Findings, Analysis and Recommendations for the Pinellas County EMS System (PRELIMINARY)

January 2011

PRELIMINARY

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Acknowledgement

Special thanks are extended to those who served on the Emergency Medical Services Resource Committee. They contributed time, information and expertise towards the analysis and formulation of recommendations and conclusions in this report.

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PREFACE

EARLY PARAMEDIC PROGRAM DEVELOPMENT IN PINELLAS COUNTY

In 1973, St. Petersburg and many other cities began using a dual response Advanced Life Support (ALS) emergency medical service (EMS) system design. Fire department paramedics responded to scenes in a non-transport 'rescue' vehicle simultaneously with basic emergency medical technicians (EMTs) responding to the scene in a private ambulance.

The fire department paramedic program was funded by city or fire district tax dollars. The private ambulance transport was funded by fees for services that were typically paid by insurance companies, Medicare or Medicaid. Because there were so many fire stations across the County, the fire department was usually able to arrive on an emergency scene first – hence the name of 'first response.' In this report, this service will be referred to as medical first response (MFR).

Many municipalities in Pinellas County began their own fire department ALS MFR programs. Each program typically had its own tax millage, physician medical director, medical protocols, and types of equipment. There was very little coordination between these programs.

However, some areas of the County did not have ALS MFR programs, particularly in the unincorporated areas. Most cities made their own arrangements for coverage by one or more private ambulance companies. Despite the well intentioned efforts of all of the communities involved, these separate initiatives did not leverage the collective resources that were in place to develop a comprehensive *System* for emergency care and medical transportation.

In 1980, the inadequacies of the EMS System in Pinellas County led to action by Pinellas County's State legislative delegation to pass a 'special act' (80-585). The special act created a System that covered all cities and unincorporated areas with ALS MFR services. It was funded by a county-wide ad valorem EMS tax that was capped at 1.5 mils. The Pinellas County Board of County Commissioners was put into the role of an EMS Authority which would oversee the new county-wide *System*.

PUBLIC UTILITY MODEL

By 1986, the MFR budget had increased significantly, rising 54% over a 4 year period as compared to the consumer price index which had only risen 14% in that same period. In response, an independent study of the entire EMS System was undertaken in an effort to address and control costs. The results and recommendations of the study led to the adoption of a Public Utility Model (PUM) EMS system design.[1]

The design of a PUM encompasses most every process in which MFR and ambulances deliver care for emergency or non-emergency responses, including:

- how the telephone calls requesting service are managed;
- who provides MFR services;
- who provides ambulance services;
- how MFR units and ambulances are selected and dispatched for emergency and non-emergency response.
- physician medical direction and medical community input;
- standards and quality management;
- continuing medical education;
- mutual aid and disaster responses;
- wheelchair transport services; and,
- how all of these different processes and the entities that provide them are funded and managed as a cohesive system.

The generic elements of the PUM model were customized to fit the specifics of Pinellas County.

Importantly, one of the most dramatic improvements was to put a single provider of ambulance service for the entire County was put into place. This was done through a competitive RFP process. The process allowed any appropriately qualified entity to submit a bid, including fire departments. Other significant changes included:

- County-wide ambulance service delivered care at an ALS level;
- all medical direction provided by an Office of the Medical Director working under the guidance of a Medical Control Board consisting of local emergency department physicians;
- all treatment protocols, medications and equipment are standardized across the County; and,

[1] Stout J: Public Utility Model – Parts 1-3. Journal of Emergency Medical Services (JEMS). May, June and July 1980.

- all continuing education is standardized across the County.

FUNDING THE PUBLIC UTILITY MODEL

Funding for all emergency and non-emergency ambulance service is paid for by user fees. The County bills for the service and then pays the ambulance contractor under a compensation formula. The formula is established during the RFP process and subsequent contract negotiations. By design, the County retains a portion of the transport revenues to pay for administration of the System as well for medical direction, continuing medical education, and other miscellaneous services. Further, the County sets aside financial reserves that may be accessed to pay for continuity of the System in the event of a disaster, such as a hurricane, when the billing and collections may be disrupted.

MFR services are paid for by ad valorem tax revenues. Individual fire departments are funded for MFR services under a funding formula that is based on the number of responses each MFR unit is anticipated to based on call volume history.

Currently, on a County-wide basis, there are three categories of MFR funding. At the lowest call volume level, MFR funding pays for one paramedic salary, equipment and associated costs on a MFR fire engine. At higher call volume levels, two paramedics and two sets of equipment are funded. At the highest level, a separate rescue vehicle with two paramedics are funded.

Importantly, the MFR funding formula differs significantly from the funding approach before and immediately after the PUM was implemented.

After 1982, an annual budget was submitted by each fire department simply asking for the costs the fire department, *itself,* allocated to EMS. Fire departments differed in how they allocated their EMS costs. This inadvertently created incentives for fire departments to allocate as much as possible to their EMS budgets. As a result, the costs for MFR rose at a rate which significantly outpaced the Consumer Price Index (CPI) in the early years of the System. It also established disparities in MFR funding levels between departments, and these disparities became magnified over time.

After 1987, under the PUM, an MFR funding formula was in place to control costs and make the level of MFR funding for like services fair and consistent across the County. In an effort to assist cities in adjusting to the new funding mechanism, fire departments getting more than their fair share were allowed to keep their 1986 funding levels. However, moving forward from that point, increases were only to be made if the funding formula qualified them to get more than their 1986 budget level. As the CPI and call volume increased over time, all of the fire departments would have become synchronized into the new funding formula in fairness to all. *In 1988*

and1989, the first two years under this MFR funding formula, the MFR budget actually decreased by 1.7 and 2.7% respectively.

In 1989, the City of St. Petersburg filed a lawsuit against the County EMS Authority protesting the new funding formula. The City prevailed, and the County reimbursed the St. Petersburg Fire Department under the old funding method. Rather than go through a series of similar lawsuits from other fire departments, the County negotiated a direct cost reimbursement plan for all fire departments similar to that used for St. Petersburg.

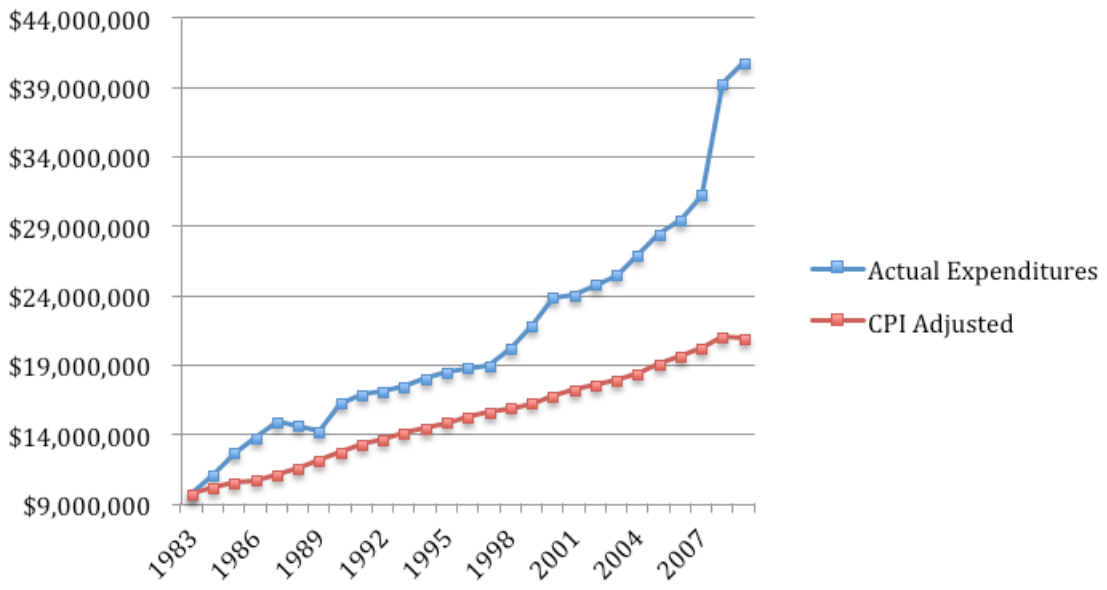
That direct cost reimbursement plan remains in place today. *In the period since the lawsuit, from FY 1990-91 to FY 2009-10, county-wide MFR expenses went from $16.2 MM to $40.7 MM (a 251% increase) compared to an increase in the CPI from 130.7 to 214.5 (a 164% increase) – outpacing the rise in the CPI by 50%.*

ECONOMIC THREAT

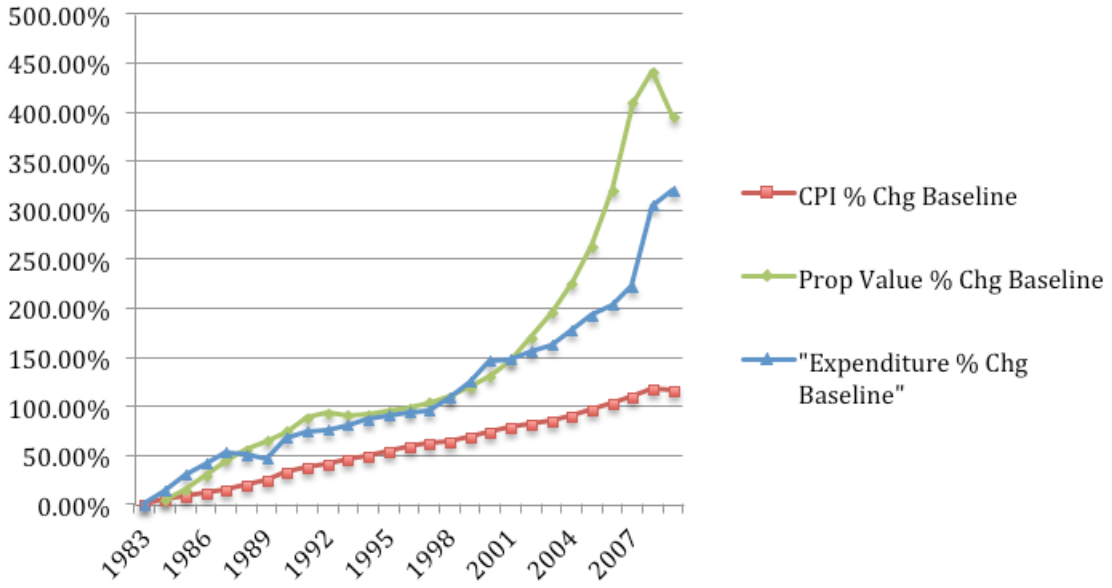
A MFR spending rate that outpaced the CPI increase was enabled by property value increases which rose 284% over the same period. The potential windfall of money from property value increases into the EMS ad valorem fund was mitigated by several appropriate decreases in the millage from 1.000 in 1990 down to 0.5832 in 2009.

Over the past few years, several factors have simultaneously brought a severe negative impact on ad valorem funding for MFR. Florida passed property tax reforms that curbed the ad valorem EMS tax revenues. Shortly after this went into effect, the overall economy began to deteriorate along with significant decreases in property values. These factors conspired to create a projected $18.5 MM shortfall in ad valorem tax revenues needed to meet the $39.6 MM projected budget for MFR in FY 2009-10.

The figure below shows actual expenditures for the County's MFR program from 1983 to present in blue. The amount of what the MFR expenditures would have been if budget increases matched the increases in the CPI are shown in red. Note how spending for MFR has significantly outpaced increases in the CPI.



The next figure shows the percentage changes from a baseline in 1983 forward for the CPI (red), MFR costs (blue) and property value (green), respectively. Note how property value increases outpaced both the CPI and MFR expenditures.



The $18.5 MM deficit projected for FY 2009/2010 was an early estimate based on the adopted FY 2008-09 budget deficit of $14.5 MM plus an additional $4 MM anticipated reduction in EMS ad valorem revenues for FY 2009-10.

In an attempt to contain costs at the System level and diversify fire department revenue streams, local fire union officials and fire chiefs collaborated in development of a proposal to assume responsibility for ambulance transport on 9-1-1 calls. This proposal was presented in late 2009. The proposal had several significant flaws in its financial and operational assumptions and was rejected.

INTERIM COST REDUCTIONS AND REVENUE INCREASES

The County has been working with System stakeholders, including the ambulance contractor, County 9-1-1 Communications Center, Office of the Medical Director, and St. Petersburg College to make changes to reduce costs in an effort to reduce the MFR budget deficits pending a full system analysis and recommendations. Although revenues and expenses from these entities normally does not effect the MFR budgets, the circumstances were such that savings in these areas would be applied towards offsetting MFR deficits and thereby mitigate the draining of EMS reserves.

Ways to increase revenue were also explored. Following a comparative analysis of ambulance rates in neighboring counties, the EMS Authority found that there was reasonable justification, based on rate comparisons with other EMS system in the area and other factors, to increase ambulance rates.

The County also negotiated with the 19 fire departments to reduce their costs or limit their cost increases.

The following table shows how these various efforts to reduce costs and increase revenues contributed to reductions in the $18.5 MM projected deficit.

Originally Projected Deficit for FY 09/2010	**$18,500,000.00**
Cost Reductions	
Reduced First Responder Agreements	$2,760,843.00
Reduced Ambulance Contract	$2,400,000.00
Reduced Office of the Medical Director	$319,934.00
St. Petersburg College	$46,700.00
Eliminate Ranger Program (5 County Positions)	$261,160.00
Total Cost Reductions	*$5,788,637.00*
Revenue Increases	
Increased Ambulance User Fees	*$7,564,626.00*
Remaining Deficit (to be covered by drawing from reserves)	**$5,146,737.00**

EXECUTIVE SUMMARY

After extensive review of the growing funding deficits and the failure of internal discussions with local cities, fire districts, and the firefighter unions to resolve these pressing issues, IPS, an experienced firm specializing in EMS and fire rescue system and process design, was engaged to objectively review the Pinellas County EMS system and then offer recommendations.

In addition to the MFR funding deficit, another major issue repeatedly surfaced throughout the review of several volumes of documents, a series of one-on-one interviews, and discussions with the EMS Resource Committee. The funding approach for MFR lacks a basic fairness in its distribution among the 19 fire departments. It is a contentious issue that must be addressed.

The following pages will provide detailed findings and analyses that have led IPS to the principal conclusion and recommendation that:

> ***A Marginal Engine Funding approach using the Paid Position Option should be implemented no later than FY 2012/2013 (October 1, 2012).*** *The model provides funding for each of the necessary 74 MFR units at the same level for every fire department, including 1 County funded position per unit.*
>
> *The funding level per MFR unit should be based upon the County-wide average for annual operating costs, including County-wide average salary and benefits paid from the EMS budget rather than call volume or funding level history. Periodically, the number and distribution of MFR responses should be re-evaluated with adjustments made accordingly.*
>
> *This approach is inherently fair to all 19 fire departments and communities while protecting the existing level of service for each citizen of Pinellas County.*
>
> *Currently, there are 64 County-funded MFR units. Our analyses show that 10 more units are needed to meet the current response time standards. Coincidentally, there are 10 additional MFR units already in operation that are funded by individual cities and fire district budgets. These unit should all become County-funded under the Marginal Engine Funding approach with the Paid Position Option.*
>
> *The virtues of the Marginal Engine Funding approach with the Paid Position Option are:*

- *provides a rational, factual basis for MFR funding*
- *provides a level of fairness in MFR funding on the basis of MFR units operated rather then the number of calls that are handled, which accommodates the needs of low volume / difficult to serve areas*
- *converts the 10 locally funded MFR units to County funded MFR units*
- *each community can spend the funds as they choose, so long as they meet their performance requirements and comply with other System policies, etc. Therefore, if a department wants to use a transport capable rescue unit to provide MFR, it is allowed to do so. However, they will not receive any more or less in MFR funding on the basis of the type of vehicle they choose to utilize.*
- *annual cost range for this option is between $23.8 MM and $28.1 MM - providing cost reductions of $15.8 to $11.5 MM for the County. This range of total MFR cost overlaps the amount now provided by the current ad valorem millage rate ($29.7 MM, less $2.5 in estimated set-asides, leaves $27.1 MM for MFR)*

The principal disadvantage is a decrease in total MFR funding for the fire departments.

