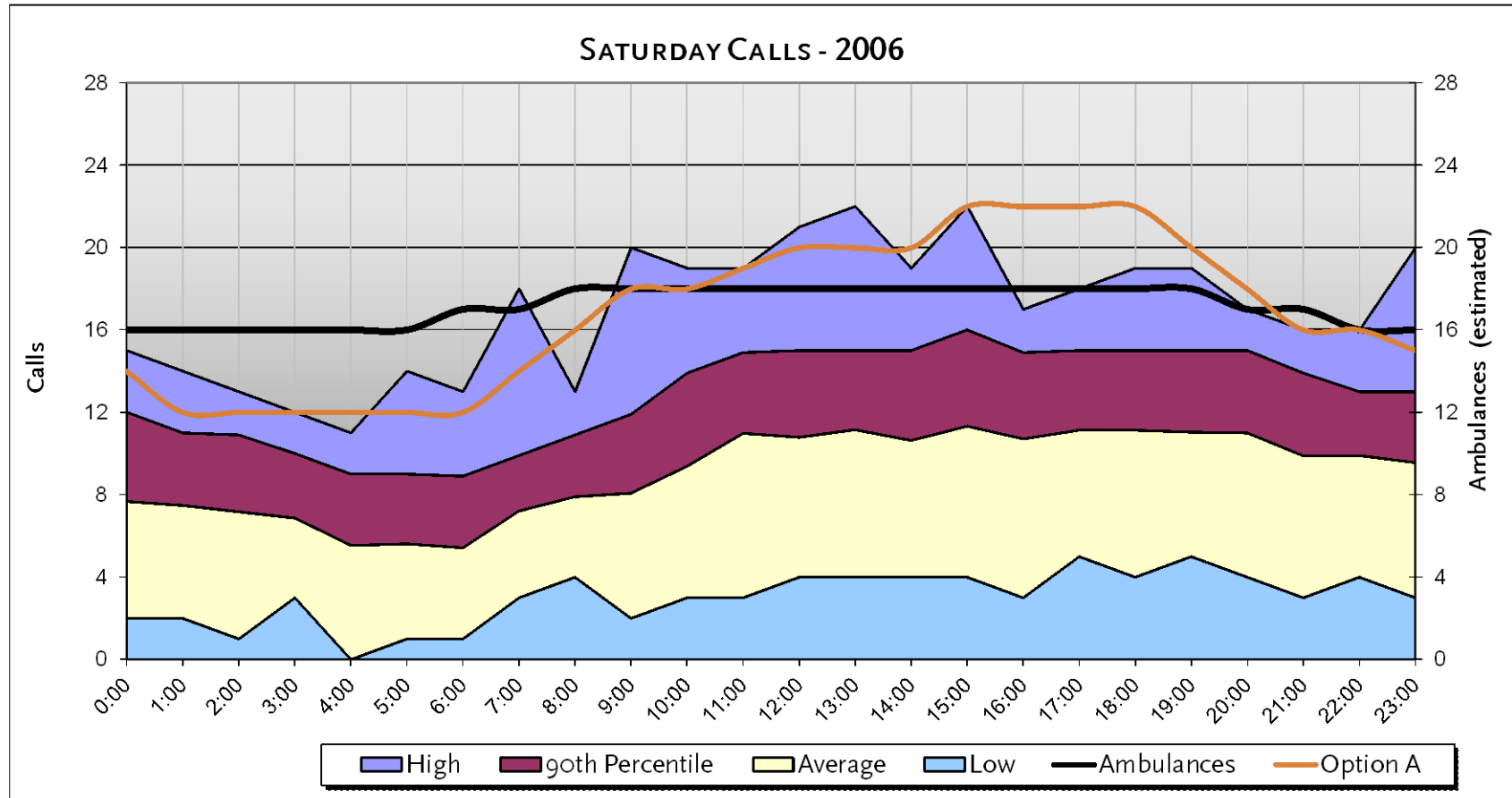
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90th Percentile	8	9	6	7	6	7	10	12	16	15	16	16	15	16	17	17	14	17	16	15	15	13	13	10
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Attachment 8