The Medical First Response (MFR) program in Pinellas County consists of 64 County-funded MFR units and 10 city or fire district funded MFR units. These units are operated by 19 separate fire departments that provide the MFR service under performance contracts. The general premises behind MFR include:

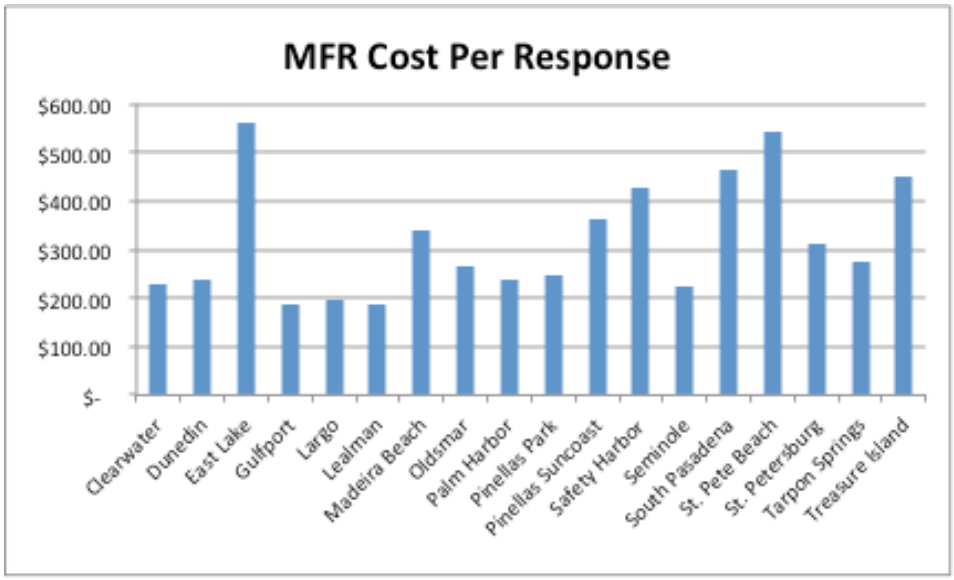
- Presumption that the net cost is lower for individual homeowners and businesses if more fire stations are built (to keep them in reasonably close proximity to homes and businesses) versus higher fire insurance premiums if more fire stations are not built. This results in more fire stations than would otherwise be justified by the fire call volume.
- Given the large number of fire stations and their proximity to homes and businesses, fire crews are often closer to the scene of a medical emergency than the closest available ambulance.
- Fires have become relatively infrequent events, leaving idle time available between fire calls for fire crews to respond to medical emergencies without significantly compromising their fire suppression role.
- Medical emergency outcomes are improved by having appropriately trained personnel on scene sooner than later
- Fire personnel, vehicles, stations, and other infrastructure have already been paid for by the community to meet their fire protection needs. Adding a medical mission to the fire department can be very economical if that

existing infrastructure and idle time between fire calls can be used to respond to medical calls.

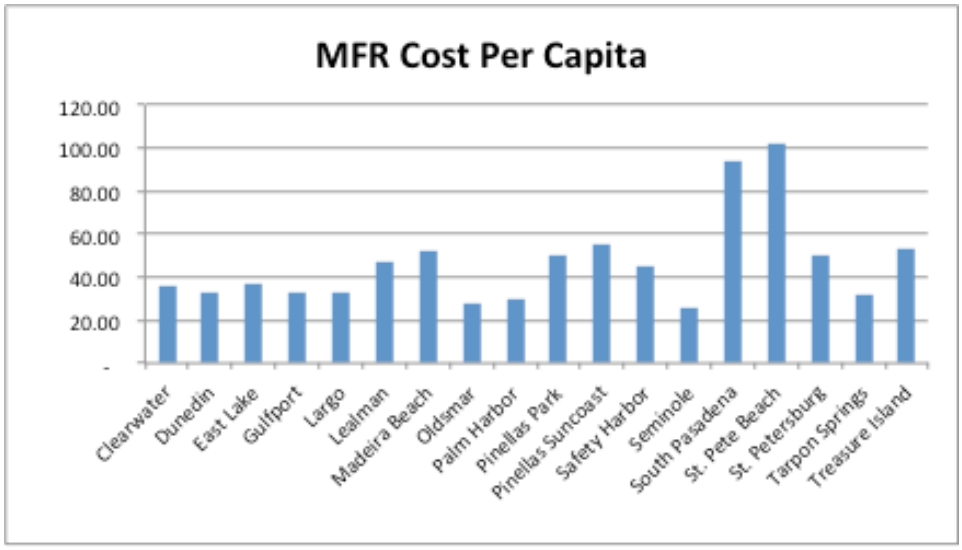
In Pinellas County, the ad valorem EMS tax was intended to cover the *additional cost* of adding the EMS mission onto the existing fire department infrastructure. This is called marginal cost funding. A very key element of this is each community having sufficient resources already in place to meet its fire protection obligations independent of any EMS funding. Over the years, the EMS funding in Pinellas County has often paid for entire vehicles and entirea positions. This is a significant departure from the premise of marginal cost funding for MFR.

The lack of fairness in how MFR funds are distributed between the 19 fire departments is a major issue. From a system-wide perspective, the amount of money paid by the County to a fire department for MFR services should be the same regardless of which fire department provides the service. Of course, there needs to be some 'normalization' of the funding on the basis of the number of calls ran, number of people served, number of MFR units operated, or some other parameter that is fair to all fire departments.

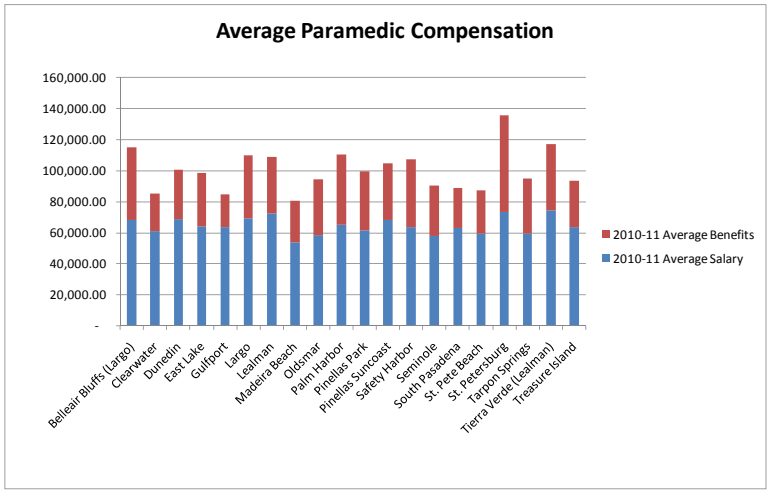
Considering MFR funding per response cross all of the fire departments in Pinellas County, there is a 202% disparity ranging from a low of $185 to a high of $558 per response.



Looking at how much MFR funding is received per resident in each city or fire district (per capita), there are also a lack of fairness. It shows a large 290% disparity ranging from a low of $26 to a high of $102.



Another perspective to consider for fairness in funding are differences in salary levels. Personnel costs are the largest category in an EMS system's budget. These analyses show a large degree of variability between departments in the salaries, benefits and the total compensation costs. Average salaries by department ranged from a low of $21,680 (Treasure Island) to a high of $73,326 (St. Petersburg) – a more than 3 fold difference. Average benefits ranged from $9,311 (Treasure Island) to $62,309 (St. Petersburg) – a nearly 7 fold difference. Total compensation ranged from $31,001 (Treasure Island) to $135,636 (St. Petersburg) – a more than 4 fold difference. The average benefits cost as a percentage of the average salary cost ranged from 33% (Gulfport) to 85% (St. Petersburg) – an approximately 2.5 fold difference. This data are illustrated in the figure and table below under the heading of 'Average Paramedic Compensation'.



Pinellas County now funds 64 MFR units. Some of the cities and fire districts have chosen to independently fund another 10 MFR units – for a total of 74 MFR units now in service. A deployment analysis revealed that 74 MFR units were needed to meet the standard between 88 and 90% of the time. Therefore, 74 MFR units is an appropriate number.

Given these findings, options were considered to close the budget deficit, protect the level of service to the citizens of Pinellas County, and establish fairness over the long term in how MFR is funded between the 19 fire departments. The MFR options considered included:

- Status Quo
- Increasing the ad valorem tax rate
- Eliminating MFR
- Privatizing MFR
- Proportional Response Funding
    - Available Funding Version
    - Current Budget Version
- Marginal Engine Funding
    - Paid Position Version
    - Salary Differential Version

Of these, the marginal engine funding method – paid position version, offers the best balance. It provides one paid position for each of the 74 MFR units with the same funding per MFR unit fairly to all fire departments. The total budget range for this option overlaps the amount of money available for MFR at the current tax millage. Patients get care in the same time frame. Patients still receive care from a paramedic.

The total cost of this option falls between $23.8 and $28.1 MM per year, depending on how many FTEs per position are funded to cover sick and vacation time and EMS supervision costs. The principal disadvantages are the reductions in funding for the fire departments – a 29% to a 44% decrease from current MFR funding.

A variant on the marginal engine funding method pays for the salary differential between a paramedic and an EMT rather than an entire salary. This cost

Keeping the status quo in place is not sustainable. It also fails to address the inequities in funding between departments.

Increasing the ad valorem tax rate would not resolve underlying problems that led to this situation. In the current political climate, public support for a tax increase is very unlikely.

The complete elimination of MFR was also considered. Pinellas County is spending approximately $39.6 MM to reduce the EMS response by just two and a half minutes. This option is easy from an operational standpoint, and it is attractive from an economic standpoint. However, it would have a severe impact the very small number of patients whose life are arguably the most dependent upon EMS – those who have a witnessed onset cardiac arrest. Those cases represent less than 1% of the call volume. This option would have severest collateral impact on fire protection services and would lead to lay-offs of a large numbers of firefighters. These factors make it a very unlikely option.

Privatizing MFR was also explored. It is more expensive if ambulances were to be utilized. Using a small SUV or sedan staffed by only one person can provide some cost savings from the current MFR budget level, but does not offer any significant savings compared to using fire engines with a full crew on a marginal cost basis.

Another option is funding in proportion to the number of calls a fire department responds to. Two variations of this were considered. Both would directly align the available ad valorem funds available with what is spent on MFR. However, it severely and inappropriately impacts low volume difficult to serve areas.

This model provides funding for each of the necessary 74 MFR units at the same level for every fire department – protecting the level of service while providing a fair and equitable method of funding MFR between the 19 fire departments. However, given the many years of funding MFR that include full salaries and in many cases, complete vehicles, the fire departments would have extremely difficult transition to this model – with severe collateral impact on fire protection capabilities. Therefore, this is not a recommended option.

Another marginal engine funding approach pays for the differential in pay between EMT and paramedic – along with fuel, equipment, etc. The response times are the same and paramedics still care for patients. Using an industry typical 15% salary differential, the total cost for this option is only $5.1 MM per year. However, this represents an 84% reduction in fire department funding. There would be a severe collateral impact on fire protection capabilities. Large numbers of firefighter layoffs would certainly occur.

A 'set-aside' fund is envisioned by the proposal. Coming out of ad valorem revenues, the set-aside fund is intended for equipment upgrades, contributions to the EMS reserve fund, and funds for implementation of new programs. A $2.5 MM estimate is used in the budget projections.

As the consumer price index, property valuations, and set-aside fund requirements change, a formula should be applied to calculate the changes that needed in the ad valorem tax rate to maintain *funding equivalence* from year to year. This could remove much of the politics from the millage rate adjustment process as the changes could be automatically applied.

The County's demographics, population, and EMS call volume will change over time. Therefore, there should be a periodic reassessment of MFR deployment – for how many MFR units are needed and where they should be located.

Many have expressed concern and frustration regarding the large number of calls that MFR units are now sent on. Many of them are difficult to justify. One method estimates that the current MFR call volume of approximately 130,000 MFR responses per year could go down to down to 83,200.

If an option for MFR funding is chosen that is not based on the specific number of responses that are made, there is probably a better chance for more earnest dialog on the topic of which calls should MFR be sent on. Reducing the number of calls that receive an initial deployment of MFR should be approached with careful consideration of several factors to include:

- Sending an engine company for MFR to cases which require ***fire*** first response services (e.g., fire protection at a motor vehicle crash)
- Sending MFR to cases where extrication and/or technical rescue services are needed
- Sending MFR to cases where additional manpower is likely to be needed (e.g., more complicated medical cases; potentially violent scenes; bariatric patients)
- Sending MFR to extremely time critical cases (e.g., cardiac arrest)

On cases where MFR is not initially deployed, the ambulance crew should always have the option to request MFR as appropriate. The need for MFR cannot always be discerned from the caller.

Who should provide ambulance transport service is another very contentious issue.

Overall, the ambulance service is running very smoothly. The County-operated billing and collections operation is running at a high level of performance. Expenses for ambulance contractor fees along with the billing and collection operation costs are well below collected ambulance service revenues. This allows other System components to be funded by ambulance service revenues to include EMS administration, medical direction, and the continuing medical education program. Additional revenues often remain even after these components are funded, allowing the rest of the net revenue to be placed into the County's EMS reserve fund. More recently, these funds have been used to help offset deficits in MFR program costs.

Several options for transport were explored.

The projected costs associated with having a fire department operated 9-1-1 ambulance service with a privately operated non-emergency ambulance service dramatically exceeds the current costs. It also creates a wide range of accountability and operational problems.

The first option considered was a fire department operated ambulance service; however, it is not viable. The costs are significantly higher. The fire departments would cost $9 MM more than the cost of the current contractor and only provide a portion of the current scope of ambulance service. There would also be significant performance accountability issues in trying to manage System performance through 20 different transport providers.

Fire department management and labor representatives expressed interest in doing transports for 9-1-1 calls, but not for routine, non-emergency inter-facility transfer calls. They would prefer to have a private contractor continue to provide those services.

In a scenario of fire department transport of patients on calls originating from the 9-1-1 center, deployment analyses[1] were performed to determine how many ambulances would be required. The deployment modeling determined that 53 transport units would be required. The locations selected for the 53 fire-based ambulances are shown in the figure labeled 'Fire Department Ambulance Locations'. However, there is some flexibility in the modeling, such that other combinations of fire station locations could potentially yield similar performance with slight changes in the selection of the 53 fire stations.

Fire Department Ambulance Locations

[1] See appendix for section on deployment analysis mathods

To put that plan into place, 27 additional ambulances with equipment would need to be purchased. The most current pricing is $217K per unit, totalling $5.8 MM.

Based on average fire department personnel compensation costs, fuel, vehicle replacement escrows, etc., the annual operations cost per fire department ambulance would be $742.3K. For a total of 53 ambulances, this comes to $39.3 MM per year for the 9-1-1 transports.

Presently, the County collects a total of $41.1 MM per year in ambulance revenues. If $39.3 MM of that is spent on covering costs for fire department transport, there is only $1.8 MM remaining to pay for the non-emergency transports – and is quite inadequate for that purpose. There also would not be any funds left over after paying ambulance transport expenses to cover the costs of EMS administration, medical direction, continuing education or to make contributions to rebuild the EMS reserve fund.

Under the present arrangement, the ambulance contractor is paid approximately $30 MM for both 9-1-1 and the non-emergency transports. This leaves the remainder available to cover the other System costs and make contributions to the EMS reserve fund.