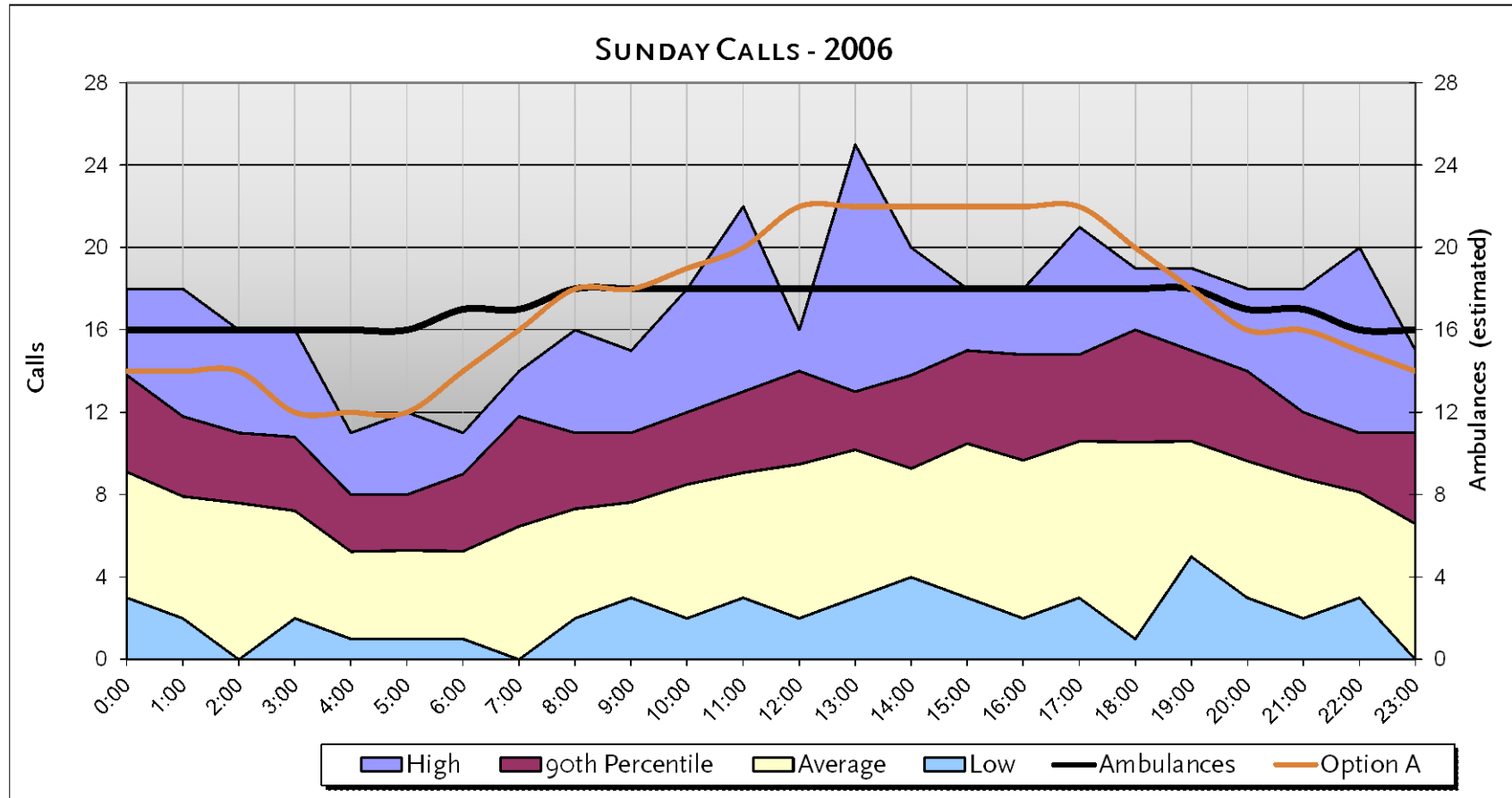
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High	12	11	9	10	10	10	10	18	14	19	23	22	19	22	20	27	22	20	22	19	20	15	19	17
90th Percentile	9	8	8	7	7	7	8	14	12	14	15	16	15	17	18	17	16	16	17	16	14	13	15	12
Average	6	5	5	4	5	4	5	9	9	9	11	12	11	12	12	12	12	12	12	12	10	9	10	8
Low	0	1	1	0	1	1	1	2	4	3	5	4	4	6	4	3	4	5	3	5	3	4	4	3
Ambulances	16	16	16	16	16	16	17	17	18	18	18	18	18	18	18	18	18	18	18	18	17	17	16	16
Option A	12	12	12	12	12	12	14	16	17	18	19	20	20	22	22	22	22	22	22	20	18	17	16	15