Beyond the financial difficulties with a fire department ambulance program, there would also be significant accountability issues. Pinellas County is densely populated. The populated areas are not separated by unpopulated areas. From an efficiency standpoint, this is best served by an ambulance fleet that has complete flexibility to send the closest ambulance to emergency scenes. This requisite flexibility would dramatically complicate accountability when the ambulances are operated by 19 different departments – plus the private ambulance contract for non-emergency calls and 9-1-1 overflow coverage.

A government operated '3rd service' ambulance provider model was considered. It did not offer any significant advantages over the current arrangement.

Consideration was also given to allowing fire department transport in high volume locations. A break-even criteria was applied to select potential sites. If there was not enough volume in transports at particular site to cover the cost of operating the fire department based ambulance, it was not given further consideration.

The break-even criteria came down to locations that have at least 12.56 responses per day. At the same rate of payment that the current contractor receives, $224 per transport, the annual operating expense for an ambulance, with fire department average personnel costs, comes to $742K per year. Only approx. 72% of EMS responses result in transport, so while 3,314 transport hit the break even point, 4,577 responses per year are needed to get that many transports. That equates to 12.56 response per day.

Only 3 locations met the criteria. That could be stretched to 4 if a group of locations are averaged together within the same department to meet the break-even criteria. They are all located in St. Petersburg.

However, breaking contracts with the current ambulance contractor and disrupting the current system design to accommodate 3 or possibly four ambulances does not offer any particular benefit to the system – apart from some political

accommodation to the interests of fire departments wanting to provide transport. The benefits do not outweigh the disadvantages.

Another option considered was a public-private partnership. In such an arrangement, the 19 fire departments would band together partner with a private company to form a combined public-private entity. This public-private entity would be the ambulance service contractor – not the individual fire departments or the private ambulance firm. The combined resources of all parties could be utilized to meet contractual requirements. The accountabilities could be preserved because the public-private entity, not the individual participants, would be held accountable for performance as a whole.

Conceptually, this could work in Pinellas County. The primary barriers are the political complexities of getting all 19 cites and their fire departments to agree on terms. In the past, the fire departments have tried to band together to bid on the ambulance service contract under the competitive RFP process. The fire departments were never able to build a coalition of the 19 to even submit a bid. Therefore, this is an interesting but highly unlikely option.

One of the things the fire departments in Pinellas County have done very well together is develop policies and procedures that let their combined resources work across jurisdictional lines to serve their communities in a smooth and collaborative manner. While the fire departments are not legally consolidation into a single department, they have found a way to behave in a way that might be termed as virtual consolidation.

Given the success and experience of the fire departments in Pinellas County in virtual consolidation, an option was considered for virtual consolidation that included the ambulance contractor.

It is envisioned that a virtual consolidation could give the ambulance contractor the latitude to ask the fire departments with transport capabilities to handle transport on cases it is having delays responding to. The ambulance company could also be given the option to purchase ambulance unit hours from fire departments on a pre-scheduled basis. This may be particularly beneficial in difficult to serve, low call volume areas – like the beach communities.

While this would probably not involve a large number of calls being transported by the fire department and thereby resolve any major financial deficits, it does provides a simple and sensible solution that would offer direct benefit to patients.

The City of St. Petersburg engaged the services of a fire and EMS consulting firm, TriData, to explore transport feasibility for their City. The projections of revenue and expenses suggested that the City of St. Petersburg could net between $7.4 and $10.4 million annually if it did its own ambulance transportation and billing operations. These net revenue projections were based on billing $600 per transport

and a 100% collection rate. These assumptions fail to consider payer types, allowable billing amounts and actual collection rates.

IPS examined the actual billing and collections data from the Pinellas County EMS billing and collections office. The IPS review considered payer types, allowable billing amounts and historical collection rates. and payer profiles:

- County has a net collection rate of 68.9 %
- County has a payer case mix and average cash collected per trip as follows:

Payer	Average Cash Per Trip	Percentage of Trips
Medicare	348.38	40.00%
Medicaid	160.37	5.90%
Insurance	384.94	26.50%
Facilities	432.49	5.30%
Private Pay	51.93	22.30%
Overall	**283**	**100%**

The costs of medical direction; continuing education program; EMS administration; financial reserve contributions and other miscellaneous costs are paid from ambulance revenues at $45.89 per response. It would be unfair for the City of St. Petersburg to calculate net revenues without allowing for these costs at the same rate of $45.89 per response.

The cost of operations against the projected revenue was considered by two methods. One is through a process where the City of St. Petersburg manages a self-collection process as described in the TriData report, using a billing and collections contractor. The other process is by allowing the County to manage billing and collections and take the same rate of payment as the ambulance contractor receives - $224 per transport (deep-discount revenue).

Using these more precise and realistic assumptions from actual billing and collection history in Pinellas County, the projected net for the City of St. Petersburg is annual loss of just above $5 MM.

There are other issues to consider beyond the net revenue impacts on both the City of St. Petersburg and the County. If the City of St. Petersburg separated itself from the rest of the System, it would result in compromises to the rest of the County:

- Some communities would totally or partially separated from the rest of the County – to the south and along the southern beaches. This would create disruptions in emergency response coverage for 'in-system' mutual aid both in and out of these separated areas.
- Loss of economies of scale – to the economic and operational detriment of both the City of St. Petersburg and the County

Therefore, IPS recommends:

- Keeping the general terms of the current ambulance contract and associated County operated billing and collections processes in place county-wide
- Consider modifications to the ambulance contract and first responder contracts and medical protocols as needed to facilitate operations consistent with the virtual consolidation approach

MEDICAL FIRST RESPONSE REVIEW

The Medical First Response (MFR) program in Pinellas County consists of 64 County-funded MFR units and 10 local city or fire district funded MFR units. These units are operated by 19 separate fire departments that provide the MFR service under performance contracts requiring the MFR unit to 1) arrive in emergency-mode responses (those using lights and sirens) with a target response interval of 7 minutes 30 seconds (7:30) at least 90% of the time. In FY 09-10, the aggregate performance of all 19 fire departments met those response time requirements 92% of the time.

There are a few fundamental issues that should be clearly understood to help put the analyses and recommendations about MFR into proper context.

Fire departments provide a variety of services on 9-1-1 calls independent of their EMS role. These services include things like fire fighting, automobile crash extrication and other type of 'technical' rescue operations. This is referred to as fire first response (FFR).

In contrast, medical first response (MFR) is a mission that many, but not all, fire departments across the United States have taken on. The general premises behind MFR include:

- Presumption that the net cost is lower for individual homeowners and businesses if more fire stations are built (to keep them in reasonably close proximity to homes and businesses) versus higher fire insurance premiums if more fire stations are not built. This results in more fire stations than would otherwise be justified by the fire call volume.

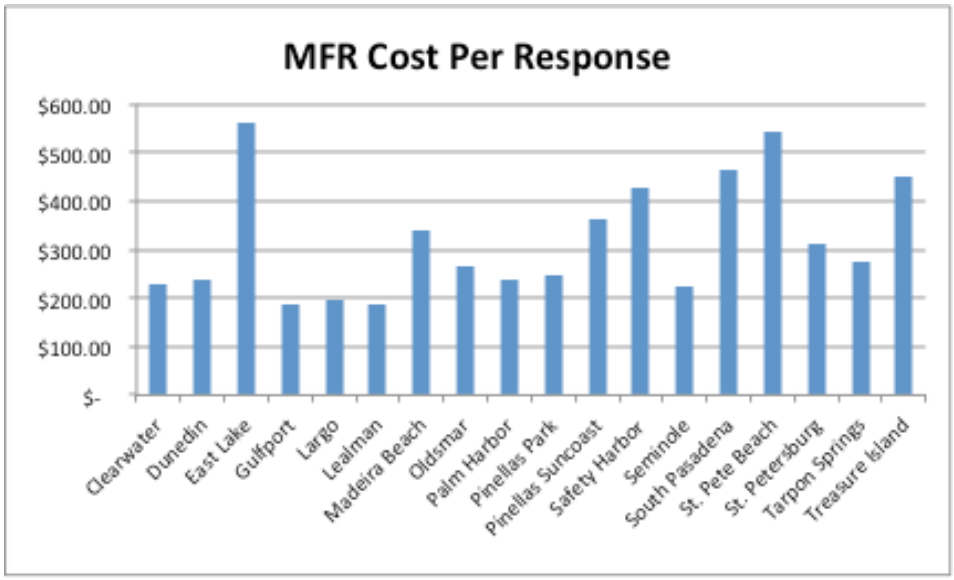
- Given the large number of fire stations and their proximity to homes and businesses, fire crews are often closer to the scene of a medical emergency than the closest available ambulance.
- Fires have become relatively infrequent events, leaving idle time available between fire calls for fire crews to respond to medical emergencies without significantly compromising their fire supression role.
- Medical emergency outcomes are improved by having appropriately trained personnel on scene sooner than later
- Fire personnel, vehicles, stations, and other infrastructure have already been paid for by the community to meet their fire protection needs. Adding a medical mission to the fire department can be very economical if that existing infrastructure can also be used to respond to medical emergency calls.

In Pinellas County, the ad valorem EMS tax was intended to cover the *additional cost* of adding the EMS mission onto the existing fire department infrastructure. This is called marginal cost funding. A very key element of this is each community having sufficient services already in place to meet its fire protection obligations independent of any EMS funding. Over the years, the EMS funding in Pinellas County has often paid for entire vehicles and new positions. This is a significant departure from the premise of marginal cost funding for MFR.

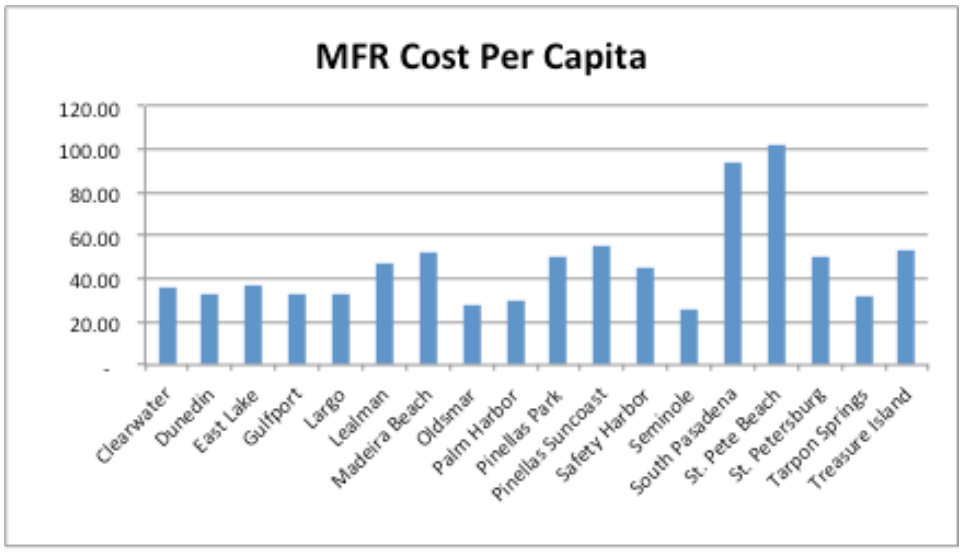
As described in the section entitled 'Economic Threats', the increase in the MFR budget has significantly exceeded increases attributable to rises in the CPI.

Another very significant issue in MFR funding is the fairness in how the MFR funds are distributed between the 19 fire departments. From a system-wide perspective, the amount of money paid by the County to a fire department for MFR services should be the same regardless of which fire department provides the service. Of course, there needs to be some 'normalization' of the funding on the basis of the number of calls ran, number of people served, number of MFR units operated, or some other parameter that is fair to all fire departments.

The figure labeled 'MFR Cost Per Response' examines the MFR funding per response for all of the fire departments in Pinellas County. There is a 202% disparity ranging from a low of $185 to a high of $558 per response.

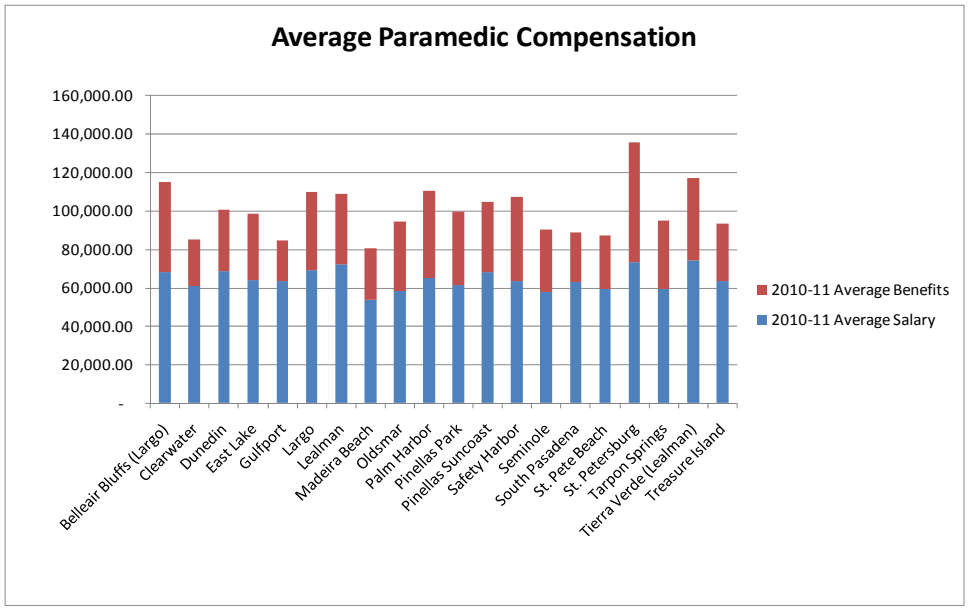


The figure labeled 'MFR Cost Per Capita' looks at how much MFR funding is received per resident in each city or fire district. It shows a large 290% disparity ranging from a low of $26 to a high of $102.



Another attribute to examine for fairness in MFR funding levels are the differences in personnel compensation. Personnel costs are the largest category in an EMS system's budget. These analyses show a large degree of variability between departments in the salaries, benefits and the total compensation costs. Average salaries by department ranged from a low of $21,680 (Treasure Island) to a high of

$73,326 (St. Petersburg) – a more than 3 fold difference. Average benefits ranged from $9,311 (Treasure Island) to $62,309 (St. Petersburg) – a nearly 7 fold difference. Total compensation ranged from $31,001 (Treasure Island) to $135,636 (St. Petersburg) – a more than 4 fold difference. The average benefits cost as a percentage of the average salary cost ranged from 33% (Gulfport) to 85% (St. Petersburg) – an approximately 2.5 fold difference. These data are illustrated in the figure and table below under the heading of 'Average Paramedic Compensation'.



Department	2010-11 Average Salary	2010-11 Average Benefits	Benefit Pct	Average Total Compensation
Belleair Bluff	68,100.00	46,900.00	69%	115,000.00
Clearwater	60,942.54	24,407.54	40%	85,350.08
Dunedin	68,501.00	32,017.33	47%	100,518.33
East Lake	64,331.56	34,292.89	53%	98,624.44
Gulfport	63,440.67	21,081.11	33%	84,521.78
Largo	69,400.00	40,800.00	59%	110,200.00
Lealman	72,204.79	36,668.62	51%	108,873.41
Madeira Bea	53,722.33	26,934.00	50%	80,656.33
Oldsmar	58,350.00	36,270.33	62%	94,620.33
Palm Harbor	65,226.00	45,306.00	69%	110,532.00
Pinellas Park	61,647.00	38,048.06	62%	99,695.06
Pinellas Sunc	68,432.67	36,506.05	53%	104,938.71
Safety Harbo	63,862.50	43,527.50	68%	107,390.00
Seminole	57,864.80	32,372.71	56%	90,237.51
South Pasade	63,029.33	25,753.69	41%	88,783.02
St. Pete Beac	59,229.28	28,080.70	47%	87,309.98
St. Petersbur	73,326.91	62,308.78	85%	135,635.69
Tarpon Spring	59,607.17	35,600.67	60%	95,207.83
Tierra Verde	74,447.87	42,700.57	57%	117,148.44
Treasure Isla	63,490.00	30,139.00	47%	93,629.00

The disparities in funding for MFR arose from variety of causes. Many of the disparities ultimately trace back to negotiations during the time that a County-wide system was established. Later, different departments were differing how their EMS costs were being allocated and then submitted for funding. There were also salary disparities that became exaggerated by cumulative differences in contract negotiations over the years between the different firefighter union locals.

IPS also examined the interplay between the MFR and non-MFR fire department budget amounts. The objective was to see if there were any discernable trends or patterns between MFR and fire funding. A correlation analysis showed that MFR funding correlates with the total fire budget at a rate >0.48. This means that upward of 48% of the variation in departmental total fire department funding might be explained by the variability in MFR funding. Unfortunately, there are too few data points to provide any useful insight on the possibility that fire departments may have been shifting fire costs onto the County-funded MFR budget (i.e., cuts in the fire budgets would show increases in the MFR budgets by a corresponding amount.).

A comparison of Pinellas' MFR budgets with other similar Florida communities was attempted. Unfortunately, MFR is funding is not a separate item in any of their fire department line item budgets. This is because MFR is considered to be one of many types of basic services that fire departments provide and is built into their overall fire budgets. While it speaks well to the extraordinary financial transparency that Pinellas has with regard to its MFR funding, it makes meaningful or valid direct MFR cost comparisons with other communities all but impossible. The results of the attempted comparisons were therefore meaningless.

Another facet of the MFR issue to consider was whether there enough or too many MFR units. Pinellas County now funds 64 MFR units. Some of the cities and fire districts have chosen to independently fund another 10 MFR units – for a total of 74 MFR units now in service.

A deployment analysis[1] was made to determine how many MFR units would be needed to serve the entire County and meet the target response interval of 7:30 at least 90% of the time. The analysis showed that 74 MFR units were needed to meet the standard between 88 and 90% of the time. Therefore, 74 MFR units is an appropriate number.

One of the problems noted in the MFR program was the lack of a real-time "closest unit response" protocol. Although GPS technology is commonly used for this purpose in many other EMS systems, fire departments in Pinellas County are not currently using it.

Presently, when a 9-1-1 call is received and when caller supplied information indicates that an emergency (i.e., lights and siren) is appropriate, the call is assigned to the 'home' MFR unit that has primary responsibility for serving that location. In the event that the 'home' unit is already on a call or is out of their response area (e.g., training; returning from a distant call), the call is assigned to the unit listed in a database as the next in line to serve a call in that area. The problem is that the *actual* location of the *closest* MFR unit which could happen to be passing close by, is not considered.

The way that MFR response times are tracked does not fully align with the interests of patients. Currently, the target is arrival within 7 minutes 30 seconds (7:30). If an MFR unit arrives just one second before the target, at 7:29, it is counted the same as an arrival 4 minutes earlier at 3:29. For the extremely time sensitive cases, like cardiac arrest, the arrival 4 minutes earlier is incredibly valuable but there is no recognition or incentive for doing so. A related problem is that arrival at 7:29 is acceptable while arrival at 7:31 is not acceptable – even though there is no

[1] See appendix for details on the methodology

significant difference in patient outcome associated with a 2 second difference in arrival – even on a cardiac arrest.

OPTIONS

Based on the findings, analyses and conclusions from the assessment of MFR services, a wide range of options were considered to close the budget deficit, protect the level of service to the citizens of Pinellas County, and establish fairness over the long term in how MFR is funded between the 19 fire departments. The MFR options considered included:

- Status Quo
- Increasing the ad valorem tax rate
- Eliminating MFR
- Privatizing MFR
- Proportional Response Funding
    - Available Funding Version
    - Current Budget Version
- Marginal Engine Funding
    - Paid Position Version
    - Salary Differential Version

STATUS QUO

Although keeping things as they are now is possible for very the short term, it is not a viable long term solution.

During the 2014 budget year, the reserve fund is projected to become totally depleted if thing remain unchanged. As discussed earlier in this report, this fund is intended for financially sustaining EMS operations in the aftermath of natural disaster or other emergency situations when ambulance fee revenues may be disrupted. It is highly unlikely that the economy and property values will recover in time to replenish EMS ad valorem fund at the current millage rate before the fund is exhausted.

INCREASING THE AD VALOREM TAX RATE

Although this is the easiest solution from an operational standpoint, this does not seem to be a viable option. The millage rate is currently set at 0.5832 and generates approximately $30 MM in available revenue. The millage cap is 1.5. An increase in the millage to close the MFR budget gap may be made by a vote of the EMS Authority. Politically, this is unlikely to gain much support as the underlying problems of MFR budget growth outpacing the CPI and the inequities in how MFR funding is distributed would remain unresolved. Further, in the current political climate, public support for a tax increase is very unlikely.

ELIMINATING MFR

This option is easy from an operational standpoint, and it is attractive from an economic standpoint. However, clinically, it would have a severe impact on a small but specific group of patients. It also would lead to lay-offs of a large numbers of firefighters. These factors make it an unlikely option.

Pinellas County is spending approximately $39.6 MM to reduce the EMS response time by two and a half minutes. The ambulance contractor meets the requirement to arrive at the scene of an emergency in 10 minutes, or less, 90% of the time. The fire departments comply with the requirement to arrive at the scene of the same emergencies in 7 minutes 30 seconds (2 ½ minutes sooner), or less, 90% of the time.

Multiple peer-reviewed EMS research studies have found that EMS arrival several minutes sooner or later has no discernable impact on patient outcomes in cases *except* cardiac arrest.[1,2,3,4,5] Cardiac arrest cases represent less than 1% of the responses by the System.

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[1] Blackwell T, et al: Lack of Association Between Prehospital Response Times and Patient Outcomes. Prehosp Emerg Care (13)4, 2009

[2] Blackwell T, et al: Response Time Effectiveness: Comparison of Response Time and Survival in an Urban EMS System. Acad Emerg Med (9)4, 2002

[3] Pons P, et al: Paramedic Response Time: Does It Affect Patient Survival? Acad Emerg Med (15)7, 2005

[4] Pons et al: 8 Minutes or Less: Does the Ambulance Response Time Guideline Impact Trauma Patient Outcome? J Emerg Med 23(1), 2002

[5] DeMaio et al: Optimal Defibrillation Response Intervals for Maximum Out-of-Hospital Cardiac Arrest Survival Rates. Ann Emerg Med 42:242-250, 2003

PRIVATIZING MFR

Privatizing MFR, using ambulances staffed with a two person crew, is not a viable option as it would not reduce the County's costs. It would diminish fire protection capabilities by not having as many firefighters on duty at any time to meet County-wide fire protection obligations. Using a small SUV or sedan staffed by only one person can provide some cost savings from the current MFR budget level, but does not offer any significant savings compared to using fire engines with a full crew on a marginal cost basis with one paid position.

There are several factors that contribute to high costs of fire department based MFR. Generally speaking, the fire departments have very limited flexibility in their scheduling. They uniformly work 24 hour shifts and are deployed from fixed locations. In Pinellas County, there are also constraints associated with having to get FD MFR units returning distant calls back to their 'home' districts to be available for fires or EMS calls in their own communities – rather than placing them in locations where there are gaps in coverage or where there may be spike in call demand levels.

There are very predictable time and location patterns in EMS calls[1]. There are clearly predictable recurring spikes and troughs in *when* calls occur by time of day and day of the week. Many of these are intuitive. The morning and evening rush hours with more motor vehicle crashes correlates to a pattern of predictable repeating spikes. The 4 to 5 AM period on Sunday mornings when most everyone is asleep correlates to a pattern of predictable repeating troughs. There are also predictable repeating patterns in *where* calls occur. The morning and evening rush hours correlate to more calls along major roads and major intersections.

Today's computer technology allows for a very sophisticated approach to detecting these predictable repeating patterns. While these tools cannot predict precisely when or where the next call is going to occur, they can reliably predict when the number of calls are most likely to rise and fall over a 24 hour time frame on a particular day of the week. The tools can also reliably predict the general areas of a community where calls are going to occur across a 24 hour timeframe for a particular day of the week.

The 24 hour shifts and fixed locations of fire stations where the MFR units respond from fails to take advantage of these predictable repeating patterns. There is resistance from firefighters on pre-positioning themselves for the next call by moving their unit to a strategically selected intersection at certain times of the day

[1] Goldberg J: Operations Research Models for the Deployment of Emergency Services Vehicles. EMS Management Journal 1(1):20-39, 2004

on the basis of these tools – and the fire stations obviously cannot be moved around to match the geographic demand patterns. The firefighters are also generally opposed to staffing patterns where the number of firefighters on duty varies and when their shifts start and end varies in attempt to match predictable repeating call patterns. While some accommodation from the firefighters might be made by using two fixed 12 hour shifts instead of a single 24 hour shift, that does not provide sufficient flexibility to take full advantage of the predictable repeating pattern analysis from an operational perspective.

In stark contrast, private contractors have been extremely innovative in their use of sophisticated operations research tools to analyze their data to improve their ability to position ambulances to be in the right general areas of a community and have enough units available during each hour of the day to match the predictable repeating patterns of demand. Some have also developed methods to quickly mobilize additional resources in response to unanticipated spikes in demand. This is a direct consequence having a financial incentive become more efficient in how they utilize their resources. They are incentivized to meet their performance standards by placing the right number of resources needed when and where they are needed. A safety margin is added to be prepared for an unanticipated spike in demand – but that is tempered to provide a reasonable balance of cost to benefit. The fire department has no such incentives. This is an area where the more sophisticated private contractors have a significant advantage over most fire departments.

IPS conducted deployment analyses to determine whether privatizing MFR with a 7:30 minute response with 90% or better reliability would be a reasonable option. Those analyses showed that by taking full advantage of current computer technology for demand analysis along with the flexibilities in moving ambulances to match the most likely geographic patterns and then adjusting the number of ambulances to match the most likely level of demand, only 50 MFR units would be required at times of peak demand. This is in contrast with the 74 fire MFR units that are staffed 24 hours a day, 7 days a week in fixed locations.

In a privatized model, far fewer units would be required during period of lowest demand. The fire department model and privatized model compared by looking at how many total unit hours each requires for a year.

Having one MFR vehicle in service 24 hours a day on all 7 days of the week equals 168 unit hours (24 x 7 =168). This is multiplied by 74 for the number of unit hours per week. Multiplying by 52 then shows the number of unit hours needed for a year – 646,464. The more unit hours used, the higher the cost of delivering service. The privatized MFR model required only 438,00 unit hours - 32.2% fewer than the fire department model.

Model	Method	Unit hours / year
Fire Department MFR (Existing vehicle types, mostly engines)	Fixed locations; fixed staffing;	646,464
Privatized MFR (Ambulances)	Dynamically adjusted locations; Dynamically adjusted staffing	438,000

The next factor in a privatized MFR analysis is a comparison of costs for putting a unit in service for one hour – the unit hour cost. The unit hour cost was calculated from actual financial data from all fire department MFR budgets and from the County's budget for ambulance contractor services.

The unit hour cost for the fire departments, based on the averaged cost of what all fire departments are paid by County is approx.. $61.25. This takes the total MFR budget for the fire departments to approx.. $39.6 MM.

The unit hour cost, based on what the ambulance contractor is paid (including any profit), is $116. This was determined by taking the total amount paid to the contractor and dividing it by the number of unit hours they deploy. Since the ambulance contractor does not deploy anything comparable to a fire engine with marginal cost funding, the analysis is made with an ambulance staffed by two people – to be as comparable as possible to transport capable fire department MFR rescue units.

Multiplying the number of unit hours needed under the privatized MFR deployment model in a year (438,000) by the unit hour cost ($116) gives the projected annual cost for the privatized model– $50.8 MM.

The reason why the privatized MFR model cost is higher, despite better deployment and lower personnel costs, speaks to the primary strength of fire department. The local fire departments can all provide MFR on a marginal cost basis using vehicles and other infrastructure that is already paid for under their fire budgets. The further that fire departments stray away from being able to deliver MFR on a marginal cost basis, the more they diminish their biggest competitive advantage in providing MFR.

If the costs to the County were similar between the two models, fire department MFR would be preferable. This is because privatizing MFR would diminish fire protection capabilities by not having as many firefighters on duty at any time to meet County-wide fire combat obligations. This is an important consideration in the event of a major incidents or other situations of high demand for firefighting

resources. Therefore, privatizing MFR is not a viable option based on the calculations above.

However, another option for privatized MFR is using a small SUV or sedan staffed by only one crew member. This model is common in many areas of the United Kingdom. For that scenario, a general unit hour cost was calculated by taking half of the unit cost from the original privatized model calculations above. This equates to use a vehicle that costs only half as much to purchase and operate. It also equates to half the personnel cost. While this method may not be precise, it has enough accuracy to reveal if the cost is in a range that is greater, similar, or less than the fire department MFR cost. With half the unit hour cost and the same number of unit hours, the total cost of privatized MFR by this method is $25.4 MM.

In fairness to the fire department for comparison, if they used small SUVs or sedans and one crew member for MFR, their total estimated cost would be $28.1 MM (with 3.6 FTEs per position) plus $2.2 MM for the initial purchase of 74 vehicles at $30K each.

PROPORTIONAL RESPONSE FUNDING – AVAILABLE FUNDING VERSION

IPS concludes that while this model has strong merits in cost reduction and some elements of fairness, it inappropriately impacts low volume difficult to serve areas. Therefore, the disadvantages outweigh the benefits.

One of the parameters for assessing fairness in MFR funding cited earlier was the amount of funding per response. The proportional response funding (PRF) model takes the total projected amount of available MFR funds for the coming year and divides it by the historical proportion of MFR responses that each fire department attends. If a given fire department goes to 5% of the MFR calls, it would receive 5% of the available MFR funds.

The table below shows how MFR funding would look for each of the 19 fire departments and contrasts the resulting funding levels with the current funding levels. For example, the first row in the table is for Clearwater FD. They ran 20,473 calls in FY 09-10 and received $5,067,389 in funding. Their call volume represents 15.76% of the total MFR call volume. If they were given 15.76% of the available MFR funds, it would come to $4,270,428. This would be a decrease of $796,961 – a decrease of 15.73%.

Department	Total EMS Responses	Total Budget FY10	% of Responses	PRF $	Change w/ PRF	% Change w/ PRF
Clearwater	20,473	5,067,389	15.76%	4,270,428	-796,961	-15.73%
Dunedin	5,135	1,319,990	3.95%	1,071,101	-248,889	-18.86%
East Lake	1,987	1,236,536	1.53%	414,465	-822,071	-66.48%
Gulfport	2,114	415,210	1.63%	440,956	25,746	6.20%
Largo	17,645	4,238,640	13.58%	3,680,540	-558,100	-13.17%
Lealman	8,694	2,224,053	6.69%	1,813,467	-410,586	-18.46%
Madeira Beach	1,025	362,622	0.79%	213,803	-148,819	-41.04%
Oldsmar	1,400	385,932	1.08%	292,024	-93,908	-24.33%
Palm Harbor	6,773	1,819,746	5.21%	1,412,769	-406,977	-22.36%
Pinellas Park	9,021	2,961,321	6.94%	1,881,675	-1,079,646	-36.46%
Pinellas Suncoast	2,454	969,501	1.89%	511,876	-457,625	-47.20%
Safety Harbor	1,997	914,683	1.54%	416,551	-498,132	-54.46%
Seminole	8,206	2,031,427	6.32%	1,711,676	-319,751	-15.74%
South Pasadena	515	710,173	0.40%	107,423	-602,750	-84.87%
St. Pete Beach	519	1,118,241	0.40%	108,257	-1,009,984	-90.32%
St. Petersburg	38,050	12,544,738	29.29%	7,936,785	-4,607,953	-36.73%
Tarpon Springs	3,083	899,739	2.37%	643,078	-256,661	-28.53%
Treasure Island	830	401,286	0.64%	173,128	-228,158	-56.86%
Totals or Averages	**129,921**	**39,621,227**	**1.0000**	**27,100,000**	**-12,521,227**	**-31.60%**

Note that the available MFR funds are shown as $27.1 MM. The total amount of ad valorem revenue is $29.6 MM. The difference between these two figures is the amount projected as a 'set-aside' fund. The set-aside fund is intended for equipment upgrades, contributions to the EMS reserve fund, and funds for implementation of new programs. The $2.5 MM funding levels for the set-asides are general projections for these purposes.