Attachment 9



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Option A	14	12	12	12	12	12	12	14	16	18	18	19	20	20	20	22	22	22	22	22	20	18	16	15	

Attachment 10



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90th Percentile	14	12	11	11	8	8	9	12	11	11	12	13	14	13	14	15	15	15	16	15	14	12	11	11
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Low	3	2	0	2	1	1	1	0	2	3	2	3	2	3	4	3	2	3	1	5	3	2	3	0
Ambulances	16	16	16	16	16	16	17	17	18	18	18	18	18	18	18	18	18	18	18	18	17	17	16	16
Option A	14	14	14	12	12	12	14	16	18	18	19	20	22	22	22	22	22	22	22	20	18	16	16	14

Attachment 11
Employee Shift Sample

Day	12 Hour Shift	24 Hour Shift	Day	12 Hour Shift	24 Hour Shift	Day	12 Hour Shift	24 Hour Shift	Day	12 Hour Shift	24 Hour Shift	Day	12 Hour Shift	24 Hour Shift	Day	12 Hour Shift	24 Hour Shift
1	12	24	29	0	0	57	12	0	85	0	24	113	12	0	141	0	0
2	12	0	30	0	0	58	12	24	86	0	0	114	12	0	142	0	24
3	12	0	31	0	24	59	12	0	87	0	0	115	12	24	143	0	0
4	12	24	32	0	0	60	12	0	88	0	24	116	12	0	144	0	0
5	0	0	33	12	0	61	0	24	89	12	0	117	0	0	145	12	24
6	0	0	34	12	24	62	0	0	90	12	0	118	0	24	146	12	0
7	0	24	35	12	0	63	0	0	91	12	24	119	0	0	147	12	0
8	0	0	36	12	0	64	0	24	92	12	0	120	0	0	148	12	24
9	12	0	37	0	24	65	12	0	93	0	0	121	12	24	149	0	0
10	12	24	38	0	0	66	12	0	94	0	24	122	12	0	150	0	0
11	12	0	39	0	0	67	12	24	95	0	0	123	12	0	151	0	24
12	12	0	40	0	24	68	12	0	96	0	0	124	12	24	152	0	0
13	0	24	41	12	0	69	0	0	97	12	24	125	0	0	153	12	0
14	0	0	42	12	0	70	0	24	98	12	0	126	0	0	154	12	24
15	0	0	43	12	24	71	0	0	99	12	0	127	0	24	155	12	0
16	0	24	44	12	0	72	0	0	100	12	24	128	0	0	156	12	0
17	12	0	45	0	0	73	12	24	101	0	0	129	12	0	157	0	24
18	12	0	46	0	24	74	12	0	102	0	0	130	12	24	158	0	0
19	12	24	47	0	0	75	12	0	103	0	24	131	12	0	159	0	0
20	12	0	48	0	0	76	12	24	104	0	0	132	12	0	160	0	24
21	0	0	49	12	24	77	0	0	105	12	0	133	0	24	161	12	0
22	0	24	50	12	0	78	0	0	106	12	24	134	0	0	162	12	0
23	0	0	51	12	0	79	0	24	107	12	0	135	0	0	163	12	24
24	0	0	52	12	24	80	0	0	108	12	0	136	0	24	164	12	0
25	12	24	53	0	0	81	12	0	109	0	24	137	12	0	165	0	0
26	12	0	54	0	0	82	12	24	110	0	0	138	12	0	166	0	24
27	12	0	55	0	24	83	12	0	111	0	0	139	12	24	167	0	0
28	12	24	56	0	0	84	12	0	112	0	24	140	12	0	168	0	0