As the consumer price index, property valuations, and set-aside fund requirements change, a formula should be applied to calculate the changes that needed in the ad valorem tax rate to maintain *funding equivalence* from year to year. This could remove much of the politics from the millage rate adjustment process as the changes could be automatically applied.

The County's demographics, population, and EMS call volume will change over time. Therefore, there should be a periodic reassessment of MFR deployment – for how many MFR units are needed and where they should be located.

The advantages of Proportional Response Funding - Available Funding Version are:

- forces the System to operate within its means;
- provides equity in funding by paying departments the same amount for the MFR calls they handle;
- each community can be given the latitude to spend the funds as they choose, so long as they meet their performance requirements and comply with other System policies. For example, if a fire department wants to use a transport capable rescue unit to provide MFR, it is free to do so. However, they will not receive any more or less in MFR funding on the basis of the type of vehicle they choose to use for MFR.

- cost reduction for the County - that matches the current funding yield at the current ad valorem millage rate

The disadvantages of this funding model are:

- approximately 32% decrease from current MFR funding to the fire departments;
- severe decreases to low call volume fire departments because the model does not acknowledge that geographically isolated, low volume areas, such as beach communities) are inherently more expensive to serve on a per call basis when maintaining the same target response interval.

PROPORTIONAL RESPONSE FUNDING – CURRENT FUNDING VERSION

IPS concludes that this model offer some elements of fairness, but requires an initial tax increase and has an inappropriately severe impact on low volume difficult to serve communities. These disadvantages outweigh the benefits.

One slight variation to the above described approach was also considered. Rather the looking at currently available MFR funding based on the current millage rate and property valuations, this method assumes that the total amount of MFR funding is 'reasonable'. The change then comes in the form of proving a more equitable method of MFR funding distribution – based on the proportions from the earlier example. Thereafter, the same formula-based approach would be applied to adjust the tax rate to maintain funding equivalence. This model has the same virtues, but some departments will still end up with a significant net loss, to include low volume / difficult to serve areas.

The advantages of Proportional Response Funding - Current Funding Version are:

- forces the System to operate within its means – after an initial increase in the millage;
- provides equity in funding by paying departments the same amount for the MFR calls they handle;
- each community can be given the latitude to spend the funds as they choose, so long as they meet their performance requirements and comply with other System policies. For example, if a fire department wants to use a transport capable rescue unit to provide MFR, it is free to do so. However, they will not receive any more or less in MFR funding on the basis of the type of vehicle they choose to use for MFR.
- overall, the funding to MFR is the same

- some department will see an increase in MFR funding

The disadvantages of this funding model are:

- requires a tax increase to initiate;
- some departments will see a decrease in MFR funding
- severe decreases to low call volume fire departments because the model does not acknowledge that geographically isolated, low volume areas, such as beach communities) are inherently more expensive to serve on a per call basis when maintaining the same target response intervals.

MARGINAL ENGINE FUNDING – PAID POSITION OPTION

This model provides funding for each of the necessary 74 MFR units at the same level for every fire department – protecting the level of service while providing a fair and equitable method of funding MFR between all 19 fire departments. The annual cost range for this option is between $23.8 MM and $28.1 MM – which overlaps the current MFR funding ad valorem yield of $27.1 MM at the current millage rate.

The deployment analysis shows that 74 MFR units are needed. This model provides funding for all of the 74 MFR units at the same level for every fire department. That funding level per MFR unit is based on the County-wide average for annual operating costs, including average total personnel cost levels on the EMS budget, rather than call volume. It uses a staffing multiplier of 3.6 - meaning that 3.6 full-time equivalent (FTE) positions are needed to staff each 'seat' on the MFR unit on a 24/7 basis. The other 0.6 FTE position is used to provide staff to cover for sick and vacation time. The total annual cost of this option with a 3.6 staffing multiplier is $28.1 MM.

The table below shows how this option would look financially for each fire department. For example, the first row shows that the City of Clearwater would receive $4,176,700 under this method, in contrast to its current funding level of $5,067,389. This represents a decrease in annual funding of $890,689.

Department	One-Seat Funding 3.6	Current Funding	Difference
Clearwater	4,176,700.00	5,067,389.00	(890,689.00)
Dunedin	1,139,100.00	1,319,990.00	(180,890.00)
East Lake	1,139,100.00	1,236,536.00	(97,436.00)
Gulfport	379,700.00	415,210.00	(35,510.00)
Largo	3,797,000.00	4,238,640.00	(441,640.00)
Lealman	1,518,800.00	2,224,053.00	(705,253.00)
Madeira Beach	379,700.00	362,622.00	17,078.00
Oldsmar	759,400.00	385,932.00	373,468.00
Palm Harbor	1,898,500.00	1,819,746.00	78,754.00
Pinellas Park	2,278,200.00	2,961,321.00	(683,121.00)
Pinellas Suncoast	1,139,100.00	969,501.00	169,599.00
Safety Harbor	759,400.00	914,683.00	(155,283.00)
Seminole	1,898,500.00	2,031,427.00	(132,927.00)
South Pasadena	379,700.00	710,173.00	(330,473.00)
St. Pete Beach	759,400.00	1,118,241.00	(358,841.00)
St. Petersburg	4,556,400.00	12,544,738.00	(7,988,338.00)
Tarpon Springs	759,400.00	899,739.00	(140,339.00)
Treasure Island	379,700.00	401,286.00	(21,586.00)

There is a slight variation to this model that should also be considered. There is a reasonable argument to be made that the only 3 FTEs per position are really needed. The 0.6 additional FTEs do not represent coverage of actual costs incurred by departments to cover absences, vacations, etc. The total annual cost of this option, with a 3.0 staffing multiplier, is $23.8 MM.

The table below shows the same model, but with only 3 FTEs per 24 hour 'position' to be funded. For example, the first row shows that the City of Clearwater would receive $3,543,100 under this method, in contrast to its current funding level of $5,067,389. This represents a decrease in annual funding of $1,524,289.

Department	One-seat Funding 3.0	Current Funding	Difference
Clearwater	3,543,100.00	5,067,389.00	(1,524,289.00)
Dunedin	966,300.00	1,319,990.00	(353,690.00)
East Lake	966,300.00	1,236,536.00	(270,236.00)
Gulfport	322,100.00	415,210.00	(93,110.00)
Largo	3,221,000.00	4,238,640.00	(1,017,640.00)
Lealman	1,288,400.00	2,224,053.00	(935,653.00)
Madeira Beach	322,100.00	362,622.00	(40,522.00)
Oldsmar	644,200.00	385,932.00	258,268.00
Palm Harbor	1,610,500.00	1,819,746.00	(209,246.00)
Pinellas Park	1,932,600.00	2,961,321.00	(1,028,721.00)
Pinellas Suncoast	966,300.00	969,501.00	(3,201.00)
Safety Harbor	644,200.00	914,683.00	(270,483.00)
Seminole	1,610,500.00	2,031,427.00	(420,927.00)
South Pasadena	322,100.00	710,173.00	(388,073.00)
St. Pete Beach	644,200.00	1,118,241.00	(474,041.00)
St. Petersburg	3,865,200.00	12,544,738.00	(8,679,538.00)
Tarpon Springs	644,200.00	899,739.00	(255,539.00)
Treasure Island	322,100.00	401,286.00	(79,186.00)

Another factor to consider in looking at justification for more than 3 FTEs per position is to provide funding for EMS supervision. Adding the EMS mission onto a fire department comes with added administrative responsibilities. Presently, the County funds on an arbitrarily determined level of 0.25 FTEs for EMS supervision for each County-funded MFR unit.

The virtues of Marginal Engine Funding – Paid Position Option funding model are:

- provides a rational, factual basis for MFR funding
- provides a level of fairness in MFR funding on the basis of MFR units operated rather then the number of calls that are handled
- does not unfairly treat low volume / difficult to serve communities
- converts 10 locally funded MFR units to County funded MFR units
- allows the System to operate within its means
- each community can spend the funds as they choose, so long as they meet their performance requirements and comply with other System policies, etc. For example, if a department wants to use a transport capable rescue unit to provide MFR, it is free to do so. However, they will not receive any more or less in MFR funding on the basis of the type of vehicle used for MFR.
- provides cost reduction for the County

The principal disadvantages are:

- 3.6 FTEs per position version results in an approx. 29% decrease from current MFR funding for the fire departments
- 3 FTEs per position version results in an approx. 44% decrease from current MFR funding for the fire departments

MARGINAL ENGINE FUNDING – POSITION DIFFERENTIAL OPTION

This model provides funding for each of the necessary 74 MFR units at the same level for every fire department – protecting the level of service while providing a fair and equitable method of funding MFR between the 19 fire departments. However, given the many years of funding MFR that included full salaries and in many cases, complete vehicles, the fire departments would have extremely difficult transition to this model – with severe collateral impact on their fire protection capabilities. Therefore, this is not a recommended option.

This model is essentially the same as the Marginal Engine Funding Paid position Option just described. The key difference is how much funding is provided per position. Recall that the premise behind marginal cost funding for fire department MFR is that the EMS budget should only pay the difference in cost for adding the EMS mission cost onto the existing vehicles, personnel, and infrastructure. With that in mind, all personnel on the MFR unit should already have their base salaries and benefits paid for. This version of the Marginal Engine Funding model limits personnel cost coverage to an estimate for the differential in pay between EMT and paramedic. For the purposes of this analysis, an industry typical 15% salary differential was used. Other County-wide average operational costs (fuel, supplies, etc.) are covered. The table below shows the results in funding for this true marginal cost approach. It uses a staffing multiplier of 3.6 FTEs per position.

Department	Salary Differential 3.6 FTEs	Current Funding	Difference
Clearwater	945,340.00	5,067,389.00	(4,122,049.00)
Dunedin	257,820.00	1,319,990.00	(1,062,170.00)
East Lake	257,820.00	1,236,536.00	(978,716.00)
Gulfport	85,940.00	415,210.00	(329,270.00)
Largo	859,400.00	4,238,640.00	(3,379,240.00)
Lealman	343,760.00	2,224,053.00	(1,880,293.00)
Madeira Beach	85,940.00	362,622.00	(276,682.00)
Oldsmar	171,880.00	385,932.00	(214,052.00)
Palm Harbor	429,700.00	1,819,746.00	(1,390,046.00)
Pinellas Park	515,640.00	2,961,321.00	(2,445,681.00)
Pinellas Suncoast	257,820.00	969,501.00	(711,681.00)
Safety Harbor	171,880.00	914,683.00	(742,803.00)
Seminole	429,700.00	2,031,427.00	(1,601,727.00)
South Pasadena	85,940.00	710,173.00	(624,233.00)
St. Pete Beach	171,880.00	1,118,241.00	(946,361.00)
St. Petersburg	1,031,280.00	12,544,738.00	(11,513,458.00)
Tarpon Springs	171,880.00	899,739.00	(727,859.00)
Treasure Island	85,940.00	401,286.00	(315,346.00)

The virtues of this funding model are:

- provides a rational, factual basis for MFR funding
- provides a level of equity in MFR funding on the basis of MFR units operated rather then the number of calls that are handled
- converts 10 locally funded MFR units to County funded MFR units
- allows the System to operate within its means
- each community can spend the funds as they choose, so long as they meet their performance requirements and comply with other System policies, etc. Therefore, if a department wants to use a transport capable rescue unit to provide MFR, it is free to do so. However, they will not receive any more or less in MFR funding on the basis of the type of vehicle used for MFR.
- provides a *dramatic* reduction in cost to the County

The principal disadvantages are:

- Severe funding reduction to all fire departments – by 84%
- Severe collateral impact on fire protection capabilities

- Large numbers of firefighter layoffs are likely

MORE APPROPRIATE USE OF MFR

Many voices in the general public, elected and senior appointed County and municipal officials, and many EMS personnel have expressed frustration with the large number of calls that MFR units are now sent on. A very large portion of the calls to which MFR currently responds are difficult to justify.

If an option for MFR funding is chosen that is not based on the specific number of responses that are made, there is probably a better chance for more earnest dialog on the topic of which calls should MFR be sent on.

Reducing the number of calls that receive an initial deployment of MFR should be approached with careful consideration of several factors to include:

- Sending an engine company to cases which require ***fire*** first response services (e.g., fire protection at a motor vehicle crash)
- Sending an engine company to cases where extrication and/or technical rescue services are needed
- Sending MFR to cases where additional manpower is likely to be needed (e.g., more complicated medical cases; potentially violent scenes; bariatric patients)
- Sending MFR to extremely time critical cases (e.g., cardiac arrest)

On cases where MFR is not initially deployed, the ambulance crew should always have the option to request MFR as appropriate. The need for MFR cannot always be discerned from the caller.

The emergency medical dispatch process used in the Pinellas County 9-1-1 Communications Center is based on the Advanced Medical Priority Dispatch System (AMPDS). This process assigns calls to one of 5 broad categories that roughly correlate to the time sensitivity and severity of the case. The lowest categories of time sensitivity and severity in the AMPDS ('alpha' and 'omega') are responsible for approximately 36% of the current EMS 9-1-1 call volume. This is a rough indication of the percentages of cases in which MFR might not be needed. This would take the current call volume of 130,000 MFR responses per year down to approximately 83,200.

However, the dialog on this issue may become complicated again if the MFR call volume is significantly reduced (as it should be) and a new deployment analysis is made to see if any fewer MFR units are required at the new MFR call volume level.

However, it is the appropriate responsible thing to do for good stewardship of taxpayer funds.

RECOMMENDATIONS

- Use the Marginal Engine Response – Paid Position Option with funding for between 3.6 and 3.0 FTEs per position
    - Consider providing some level of accommodation above a 3.0 staffing multiplier for sick and vacation time coverage as well as EMS supervision costs
- Limit initial deployment of MFR to cases where it can justified on the basis of fire protection, scene safety, manpower needs, or extreme time sensitivity
    - If economic conditions further deteriorate, consider recalculation of the number of MFR units required based on revised MFR call volumes
- Give each city and fire district the option to respond to more calls it responds to beyond minimum established requirements, but without changing the level funding they receive from the County
- Give each city and fire district the option to use transport capable units, but without changing the level funding they receive from the County
- GPS should be used on all FD apparatus, including field supervisor units
    - Locations of units should be displayed on the computerized maps used in the 9-1-1 Communications Center
    - Unit locations should be integrated into any unit selection decision support systems, particularly on *extremely* time sensitive cases, such as cardiac arrest and other AMPDS category 'echo' cases
- Response interval performance should be reported and regulated in a more detailed manner which recognizes and that arrival sooner than later on extremely time sensitive cases, like cardiac arrest, is valuable.
    - Rather than using a single time metric for reporting purposes, the EMS Authority and the fire departments should consider using reports that look at the percentage of responses in 4 minute time segments as well as the 7:30 target:
        - % of responses within 7:30 (at least 90% required)
        - % of responses within 0:00 to 3:59
        - % of responses within 4:00 to 7:59
        - % of responses within 8:00 to 11:59
        - % of responses within 12:00 to 15:59
        - % of responses greater than or equal to 16:00

TRANSPORT

Overall, the ambulance service is running very smoothly. The County-operated billing and collections operation is running at a high level of performance. Expenses for ambulance contractor fees along with the billing and collection operations are well below collected ambulance service revenues. This allows other System components to be funded by ambulance service revenues – to include EMS administration, medical direction, and the continuing medical education program. Additional revenues often remain even after these components are funded, allowing the rest of the net revenue to be placed into the County's EMS reserve fund. More recently, these funds have been used to help offset deficits in MFR program costs.