Week	12 Hour Shift	24 Hour Shift
1	48	72
2	48	48
3	48	48
4	48	72
5	36	48
6	36	48
7	36	72
8	36	48
9	48	48
10	48	72
11	48	48
12	48	48
13	36	72
14	36	48
15	36	48
16	36	72
17	48	48
18	48	48
19	48	72
20	48	48
21	36	48
22	36	72
23	36	48
24	36	48

Notes:

- Employees scheduled 12-hour shifts work “4 on/4 off”, or 2 AM shifts then 2 PM shifts then 4 days off
- It takes 8 weeks for the schedule cycle to repeat itself
- The average hours per week is 42 per cycle
- Employees scheduled 24-hour shifts work “1 on/2 off”, or 1 24-hour shift then 48 hours off
- It takes 3 weeks for the schedule cycle to repeat itself
- The average hours per week is 56 per cycle

Sum	1,008	1,344
Avg/Week	42	56

Attachment 12

Options Provided within Request for Proposal (RFP)

As part of the RFP process, NFD provided six possible methods for improving the EMS transport system. During the course of this project, each method was reviewed and discussed with stakeholders to fully appreciate the strengths and weaknesses associated.

- A. *Transfer of recently increased staffing (57 personnel over the last 5 years) in the fire suppression division to the EMS division in order to place 3-5 additional medic transport units on line, 24/7. This option would allow all fire suppression equipment to remain in service, however with less personnel.*

This option would provide 25% (assuming 4) more ambulances into the system. The increased unit hours would reduce the unit hour utilization rate to 35% based on the current call volume. The number of available ambulances and response times would both improve. If this option were adopted, the augmented capacity would be negated by the increasing demand for service within two years and NFD would be in the same situation again. Additional efficiencies are necessary within the existing capacity for the long-term benefit of the EMS Bureau.

A secondary concern regarding implementing this option may be any impact on fire defense ratings by the Insurance Services Office (ISO). The ISO assesses fire liability in accordance with a comprehensive rating system that insurance companies use to determine premiums for home and business fire insurance policies. The proposed option would shift fire suppression personnel staffing to ambulance duty only, thereby conflicting with the Fire Suppression Bureau's goal to improve the ISO fire defense rating for the General and Urban Services Districts of Nashville. Additionally, shifting resources from engine companies to ambulance may be difficult and may not be supported by the Fire/EMS personnel. The employees who transferred from the EMS Bureau to the Fire Bureau have a different work schedule; to place them on transport ambulances would require these employees to change their working hours. It would also decrease the number of ALS providers available on first response fire apparatus, thus decreasing the number of ALS engines, which would impact emergency care when the fire apparatus arrives prior to the ambulance.



- B. Variations of "A", however, fire suppression personnel would remain assigned to suppression division, but would "dependently" staff BLS transport units with one Fire Fighter/EMT from their engine company and one Fire Fighter/EMT from their truck or rescue company, in double suppression companies co-located at the same fire station. The fire suppression companies (engine, truck and or rescue) would remain in service during a medical call; however, staffing on 2 suppression units would be reduced from 4 to 3 while the ambulance was on a call until the ambulance returned to quarters. If all personnel are in quarters from both companies and if a fire call came in, both suppression units would respond with all personnel, leaving the ambulance out of service until the suppression units returned. This modality is called Handle First Emergency.

There are firefighter safety concerns similar to option A with this alternative as well. Adding BLS-only ambulances creates tiered levels of service, which are typically inefficient and duplicative. The Clawson Dispatch System used by the NFD dispatch center can determine whether medical calls could potentially be assigned to BLS ambulances. During 2006, this represented 28% of the call volume. Two-tier services require more total ambulances and personnel than a single tier system, as ALS ambulances respond to three-quarters of the calls and BLS ambulances for the balance, but require the same geographic coverage. Currently, the system is designed around a single tiered system. A change would require a significant adjustment in the dispatch protocols and response parameters. The dependent staffing model would have a negative effect on fire apparatus staffing. There is also a greater liability potential for a patient handled by a BLS transport unit who ultimately needs advanced care. This option would increase the workload on personnel assigned to this dual-role staffing of multiple apparatus.

- C. Create a part-time force of trained EMT's and paramedics from other EMS systems in our region. Pay the part-timers well, but offer no benefits beyond what is required and schedule the part-time personnel for peak time coverage only.

A pool of part-time EMTs and paramedics could be a cost-effective way of staffing open shifts. The NFD proposal includes considering hiring back on a part-time basis retired NFD paramedics/EMTs or other qualified personnel. The challenge with this concept would be maintaining clinical proficiency, especially with paramedics. Typically, agencies hire part-time paramedics who work full-time for a different fire department or private provider to ensure clinical skills are maintained; this is not a realistic option for NFD as it is the only paramedic provider in the county. Additionally, the monitoring and scheduling of part-time personnel to insure they do not work beyond designated maximums could create a challenge.



- D. *Contract with private ambulance companies to handle all medical calls or only those at peak times classified as "Alpha" and possibly non-emergency calls classified as "Bravo" and "Charlie" under the Medical Priority Dispatch System.*

Alpha and Bravo calls each independently represent about 14% of dispatched events or 28% overall. It is unknown what the financial impact would be to the Department if it contracted-out these calls, as the billing system does not track dispatch classifications. However, if the calls are not profitable, the private ambulance companies may need a subsidy to respond to them and, if the calls are profitable, NFD will lose significant revenue from the general fund that may affect its budget appropriations. Neither outcome is desirable. There can also be significant clinical and quality assurance requirements to ensure the private ambulance providers are meeting the patients' needs. The Medical Director cited prior bad experiences in Atlanta under this model. Further review of this option would require tracking of dispatch classification and correlation with actual collections. Again, under the single tiered system, this would require a change in the current dispatch protocols and response matrix. A careful review of the private ambulance transport charges, if in excess or less than NFD rates, would need to be considered.

- E. *Create an all volunteer EMS transport system to supplement the paid staff, in essence create a "combination" fire department system as has been successful elsewhere in Tennessee and other parts of our nation. The system could be organized at the BLS and possibly include ALS transport also. An existing volunteer service, the Davidson County Rescue Squad, has made overtures to the Fire Department regarding their desire to participate in emergency activities.*

A representative of the Davidson County Rescue Squad was interviewed as part of the performance audit process. The rescue squad is interested in supporting the NFD during special events and major disasters, but does not have the resources to sustain a substantial 24/7 transport program. Therefore, the project team recommends that the NFD provide advice to the rescue squad, and oversee its role during major disasters and support their efforts, including grant support, surplus equipment, and integrated communications. Notwithstanding the Davidson County Rescue Squad, Metro could of course consider a volunteer EMS component to enhance its transport system. While volunteer personnel are not paid salaries, such a system is not free. There would be associated expenses with the addition of volunteer personnel including uniforms, protective equipment, training, liability cost, workers compensation, and medical testing. Communities with combined professional and volunteer services frequently find significant work coordination and management issues.