The projected costs associated with having a fire department operated 9-1-1 ambulance service with a privately operated non-emergency ambulance service dramatically exceeds the current costs. It also creates a wide range of accountability and operational problems.

No major changes are recommended in the ambulance transportation or billing and collections components of the Pinellas County EMS System.

Ambulance transport is provided by a private contractor selected through a competitive procurement process. The selected bidder is awarded exclusive County-wide emergency and non-emergency ambulance service. provider contract. The ambulance contract comes with many stipulations to meet a variety of performance requirements.

The contractor must also post performance bonds, which protect the County's interests and provide for continuity of service in the event of failure to adequately perform on key requirements or if the contractor is immediately removed for sufficient cause. The procurement and contract management processes overseen by the County are well designed and provide a robust set of quality controls that dramatically improve the probability of compliant performance throughout the duration of the contract.

The ambulance service in Pinellas County operates under a County trade name of Sunstar. The purpose of the trade name is to maintain continuity of branding regardless of the entity that that County contracts with to provide the service.

No significant issues or deficiencies were identified in contractor performance. The contractor has actually exceeded expectation in many respects. Their high level of performance has been externally validated through their receipt of the highest level

of recognition in the Florida Sterling program.[1] This is a very significant achievement.

Similar to the problem noted in MFR response time tracking and reporting, the way that ambulance response interval performance is tracked does not fully align with the interests of patients. Currently, the target is arrival within 10 minutes 0 seconds (10:00). If an ambulance unit arrives just a couple seconds before the target, at 9:58, it is considered the same way as arrival in 4 minutes earlier at 5:58. For the extremely time sensitive cases, like cardiac arrest, the arrival 4 minutes earlier is incredibly valuable but there is no recognition or incentive for doing so. A related problem is the arrival at 9:58 is acceptable while arrival at 10:01 is not acceptable – even though there is no significant difference in patient outcome associated with a 3 second difference in arrival including cardiac arrest.

The ambulance contract currently requires that the ambulance meet the 10 minute response time with 90% reliability for the County overall and in each of the 19 cities and fire districts. The rationale for this policy is that all residents pay the same rate in taxes to support EMS; and they should get the same level of response time. Generally, this makes sense in a densely populated area such as Pinellas County; however, this may inadvertently have a negative impact on the outcomes for extremely time sensitive emergency cases.

There is peer-reviewed science that suggests there may be significant differences in how ambulances are deployed depending on which of the following two objective are being sought: political equity or survival from extremely time sensitive emergencies such as cardiac arrest.[2,3] The current system design and ambulance contracts recognizes the political equity factor but does not recognize the potential conflicts this may cause when trying to optimize deployment for higher rates of survival from cardiac arrest.

The system design in Pinellas places responsibility for billing and collections of ambulance user fees with the County rather than the ambulance contractor. The ambulance contractor is paid a guaranteed rate for each transport provided. Through this arrangement, the County is incentivized to manage the billing and collections process efficiently so that more funds in user fees are collected than paid out to the ambulance contractor.

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[1] http://www.floridasterling.com/performanceimprovement_awardrecipients.html. RE: 2009 recipient listing for Sunstar Paramedics.

[2] Erkut E, Ingolfsson A, Erdogan G: Ambulance Location for Maximum Survival. Naval Research Logistics. 2007.

[3] Feldera S, Henrik Brinkmann H: Spatial allocation of emergency medical services: minimising the death rate or providing equal access? Regional Science and Urban Economics 32 (2002) 27–45

In Pinellas, this has worked out well. The collections in ambulance user fees have been in excess of payout to the ambulance contractor and billing and collections operation costs for many years. These revenues are used to pay for other EMS administration costs, medical direction contractor costs, CME contractor costs, and other miscellaneous system leaving enough remaining to enable contribution to the EMS reserve funds. Presently, these funds are being used to help offset the deficit in MFR program costs.

OPTIONS

Given the economic challenges facing the System, IPS examined the potential benefits that other options for ambulance transport services might provide.

FIRE DEPARTMENT AMBULANCE SERVICE

The first option considered was a fire department operated ambulance service; however, it is not viable. The costs are $9 MM higher than the cost of the current contractor - and only provides a portion of the current scope of ambulance service. There would also be significant performance accountability issues with 20 different transport providers.

Fire department management and labor representatives expressed interest in doing transports for 9-1-1 calls, but not for routine, non-emergency inter-facility transfer calls. They would prefer to have a private contractor continue to provide those services.

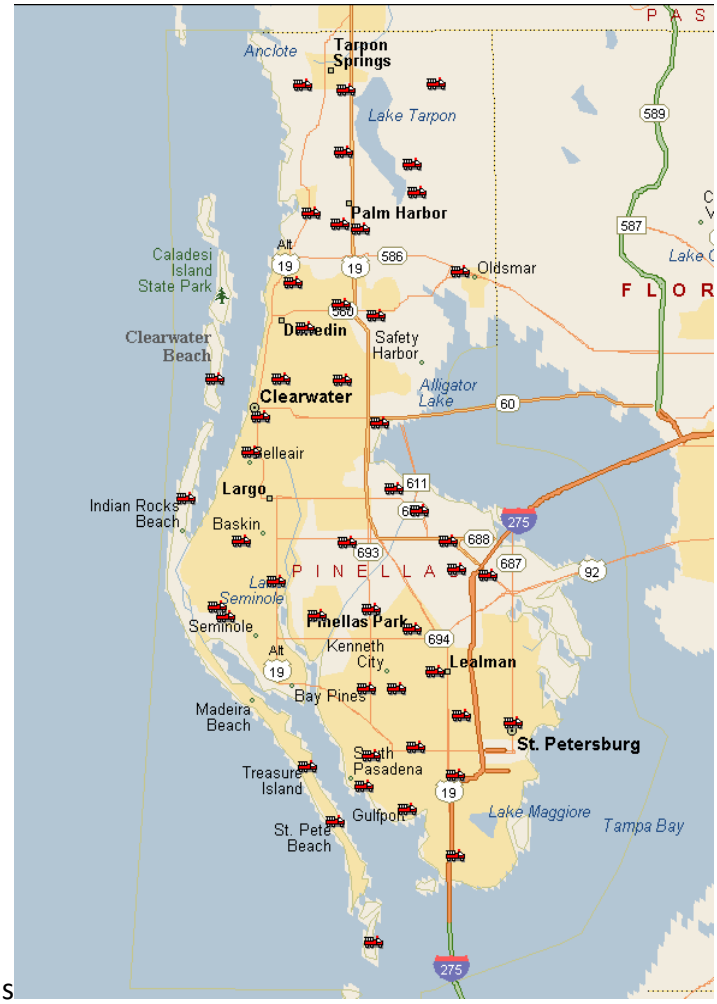
In a scenario of fire department transport of patients on calls originating from the 9-1-1 center, deployment analyses[1] were performed to determine how many ambulances would be required. This would be different from the number of ambulances used by the incumbent private contractor. The fire department ambulances would be based out of existing fire stations, not street posts as used by the current contractor. However, the deployment modeling used assumes that upon completion of a transport at the receiving hospital, the fire department ambulance is immediately available for another call. This is in contrast with the fire department's preferred scenario of returning to the community where the ambulance is based

[1] See appendix for section on 'Deployment Analysis Methods'

without taking calls the ambulance may be closer to on their way back to their primary response area.

With a set of operational assumptions, the deployment modeling determined that 53 transport units would be required. The locations selected for the 53 fire-based ambulances are shown in the figure labeled 'Fire Department Ambulance Locations'. However, there is some flexibility in the modeling, such that other combinations of fire station locations could potentially yield similar performance with slight changes in the selection of the 53 fire stations.

Fire Department Ambulance Locations



To put that plan into place, 27 additional ambulances with equipment would need to be purchased. The most current pricing is $217K per unit, totaling $5.8 MM.

Based on average fire department personnel compensation costs, fuel, vehicle replacement escrows, etc., the annual operatiing cost per fire department ambulance would be $742.3K. For a total of 53 ambulances, this comes to $39.3 MM per year for the 9-1-1 transports.

Presently, the County collects a total of $41.1 MM per year in ambulance revenues. If $39.3 MM of that is spent on covering costs for fire department transport, there is only $1.8 MM remaining to pay for the non-emergency transports – and is quite inadequate for that purpose. There also would not be any funds left over after paying ambulance transport expenses to cover the costs of EMS administration, medical direction, continuing education or to make contributions to rebuild the EMS reserve fund.

Under the present arrangement, the ambulance contractor is paid approximately $30 MM for both 9-1-1 and the non-emergency transports. This leaves the remainder available to cover the other System costs and make contributions to the EMS reserve fund.

Beyond the financial difficulties with a fire department ambulance program, there would also be significant accountability issues. Pinellas County is densely populated. The populated areas are not separated by unpopulated areas. From an efficiency standpoint, this is best served by an ambulance fleet that has complete flexibility to send the closest ambulance to emergency scenes. This requisite flexibility would dramatically complicate accountability when the ambulances are operated by 19 different departments – plus the private ambulance contract for non-emergency calls and 9-1-1 overflow coverage.

Accountability for ambulance performance should only come with control of the resources. That is why the incumbent ambulance contractor controls the scheduling, placement, selection and dispatching of its own ambulances. If similar accountability was put onto the fire departments, it should have similar operational control of its dispatching. However, this it is just not practical to have 19 different MFR dispatch operations. A single County-wide fire department would make this more feasible, but that is a very different issue outside the scope of this study – and the associated complexities and politics make that an unlikely event.

Fire department ambulance service operations in Pinellas County would have a net negative impact on system finances.

GOVERNMENT OPERATED AMBULANCE SERVICE

A government operated '3rd service' ambulance provider does not offer any significant advantages over the current arrangement. It potentially takes away the

incentives now in place with a private provider to meet / exceed performance requirements.

Another scenario considered is the creation of a government operated ambulance service separate from the fire department. These are referred to as 3rd service ambulance providers (with reference to police and fire as the other two public safety services).

A 3rd service ambulance operation could potentially operate with greater flexibility in scheduling and deployment than the fire department; however, 3rd service operators typically do not use dynamic deployment methods to the degree that private entities do. Third service operators are also not typically under the pressure of a well-designed performance contract. They do not have the same pressure to perform with a risk of losing performance bonds and being 'fired' if they fail to meet requirements. They also do not have the financial incentives to be efficient in their business operations to maximize profits.

FIRE DEPARTMENT TRANSPORT IN HIGH CALL VOLUME LOCATIONS

There are 3 or 4 current MFR unit locations where a fire department ambulance is likely to run enough calls to break even at averaged fire department operating costs. They are all located in St. Petersburg. Breaking contracts with the current ambulance contractor and disrupting the current system design to accommodate 3 or possibly 4 ambulances does not offer any particular benefit to the system – apart from some political accommodation to the interests of fire departments wanting to provide transport. The benefits do not outweigh the disadvantages.

Other options were also considered that fall between fully privatized ambulance transport under a performance contract and all 9-1-1 ambulance transport being handled by the fire departments. Some members of the EMS Resource Committee suggested that it may be appropriate to limit the number of fire department operated ambulances to those with higher call volume areas. This option was given consideration as to how the locations for fire department ambulances would be selected. Payment to the fire departments was not presented as an issue per se, other than having the County fund the cost of ambulance operations. This would allow the County to retain any funds that might remain after the operating expenses were covered.

This scenario would require selection of sites where there would be provide enough transports to cover the operating costs. To be fair, the same rate of 'payment' used

for the ambulance contractor ($224) was applied to determine total 'revenue' from a fire department operated ambulance. Based on an annual operating cost of $742,300 for a fire department ambulance and a 'revenue' per call of $224, at least 3,314 transports per year are needed to break even. County data shows that the overall rate of 9-1-1 responses that result in transport is 72.4%. This means that a fire department ambulance would have to respond to at least 4,577 calls/yr. (12.54/day) to have the ambulance get the 3,314 transports / yr. (9.08/day) to break even.

This criteria for the break-even call volume is met by only two MFR units (assuming that the ambulance would be placed where the MFR unit runs the break even call volume or higher):

- Rescue 1 (St. Petersburg) with 12.63 responses/day; 4,610/yr.
- Rescue 3 (St. Petersburg) with 14.32 responses/day; 5,228/yr.
- Rescue 5 (St. Petersburg) with 12.24 responses/day; 4467/yr.

One other location was very close to the break even threshold:

- Rescue 4 (St. Petersburg) with 10.26 responses/day; 3,745 yr.

If the average response volume is for a group of units in the same fire department, a transport unit could be justified at each station for all MFR locations in the group. That would allow Rescue 4 (St. Petersburg) to be included. Individually, Rescue 4 has only 10.26 responses/day or 3,745 response /yr. Combining the response volumes of Rescues 1, 3, 4 and 5, yields a group average of 12.36/day; 4,513/yr. – just shy of the 4,577 break even target by only 64 transports for the year.

Some stations have a combined response volume at or near the break even point, but the criteria are based on MFR call volume for an individual unit, not a pair.

The larger question is whether or not MFR locations meeting the break even criteria should be assigned a fire department ambulance role. Since only a few MFR units meet the criteria, it is difficult to justify breaking the contract with the incumbent contractor and introducing the problems of performance accountability to fire department ambulances that are not dispatched by the accountable entity. Therefore, this is not a viable option.

PUBLIC-PRIVATE PARTNERSHIPS

Another option considered was a public-private partnership. In such an arrangement, the 19 fire departments would band together partner with a private company to form a combined public-private entity. This public-private entity would be the ambulance service contractor – not the individual fire departments or the private ambulance firm. The combined resources of all parties could be utilized to

meet contractual requirements. The accountabilities could be preserved because the public-private entity, not the individual participants, would be held accountable for performance as a whole.

This approach has been applied with long term success in the City of San Diego with the San Diego Medical Service Enterprise as the public-private entity consisting of the City of San Diego's Department of Fire & Life Safety Services with Rural/Metro Corporation.

Conceptually, this could work in Pinellas County. The primary barriers are the political complexities of getting all 19 cites and their fire departments to agree on terms. In the past, the fire departments have tried to band together to bid on the ambulance service contract under the competitive RFP process. The fire departments were never able to build a coalition of the 19 long enough to complete a bid. This is an interesting but highly unlikely option.

VIRTUAL CONSOLIDATION

One of the things the fire departments in Pinellas County have done very well together is develop policies and procedures that let their combined resources work across jurisdictional lines to serve their communities in a smooth and collaborative manner. While the fire departments are not legally consolidated into a single department, they have found a way to behave in a way that might be termed 'virtual consolidation'.

Given the success and experience of the fire departments in Pinellas County in virtual consolidation, an option was considered for virtual consolidation that included the ambulance contractor.

This type of virtual consolidation could give the ambulance contractor the latitude to ask the fire departments with transport capabilities to handle transport on cases it is having delays responding to. The ambulance company could also be given the option to purchase ambulance service fire departments on a pre-scheduled basis. This may be particularly beneficial in difficult to serve, low call volume areas – like the beach communities.

While this would probably not involve a large number of calls being transported by the fire department and thereby resolve any major financial deficits, it does provides a simple and sensible solution that would offer direct benefit to patients.

CITY OF ST. PETERSBURG'S TRANSPORTATION FEASIBILITY STUDY

The City of St. Petersburg engaged the services of a fire and EMS consulting firm, the TriData Division of System Planning Corporation[1], separately from the County's EMS study.

TriData's projections of revenue and expenses suggested that the City of St. Petersburg could net between $7.4 and $10.4 million annually if it did its own ambulance transportation and billing operations.