- F. *Contract with local taxi cab companies to create a “voucher system” to transport ambulatory, non-emergency patients to the hospital or their doctor’s office.*

It is a fact that all EMS systems transport some patients using an ambulance who could be transported by other means. The challenge is in accurately recognizing these patients. Assuming callers could be identified as not needing an ambulance prior to dispatch, there could be significant opportunities to save unit hours. Richmond, VA and Montreal, Canada are both experimenting with nurse staffing in the dispatch center to triage, and possibly downgrade, 9-1-1 calls for ambulance service (see benchmarking section). However, typical voucher programs still dispatch 9-1-1 resources to the scene and evaluate the patient. Then, with supervisor or physician approval, they can provide a voucher. The most expensive part of the 9-1-1 system is having the resources ready to respond. If the ambulance has already responded to the patient, the time it takes to transport is negligible and may be equal to the time necessary to evaluate the patient, complete any paperwork, and obtain approval to not transport. In addition, there is the potential to misdiagnose a life-threatening condition that could expose Nashville to liability.

In summary, the RFP list of options that NFD asked the consultant to consider mostly focus on shifting existing resources or contracting with new resources to mitigate the current system deficiencies. While there may be short term benefits to some ideas, some options, at best, will only offer temporary solutions to a larger problem. Some of these options will cause revenue loss. Notwithstanding the options offered by NFD in the RFP, there are many recommendations contained in this report that will improve efficiencies. There is no avoidance, however, of the need for additional resources if Nashville is to maintain a responsive EMS delivery system.



Attachment 13
Management Response

KARL F. DEAN
MAYOR

**METROPOLITAN GOVERNMENT
OF NASHVILLE AND DAVIDSON
COUNTY**



NASHVILLE FIRE DEPARTMENT
500 2ND AVENUE NORTH
NASHVILLE, TN 37201
(615) 862-542

January 23, 2008

Mark Swann
Metropolitan Auditor
Office of Internal Audit
222 3rd Avenue North, Suite 401
Nashville, TN 37201

Dear Mr. Swann:

This letter is acknowledgement that the Nashville Fire Department (NFD) has received the report entitled, Management Audit: Emergency Medical Services Transport System of the Nashville Fire Department. The Department is determined to evaluate all of the observation raised in the Report. Several of the observations were corrected prior to the initial briefing with NFD Management. For the remaining observations we have developed an action plan or have included additional comments to specific concerns in the attached response.

We would like to express our appreciation again for your assistance and cooperation during this process. Any improvement we can make in the delivery of emergency medical services is always welcomed.

Sincerely,

Stephen D. Halford

Stephen D. Halford

Director-Chief
Nashville Fire Department

Acting Director
Office of Emergency Management



**Nashville Fire Department
 Fire Department Management Response to EMS Transport Study Recommendation
 January 2008**

<u>Report Item and Description</u>	<u>Fire Department Response to Recommendation</u>	<u>Assigned Responsibility</u>	<u>Estimated Completion</u>
1.1 Data	Accepted without qualification - We will also track time med-units spend available in quarters and time spent for meals	EMS Deputy, Fire Deputy	July 2008
1.2 System Status Plan	Accepted with qualification and partially completed: - Consultant's observations on post dispatch redirect and available unit repositioning is outdated - Full time assignment of paramedic who has been given AVL/CAD technology, who uses full knowledge of EMS and hospital-medical unit policies, and who is devoted exclusively to this analysis and redirect function, has produced outstanding deployment results and eliminated all issues identified with peak, real time unit deployment	EMS Deputy	January 2009 <i>(funding contingent)</i>
1.3 Work Load Unit Scheduling	Accepted with qualification and partially completed - All units now on 12 hour rotations, no more 14 hour work load units - Staggered 12 hour work starts as recommended may pose significant labor issues	EMS Deputy	July 2008
1.4 24-Hour Shifts	Further study required: - Legal review of FLSA compliance (impact of lowering of hourly wages) - Legal review of FLSA compliance (80/20 rule to qualify for partial fire fighter 207K exemption) - Legal review of retroactively conscribed, position re-classification (Paramedic or EMT to FF/Paramedic or FF/EMT respectively) - Fiscal impact lacking on recommended reclassifications - Stated transitional fiscal impact appears underestimated - Legal review of recommendation impact on current MOU terms and conditions	Director-Chief	Contingent to further study <i>(funding contingent)</i>

<u>Report Item and Description</u>	<u>Fire Department Response to Recommendation</u>	<u>Assigned Responsibility</u>	<u>Estimated Completion</u>
	<ul style="list-style-type: none"> - Quality care issues (fatigue) for transport paramedics in an urban EMS system such as Nashville - Significant labor issues involved 		
1.5 Response Times	Accepted without qualification - review impact on State EMS system rating	EMS Deputy, Fire Deputy	April 2008
1.6 Utilization	Accepted without qualification	EMS Deputy	January 2008 <i>(funding contingent)</i>
1.7 Field Supervision	Accepted without qualification	EMS Deputy	September 2008 <i>(funding contingent)</i>
1.8 Dispatch	Accepted without qualification and completed	N/A	Tasks completed
1.9 Time Tracking	Accepted without qualification	EMS Deputy	April 2008
1.10 Hospital Off Load Times	Accepted without qualification and completed	N/A	Tasks completed
1.11 Cross Staffing	Further study required <ul style="list-style-type: none"> - Need better frequency data regarding potential overtime offset; savings appears so minimal that logistical and administrative issues associated will offset - Implementation of recommendation may negatively impact the FAST Car response program - Initial overtime offset in EMS Division may subsequently be offset by overtime cost paid in the fire suppression division in the event that existing fire suppression staff go off duty sick after start of shift - Will reduce average daily fire suppression division unit staffing goal of 4 personnel per fire suppression unit - Review recommendation in light of recommended staffing for CPR rotation for first responders 	Director-Chief	Contingent to further study

<u>Report Item and Description</u>	<u>Fire Department Response to Recommendation</u>	<u>Assigned Responsibility</u>	<u>Estimated Completion</u>
1.12 Scheduling	Accepted with qualification - Links to recommendation 1.3 (staggered starts) - Staggered starts present logistical issues for proper assignment of “traveling” personnel - Part of recommendation would require the purchase of 20 ambulances, this aspect not acceptable	EMS Deputy	July 2008 <i>(funding contingent)</i>
1.13 Ambulance Tracking	Accepted with qualification and partially completed - Partially inaccurate observation and recommendation due to consultant’s misunderstanding of CAD/AVL technology interface.	EMS Deputy	September 2008 <i>(funding contingent)</i>
1.14 Patient Turnover Times	Accepted without qualification	EMS Deputy	July 2008
1.15 Hospital Diversion	Accepted without qualification	EMS Deputy	July 2008
1.16 Destination Hospital	Further study required - Need for hospital association group to review recommendation for input and comment - Need to review fiscal impact to patient with regard to insurance coverage, certain insurance plans may pay more for one hospital than another, some plans pay a benefit for one hospital for transport but not to another	EMS Deputy	Contingent to further study
1.17 Bidding	Accepted without qualification and completed	N/A	Tasks completed
1.18 Work Load Units	Not applicable - We no longer have work load units, defer to recommendation 1.3 staggered hour starts of 12 hour units	N/A	N/A