TriData's net revenue projections were based on billing $600 per transport and a 100% collection rate. These assumptions fail to consider payer types, allowable billing amounts and actual collection rates.

IPS examined the actual billing and collections data from the Pinellas County EMS billing and collections office. The objective was to get a more accurate basis for projecting the amount of money that St. Petersburg could realistically expect in gross revenues. IPS' review considered payer types, allowable billing amounts and historical collection rates. and payer profiles:

- County has a net collection rate of 68.9 %
- County has a payer case mix and average cash collected per trip as follows:

Payer	Average Cash Per Trip	Percentage of Trips
Medicare	348.38	40.00%
Medicaid	160.37	5.90%
Insurance	384.94	26.50%
Facilities	432.49	5.30%
Private Pay	51.93	22.30%
Overall	**283**	**100%**

The costs of medical direction; continuing education program; EMS administration; financial reserve contributions and other miscellaneous costs are paid from ambulance revenues at $45.89 per response. It would be unfair for the City of St.

[1] http://www.sysplan.com/capabilities/fire_ems/index.html

Petersburg to calculate net revenues without allowing for these costs at the same rate of $45.89 per response.

The table below compares the cost of operations to the projected revenue by two methods. One is through a process where the City of St. Petersburg manages a self-collection process as described in the TriData report, using a billing and collections contractor. The other process is by allowing the County to manage billing and collections and take the same rate of payment as the ambulance contractor receives - $224 per transport (deep-discount revenue).

Department	New Unit Cost	Annual Cost	Annual Calls	Deep Discount Revenue	Self Collect Revenue	Self Collect Net	Self 1st Year Net
St. Pete Beach	0	742300	2058	342056.064	335131.9711	-407168.029	-407168.0289

Using these more precise and realistic assumptions from actual billing and collection history in Pinellas County, the projected net for the City of St. Petersburg is annual loss of just above $5 MM.

There are other issues to consider beyond the net revenue impacts on both the City of St. Petersburg and the County. If the City of St. Petersburg separated itself from the rest of the System, it would result in compromises to the rest of the County:

- Some communities would totally or partially separated from the rest of the County – to the south and along the southern beaches. This would create disruptions in emergency response coverage for 'in-system' mutual aid both in and out of these areas.
- Loss of economies of scale – to the economic and operational detriment of both the City of St. Petersburg and the County

RECOMMENDATIONS

- Keep the general terms of the current ambulance contract and associated County operated billing and collections processes in place county-wide
- Consider modifications to the ambulance contract and first responder contracts and medical protocols as needed to facilitate operations consistent with the virtual consolidation approach
- Do not apply political equity standards to Echo cases; encourage deployment that optimizes for improved survival rates
- Response interval performance should be reported and regulated in a more detailed manner which recognizes and that arrival sooner than later on extremely time sensitive cases, like cardiac arrest, is valuable.

- Rather than using a single time metric for reporting purposes, the EMS Authority and the ambulance contractor should consider using reports that look at the percentage of responses with 4 minute time segments as well as the 10:00 target:
  - % of responses within 10:00 (at least 90% required)
  - % of responses within 0:00 to 3:59
  - % of responses within 4:00 to 7:59
  - % of responses within 8:00 to 11:59
  - % of responses within 12:00 to 15:59
  - % of responses within 16:00 to 19:59
  - % of response greater than or equal to 20:00

OTHER FINDINGS AND RECOMMENDATIONS

SCOPE OF SYSTEM

There are two primary routes of access to service provided by Pinellas County EMS. Requests for service can come in via the 9-1-1 telephone number, which is answered by the County 9-1-1 Communications Center. In a separate, but parallel, EMS System component, the ambulance contractor manages calls coming via a 7 digit telephone number for inter-facility and other types of scheduled medical transportation services.

Approximately 63% of the calls that come into the EMS System via the 9-1-1-telephone lines are what might be characterized as urgencies and chronic care support calls. The problem is that the 9-1-1 component of the EMS System has been designed to meet the needs of an emergency. The EMS System does not have processes in place, nor does it provide training to its staff, to appropriately handle many of these lower severity cases. This leads to the many responses to 9-1-1 calls that results in neither care nor transport. Sometimes, transport to the emergency department for these types of cases is provided. In effect, patients are taken to the hospital to see if they need to go to the hospital. This is a clear example of a misalignment between community needs and the EMS System design. This problem is not unique to Pinellas County.

Other EMS systems across the United States, and internationally, have recognized this need and are working to develop modifications to their system designs and associated care processes. Pinellas County EMS was actually at the forefront of recognizing this need back in the early 1990's when it sponsored the two original Sand Key EMS Summits. Unfortunately, there were several legislative and financial barriers back then to using EMS resources to better address this problem – and insufficient political to move past those barriers.

RECOMMENDATIONS

- Bring together local stakeholders from EMS, public health, hospitals, and payers to begin to discuss:
    - Nature and scope of 9-1-1 and emergency department resource utilization for urgencies and chronic care support
    - Associated clinical consequences
    - Associated costs to payers (governmental and private)
    - Ways to eliminate, reduce or mitigate the problem
- In parallel, begin to study research, program development efforts, and best practices in other EMS systems. Examples consider include:
    - Frequent 9-1-1 caller intervention programs
        - Houston Fire Department's CareHouston program[1]
        - Alameda County EMS' (CA) Project Respect[2]
    - Community Paramedicine programs, such as those described at the International Roundtables on Community Paramedicine[3]
    - Wake County (NC) Advanced Practice Paramedic program[4]
    - Asthma Assessment and Education Program from AMR in Alameda County (CA)[5]
- Fund development of pilot programs, and then operationalize them if successful. Funding should be a component of the budget that is comes from the EMS ad valorem tax fund.

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[1] http://www.jems.com/article/operations-protcols/carehouston-provides-new-appro-0/

[2] http://documents.csh.org/documents/ResourceCenter/HotTopicsSH/2010-FrequentUsers/ProjectRESPECTSummary.doc

[3] http://www.ircp.info

[4] http://www.wakegov.com/ems/staff/app.htm

[5] http://itunes.apple.com/us/podcast/asthma-assessment-education/id350488765?i=80479244

GOVERNANCE

The governance structure of the EMS System consists of the EMS Authority, County Administrator, Assistant County Administrator, Director of Public Safety Services, and the County EMS staff. The clinical governance rests with the Office of Medical Director and the Medical Control Board.

An entity without formal governance powers, an EMS Advisory Council (EMSAC), is codified in the Pinellas County EMS Special Act, Chapter 80-585, Laws of Florida. Section 5 of the 2001 amended version of this legislation[1] makes reference to the EMSCA as follows:

> *"It shall be the responsibility of this Council to evaluate the County's emergency medical services system from a qualitative point of view, to review the operation of EMS on a countywide basis, to recommend requirements and programs for the contract management firm and monitor performance of same, to review and evaluate studies commissioned by the authority upon the authority's request, and to make such recommendations as may be necessary to the authority on needs, problems and opportunities relating to emergency medical services, including the financing and establishment of a trauma center or centers, and to carry out such other duties as may be required to ensure the delivery of good, countywide EMS at reasonable cost."*

Despite the existence of this group, it does not seem to be utilized as envisioned or have the level of influence as envisioned by the legislation. The current EMS assessment and recommendations project that generated this report would seem to be just the sort of thing that the EMS Advisory Council should have been deeply involved in.

> *"…evaluate the County's emergency medical services system from a qualitative point of view, to review the operation of EMS on a countywide basis…"*

There does not appear to be a process in place that prompts the EMSAC to perform a system evaluation.

> *"…to recommend requirements and programs for the contract management firm and monitor performance of same, to review and evaluate studies commissioned by the authority upon the authority's request…"*

[1] http://laws.flrules.org/2001/305

The EMAC does not seem to play a meaningful role in setting requirements, recommending programs, monitoring the performance, or reviewing studies of the overall system or the contracted providers – to include the ambulance firm, medical first responders, CME contractor, or the medical direction contractor.

> *"to make such recommendations as may be necessary to the authority on needs, problems and opportunities relating to emergency medical services, including the financing and establishment of a trauma center or centers"*

The EMAC seems to receive a lot of information about the happenings within the System but does not appear to engage in developing consensus between stakeholders on contentious issues or making recommendations of any sort.

> *"to carry out such other duties as may be required to ensure the delivery of good, countywide EMS at reasonable cost."*

The EMAC does not appear to be asked to perform, nor does it initiate, activities to ensure quality EMS at a reasonable cost.

The EMS Authority is supposed to include the Chairperson from the EMAC as a non-voting member. The EMAC chair does not appear to be included, or even invited, in EMS Authority activities.

Discussions with various stakeholders revealed several potential reasons why the EMS Advisory Council is not a stronger influence. The most significant reason seems to be that many of the members of the EMS Advisory Council who serve in an operational capacity (e.g., for the ambulance service, Office of the Medical Director, fire departments, and St. Petersburg College) are on other committees that meet more often and therefore have already provided their input on issues. This seems to inadvertently bypass the broader input of the full range of technical and consumer input designed into the EMS Advisory Council's structure.

Some of the consumer representative positions on the EMSAC are filled by persons who are not 'consumers' in the sense of not being representatives of typical citizen / consumers without other interests / biases regarding EMS. Indeed, these positions are filled by physicians, elected officials, or others with specific stakeholder interests that are clearly not those of the typical citizen / consumer.

Another stakeholder group codified into the System design is the Medical Control Board. The Medical Control Board provides an important check and balance mechanism for the EMS Medical Director. It formalizes medical community input on EMS. It seems to be working reasonably well in review and approval of protocols and clinical policies.

In Pinellas EMS, there is little evidence of any visioning activities for where the EMS system should be at some point in the future. Hence, there does not seem to be a

strategy in mind for how to move the System forward. Management of the 'system' is far more reactive than proactive. In this context, IPS is referring to 'visioning' as efforts to describe what the EMS System should be like at some point in the future. The 'strategic planning' would outline the steps, resources, and associated accountabilities needed to fulfill the vision.

In the absence of visioning and strategic planning efforts (or some version thereof), the Pinellas EMS System seems to drift from year to year in an efforts that seek more to preserve the status quo and continually engage in 'managerial firefighting' rather than proactive efforts that make substantive improvements. This is a leadership issue. Pinellas County EMS has a strong infrastructure and excellent operational capabilities. It is capable of performing, and innovating, at a much higher level.

The County EMS and Fire Administration appears to be operating well on a day to day basis. The billing and collections operation seems to be operating at exemplary levels. Contract management functions seems to be working well. Much of the staff's efforts seem to be in resolution of conflicts between providers.

A notable void is a lack of 'system' performance analysis by County EMS staff. The contract management responsibilities bring scrutiny of operational performance at an individual contractor level from a compliance standpoint. There is a stark absence of analysis how the overall system performs. For example, there are two sources of dispatch data – from the 9-1-1 communications center for fire department medical first response and another from the ambulance communications center for ambulance responses. Processes have not been developed that allow analysis of the combined impact of ambulance and first response performance in aggregate. IPS attempted to do its own aggregate response performance analysis to report on overall system performance and found that the data structures to not accommodate this in a reasonable manner – particularly for an EMS system that responds to approximately 130,000 calls a year.

Another shortcoming was found in financial oversight. Until the current economic challenges described earlier in this report came to light, there did not seem to be much detail in the scrutiny of the medical first responder budgets. Fortunately, the economic challenges seem to have forced a correction of this shortcoming.

RECOMMENDATIONS

- Utilize the EMS Advisory Council in a manner that honors the intent of the legislation
- Reconsider the structure of the EMS Advisory Council to include four distinct groups:
    - Community Advisory Group

        - Consists of citizens or consumer group representatives without specific ties or biases to any particular EMS provider group.
    - Medical Control Board
        - As is; Consists of physicians, medical society representatives, hospital representatives, and a County health department representative
    - City and Fire District Group
        - Consists of elected or senior appointed officials (e.g. mayors, city council members, fire district board members, city managers; Should *not* include fire department staff). The members in this group should include designated liaisons from groups of elected and senior appointed officials (e.g., mayor's council; city manager's group). The Chair of the EMS Advisory Council should come from this group.
    - Provider Group
        - Consists of representatives from the ambulance contractor, fire department MFR contractors, medical direction contractor, and CME contractor
    - Non-voting members should include the Director of Public Safety Services and a designated County attorney.
- Reconsider the purpose of the EMS Advisory Council as a body which:
    - Establishes a formalized source of input and counsel to the governance structure (EMS Authority, County Administrator, Assistant County Administrator, Director of Public Safety Services, County EMS staff; Medical Control Board and the Office of Medical Director)
    - Utilizes the various EMS constituency groups as ancillary sources of input and support (e.g., Pinellas Advanced Life Support (PALS) group; city managers association; fire chief's association; CME steering committee; emergency department nurse manager's association; nursing home association; etc.)
        - EMS related activities from these recognized constituency groups reports up to the EMAC
        - Seeks consensus on issues among the constituency groups
        - Advises the EMS Authority and County EMS staff accordingly
        - A similar structure exists with the Florida EMS Advisory Council and its various EMS constituency groups[1]. This may serve as a useful model for the interrelationship between the Pinellas EMSAC and the EMS constituency groups.

[1] http://www.doh.state.fl.us/demo/ems/EMSAC/EMSAChome.html#EMSACgroups

- Facilitates a visioning process every 2 years that re-visits and re-articulates what the EMS System needs to strive to accomplish in the future to better serve the community
  - Consider an initial focus in visioning efforts that address gaps between the current status of the System versus the goals articulated in the EMS Agenda for the Future[1]; IOM EMS at the Crossroads report[2] and the Baldrige Criteria for Healthcare Performance Excellence[3] (or the Florida Sterling program criteria[4])
  - Consider recommendations for vision statement milestones on 1, 3, 5 and 10 year timeframes
    - Work with County staff to translate the vision statement milestones into strategic plan recommendations coupled with budget recommendations to achieve those milestones
  - EMS Advisory Council Chair or designee to present an oral and written report of findings to the EMS Authority
- Leads a process that evaluates the overall EMS *system* and conducts a performance audit of County EMS administration (during opposite years from the visioning process)
  - Evaluation process should be led by the Council (not the County), but performed by consultants or other outside experts
  - Appropriate funding for this function should be provided by the EMS Authority.
  - Criteria for the system evaluation should be derived from:
    - EMS Agenda for the Future[5];
    - IOM EMS at the Crossroads report[6]
    - and the Baldrige Criteria for Healthcare Performance Excellence[7] (or the Florida Sterling program criteria[1])

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[1] Institute of Medicine: Emergency Medical Services at the Crossroads. 2006. National Academy Press, Washington, DC

[2] http://www.nhtsa.gov/people/injury/ems/agenda/emsman.html

[3] http://www.nist.gov/baldrige/enter/health_care.cfm

[4] http://www.floridasterling.com/p&s_assessement_tools.html

[5] Institute of Medicine: Emergency Medical Services at the Crossroads. 2006. National Academy Press, Washington, DC

[6] http://www.nhtsa.gov/people/injury/ems/agenda/emsman.html

[7] http://www.nist.gov/baldrige/enter/health_care.cfm

        - EMS Advisory Council Chair or designee to present an oral and written report of findings to the EMS Authority
- Reconsider the composition of the EMS Advisory Council such that contracted provider entities (medical direction, first responders, ambulance service, and continuing education contractors) and County staff are not members. The members should consist of institutional, governmental and citizen 'consumers' of System services. Institutional consumers would include entities such as hospitals, care facilities, clinics, and medical societies. Governmental consumers would include representatives such as mayors / city managers, city council members, and fire district board members. Citizen consumers would include laypersons and illness care support group representatives (e.g. Altzhiemer's support group; family caregiver support group; etc.)
- Redesigning stakeholder representation / input processes so that EMS related input from the various stakeholder groups funnels up through the EMS Advisory Council.
    - The EMS Advisory Council would consider the input from all of the various stakeholder groups in forming its consensus opinions and recommendations that are forwarded to County staff and the EMS Authority.
    - In parallel, stakeholder group input can still go directly to the County staff and EMS Authority as necessary and appropriate, but not such that the EMS Advisory Council is deliberately bypassed.
- Invite the EMSAC Chairperson to attend and participate in discussions as a non-voting member of the EMS Authority
    - When the BOCC agenda includes items for the EMS Authority, an invitation and applicable portions of the Board packet should be sent to the EMSAC Chairperson.
    - The EMSAC Chair should be sent applicable portions of the BOCC minutes
- County EMS Administration, to include the billing and collections operation, should have its performance routinely measured using appropriate performance indicators (e.g., monthly or annually depending on the nature of the indicator)

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[1] http://www.floridasterling.com/p&s_assessement_tools.html

SYSTEM EVALUATION AND IMPROVEMENT

FINDINGS AND DISCUSSION

Pinellas County EMS has reached a level of sophistication that begs for better tools and processes for evaluating *System* performance. Objective evaluation data of overall System performance is essential to sound decision-making at a System level, and the Pinellas County EMS System has severe limitations in this area which are hampering high-level policy decision-making.