<u>Report Item and Description</u>	<u>Fire Department Response to Recommendation</u>	<u>Assigned Responsibility</u>	<u>Estimated Completion</u>
1.19 Triage Car	Accepted without qualification and partially completed - Triage car concept terminated in summer of 07, concept re-captured by FAST Car program - EMS District Chief peak time back up not yet developed	EMS Deputy	July 2008
1.20 Dispatch Radio Channels	Not accepted - During peak demand periods, the district or zone concept is completely eviscerated; the closest available unit must respond regardless of unit's assigned district - Multiple channels beyond the number needed to handle peak activities times (currently 2), presents a barrier to effective post-dispatch, self re-direct as under the current system ambulances must monitor two channels; this recommendation would increase monitoring requirements and could cause significant confusion - Multiple channels beyond the number needed to handle peak activities times (currently 2), presents a barrier to effective post-dispatch, system status monitor redirect	N/A	N/A
1.21 Dispatch Paging	Accepted without qualification and partially completed - New paging system purchased - Currently programming changes to paging system	Fire Deputy, EMS Deputy	April 2008
1.22 Backup Dispatch	Accepted without qualification	ECC Director	April 2008 <i>(funding contingent)</i>
1.23 Dispatch Clear Text	Accepted without qualification	ECC Director	April 2008
1.24 Resupplying	Accepted without qualification	EMS Deputy	September 2008 <i>(funding contingent)</i>

<u>Report Item and Description</u>	<u>Fire Department Response to Recommendation</u>	<u>Assigned Responsibility</u>	<u>Estimated Completion</u>
1.25 Fire and EMS Bureau	Requires further study - Significant labor issues involved - Consolidation fraught with scores of significant barriers that will take a great deal of time to resolve - Consolidation may have significant short and mid-range costs	Director-Chief	Contingent to further study
2.1 Non-Transports	Accepted without qualification	EMS Deputy	September 2008
2.2 Medically Appropriate Transports	Accepted without qualification	EMS Deputy	July 2008
2.3 Frequent Users	Accepted with qualification - Cost of implementing the identification and referral system must be determined, subsequently contingent to funding - Identification and referral may not in and of itself prevent customer from accessing the 911 response system	EMS Deputy	January 2009
2.4 Traumatic Full Arrests	Accepted without qualification and completed	N/A	Tasks completed
2.5 Obvious Death Calls	Requires further study - recommendation will generate unnecessary med-unit response - other alternatives need development	EMS Deputy	Contingent to further study
2.6 Helicopter Usage	Accepted with qualification - permit any FD EMT personnel to place in stand-by mode - restrict launch directive to any certified paramedic	EMS Deputy	April 2008

<u>Report Item and Description</u>	<u>Fire Department Response to Recommendation</u>	<u>Assigned Responsibility</u>	<u>Estimated Completion</u>
3.1 Billing Information	<p>Not accepted</p> <ul style="list-style-type: none"> - There is no information available that suggests Nashville EMS or its private billing agency is experiencing any significant problems with patient billing - EMS billing coordinates well with hospitals on information; FD does not wish to overbear on patients for insurance information as it detracts from the perception of our service and our purpose of responding - EMS billing to meet with hospital billings to determine if any improvements can be made 	N/A	N/A
3.2 Billing Rates	Accepted without qualification and completed	N/A	Tasks completed
3.3 Quality Improvement	Accepted without qualification	EMS Deputy	July 2008
3.4 FAST Cars	<p>Further study required</p> <ul style="list-style-type: none"> - In process of possible changes to FAST Car system for better unit interface with med units, recommended change may become moot or will be reconsidered at appropriate time 	Fire Deputy	Contingent to further study
3.5 Billing	<p>Further study required</p> <ul style="list-style-type: none"> - Billing of non-transport patients would require Metro Council approval - Current benefits under the primary payor (Medicare/Medicare) only provides payment for treatment if patient is transported; out of pocket cost will be incurred by citizens 	Director-Chief	Contingent to further study
3.6 Online Training	Accepted without qualification	EMS Deputy	June 2009