More specifically, the lack of this data compromises the ability of System leaders to objectively assess the impact that substantive changes have or will have on System performance. Further, in the absence of objective evaluation data, the System is highly susceptible to continuations of ineffective and costly policies, programs and procedures.

For example, how much did the first unit's arrival on-scene change when Sunstar's response time of 10:00 went from 92% to 90%? On cardiac arrest and other extremely time-sensitive case types, what correlations were there, if any, to that change and survival rates?

Currently, Pinellas County EMS does have *some* metrics in place help evaluate System performance. The Office of the Medical Director has been diligent in development and implementation of various clinical case registries and associated process performance metrics; howver, clinical outcome data is still very scarce. Certainly, this is a challenge that goes beyond the span of control of EMS; however it also speaks to the very limited level of engagement that EMS has with the receiving hospitals which unfortunately impedes progress at a community healthcare level.

For example, what is the impact of the trauma system? We may know for an individual patient and maybe for an individual hospital but not for the entire County trauma *system* in aggregate. Additionally, we do not know what the differences are in stratified risk adjusted outcomes, if any, between cases delivered by ground ambulance versus helicopter versus private vehicles. Similarly, problems exist for evaluating care of heart attacks, stroke and other time-sensitive high-risk case types.

Also, operational metrics, specifically with regard to response interval performance, are in place for each of the 19 fire department MFR programs and the ambulance contractor. These metrics have been important for County EMS staff to measure contractual compliance with response requirements and are very well evolved for each individual contractor.

However, the necessary infrastructure and processes are *not* in place to integrate the fire department MFR response and emergency medical dispatch data from the computer aided dispatch (CAD) system in the County 9-1-1 Communications Center with the Sunstar's response and emergency medical dispatch data in the CAD at Sunstar's communications center and therefore we cannot evaluate the performance of the *System*. As a result, we do not know how soon EMS arrives at the scene of a 9-1-1 emergency response in aggregate. It can only be answered for MFR and the ambulance separately.

And by extension, there becomes no real accountability for the overall System performance, and is likely the major reason why the necessary infrastructure and processes are not in place to integrate data so performance can be measured, monitored and help facilitate improvements. In the absence of objectively and regularly monitored System performance data, the System is forced to identify improvement opportunities that come up as problems to be solved in a reactive manner rather than proactively. Typically, the outcome in 'reactive' improvement initiatives restores the relevant process to its pre-problem performance level rather than making a net improvement. The latter is the inherent objective with proactively generated improvement initiatives.

There are plans for Pinellas County Government, as a whole, to implement an 'enterprise performance management' solution - Oracle Hyperion[1]. This is step in the right direction as this type of solution is suited to addressing data collection and reporting needs for multiple entities while deriving tiered reports ('roll-ups') for enterprise-level (System) views.

RECOMMENDATIONS

- The EMS Advisory Council should facilitate System assessment by:
  - Identifying key stakeholders and then determine what their respective needs and expectations are from EMS
    - Develop 'quality' performance indicators that reflect on how well those needs and expectations are being met
    - Develop 'cost' performance indicators that reflect on the cost of processes used to address these needs and expectations
    - Combine quality and cost metrics to calculate value[2]
    - Pressing the EMS Authority to develop the resources to implement and report on these metrics at a provider

[1] http://www.oracle.com/us/solutions/ent-performance-bi/index.html

[2] Gunderson M: The EMS Value Quotient: Looking at the Combined Effects of Costs and Quality. Journal of Emergency Medical Services (JEMS). 34(3):36-7 (March 2009)

organization and System level via a business intelligence system accessible to the County EMS staff, OMD, provider organizations, CME contractor, and others as appropriate

- Oversee a regularly scheduled self-assessment process. This would gather and organize information in preparation of an external assessment process
  - Assess the System in context of:
    - Accreditation criteria from CAAS[1] and CFAI[2]
    - The Baldrige Criteria for Healthcare Performance Excellence[3]
    - EMS Agenda for the Future (and applicable Agenda document for system components [e.g., education, research])[4]
    - IOM's EMS at the Crossroads report[5]
- Oversee a regular scheduled external assessment of System performance – particularly in context of how well the System is meeting community needs and at what cost
  - Consider participating in the Florida Sterling[6] or the national level Baldrige programs for the self-assessment and for a site-review team to perform the external assessment
  - Have summaries of System and provider agency performance reports presented to the Office of the Medical Director, Medical Control Board, EMS Advisory Council, the EMS Authority
    - To enhance external accountability, send copies of the performance report summaries attached to press releases to local media
    - Develop a data warehouse that integrates data from disparate sources pertaining to a specific incident
    - Develop and implement as universal incident and patient identifier system
      - Orange County (FL) EMS has had an excellent system in place for several years

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[1] Commission on Accreditation of Ambulance Services. http://www.caas.org

[2] Commission on Fire Accreditation International http://www.publicsafetyexcellence.org

[3] http://www.nist.gov/baldrige/enter/health_care.cfm

[4] http://www.nhtsa.gov/people/injury/ems/agenda/emsman.html

[5] Institute of Medicine: Emergency Medical Services at the Crossroads. 2006. National Academy Press, Washington, DC

[6] http://www.floridasterling.com/p&s_assessement_tools.html

- Develop and implement, incrementally, a comprehensive set of clinical, operational, and financial performance metrics at a System, provider agency, and work unit (i.e. crew or individual) levels
- Couple the data with a robust business intelligence system that facilitates automated calculation, display and dissemination of performance metrics.
- Explore how the County's Oracle Hyperion system could be used by Fire, EMS and 9-1-1 for KPIs, dashboards, scorecards, and other business intelligence functions with access by dispatch, ambulance contractor, FDs, OMD, CME and EMS administration
- Discussion should take place early regarding implementation and coordination to integrate with the County's Public Safety Services Division and the disparate data systems at the Office of the Medical Director, ambulance contractor, fire departments, CME contractor, hospitals, public health department, etc.
    - FirstWatch may also be a viable platform for this functionality within EMS
- Include robust on and off-site data storage for routine back-up and disaster recovery

- The EMS Advisory Council and Office of the Medical Director should facilitate System performance improvement efforts
    - Focus most efforts on projects that align with the System's strategic and operational priorities
    - Adopt a performance improvement methodology (e.g., six sigma, lean) and use it consistently

MEDICAL DIRECTION

Medical direction in Pinellas County is a responsibility shared by the Medical Control Board (MCB) and an EMS Medical Director. The MCB is an 11-member board, appointed by the EMS Authority. The MCB is responsible for[1]:

- recommending to the EMS authority a medical director for the county EMS system
- promulgating rules and regulations on:

[1] Pinellas County Code - Article II, Section 54-60

- Minimum personnel standards for ambulance crew members, first responder personnel, control center personnel, and wheelchair service drivers;
- Certification provisions for ambulance drivers, paramedics, dispatchers, and wheelchair service drivers;
- In-service training;
- On-board equipment and supplies;
- Medical protocols for first responders and ambulance service providers;
- Radio protocols;
- Mass-casualty protocols;
- Transport protocols;
- Helicopter services and protocols therefor;
- Protocols for interaction by first responder services and ambulance personnel;
- Requirements for uniformity of equipment and supplies;
- Standards governing the training and conduct of on-line medical control physicians;
- Standards for control center operations (i.e., telephone protocols, pre-arrival instructions and protocols for requesting first responder services);
- Standards for recordkeeping and reporting;
- Standards for wheelchair vehicle services; and
- Procedures for issuance, renewal, suspension, and revocation of certifications of ambulance drivers, paramedics, dispatchers or of wheelchair vehicle service drivers, which procedures shall contain due process provisions; all such provisions shall be approved, in advance, by the county attorney.

The responsibilities of the EMS Medical Director are described in two sections of State legislation. The first pertains to all EMS medical directors throughout the State[1]. The second is in language that governs EMS in Pinellas County[2].

Responsibilities for medical direction are carried out primarily by a medical direction contractor. The contracted firm is required to employ a physician, subject to County approval, that serves as the designated medical director for the Pinellas County EMS System. The company is required to provide a range of administrative services needed to carry out the fiduciary responsibilities as expressed in State and County statutes pertaining to EMS medical direction and other responsibilities

[1] Florida Statutes Ch. 402 and Florida Administrative Code 64J-1.004

[2] Pinellas County Code - Article II, Section 54-60

described in its contract with the County. The activities of the medical direction contractor are not performed under the business name of the contractor, but as the Office of the Medical Director (OMD). This is a useful approach, as a change in medical direction contractors would not require changes in all of the various documents in the state that refer to the entity that provides medical direction. A similar approach and rationale is used in referring the ambulance contractor as Sunstar rather than by the business name of the company that provides ambulance service.

Generally, feedback from field personnel and managers at all levels on medical direction was quite positive. However, online medical control (OLMC) was one of area which was repeatedly cited as an area of concern by both EMS managers and field personnel. OMD reporting on quality management initiatives and results also was cited as a concern.

OLMC is a process in which field crews make radio contact with a member of the OLMC staff for clinical consultation; authorization to perform some types of treatment; or after-the-fact notification of specific types of interventions under specific circumstances. There were two general criticisms: the use of paramedics in an OLMC role; and, the limited latitude given to field crews in carrying out care without the requirement of contacting OLMC.

Clinical supervision is a role that OMD plays an unusually strong role in compared to other EMS systems. In most EMS systems, front-line supervisors play of strong role in *clinical supervision*. Clinical supervision is commonly used for many types of administrative and clinical policy issues, such as hospital destinations and bypass issues. Emergency department physicians that are on-duty in receiving hospitals or designated 'base' hospitals provide the *online medical direction.* OLMC is typically required in many systems to obtain authorization to perform higher risk treatments. It is also where field crews turn to for a consultation with a physician on difficult cases. But in Pinellas County, with 20 different sets of EMS provider agency supervisors, employing 713 EMTs and 863 paramedics, and with 15 different sets of emergency department physicians, there is a greater potential for inconsistencies in how care is actually delivered. Among the field crews, there is a huge range of skills, knowledge, and experience – from brand new EMTs and paramedics to the highest caliber veterans who have aggressively pursued their academic / professional development coupled with many years of experience in areas where they have been more frequently exposed to high acuity cases. Therefore, Pinellas County uses its OLMC process to help ensure consistency in clinical quality across all 20 provider organizations for most all administrative, clinical policy, treatment authorization issues, and clinical consultations.

Using appropriately qualified paramedics for the administrative and clinical policy issues is not that different from the role that clinical supervisors play in other

systems. The use of appropriately qualified paramedics to provide clinical consultation and treatment authorization is less common.

In Pinellas County, the paramedic staff members used to provide OLMC are referred to as Medical Officers of the Day (MODs). In the even of truly complex clinical situation, the MODs always have access to one of the OLMC physicians to step in as needed.

The many aspects of the knowledge and skills to provide high quality OLMC are not a part what paramedics or paramedic supervisors are taught. However, a formal process missing to initially train, mentor and improve the skills of the MODs. This undermines their credibility in the eyes of many of their EMT and paramedic colleagues in the field. Similarly, the initial training and on-going development processes for the physicians also appears to be very unstructured.

The latitude given to field crews to carry out treatment before making OLMC contact is another point of contention. This manifests as whether or not field crews are required to contact OLMC for care on a particular type of case. If they are required to make OLMC contact, the issue is then how early or late in the process does the contact have to be made.

There are several factors that typically come into play for where that OLMC trigger point is set. Those factors include the size of the system; the level of detail that the quality assurance system operates at; the quality of the initial training and continuing education; the ease and practicality of real-time field to OLMC communications; and the general risk tolerance of the medical director, Medical Control Board, and EMS system managers. Factors working toward a more conservative trigger point (i.e. OLMC contact more often and sooner than later in a case) include the fact that Pinellas County is a large EMS system; the quality assurance system does not work at a very detailed level; there is easy access to real-time communications between field and OLMC staff; and the risk tolerance is relatively low. Factors in favor of a more liberal trigger point are the reasonable quality of initial training for most EMTs and paramedics; and the good quality of the continuing medical education program.

A significant portion of OMD's responsibilities relate to quality management. There are three dimensions to a well designed quality management program – quality planning (process design), quality assurance, and quality improvement[1]. The quality planning (process design) component as it relates to OMD is in writing and updating clinical protocols and policies. The process for this seems to be working well. Quality assurance as it relates to OMD, is in review of compliance to the clinical protocols and policies. OMDs efforts in this regard have been limited to detailed

[1] Juran JJ: Juran on Leadership for Quality. Free Press, New York, NY. 1989.

reviews of selected cases with a high risk profile, such as cardiac arrests and all cases with endotracheal intubation. Processes for data collection, validation and analysis of those cases have been developed and improved over many years. These processes generally operate very well, within their limited scope.

Quality assurance reviews of cases are also done by each of the 19 fire departments and the ambulance service contractor in varying degrees and with varying methods. The fire departments and ambulance contractor also provide front line supervision for a level of real-time quality assurance as well as retrospective documentation reviews for a level of retrospective quality assurance.

There does not appear to be a minimum standard for the process used by the fire departments and ambulance contractor in how they perform their respective quality assurance activities. There does not appear to be a training program for those front line and middle managers that actually provide front line supervision and retrospective documentation reviews.

The ambulance contractor and two of the fire departments have started using electronic patient care reports. This can have an enormous impact on quality assurance. The data from the paper patient care reports has limited conversion into electronic data. Quality assurance reviews have to be performed manually and are very time consuming to do well. Doing manual patient care report reviews in detail with high levels of consistently is incredibly difficult. Sustaining it over time is almost impossible. That all changes with a well-designed and well managed electronic patient care report and review process. The reason is that the software can perform a significant portion of the reviews – in great detail, with great consistency, and sustain that level of performance over time. These processes are very well evolved in the ambulance contractor's operations and will hopefully transfer well into the two fire departments that are still early in their implementation learning curve. Plans are in place to bring all of the fire departments online with electronic patient care reports within the next few years.

OMD leads a process for management of complaints. It is referred to as the Quality Assurance Review (QAR) process. This is a very well designed and well managed process.

Quality improvement is the deliberate changing of a process design in hopes of improving its performance. There are many examples of successful clinical quality improvement efforts by OMD, but they are relatively infrequent. A specific formalized for conducting quality improvement projects is not in place. This makes training for, developing and managing projects all the more difficult and less likely for projects to produce demonstrable and sustainable results. It also appears that much more of OMDs efforts are spent on managing the QAR process. Leaving little time and resources still available to conduct quality improvement projects.

The reporting of statistics and results on the quality improvement projects that are conducted and for the on-going quality monitoring programs for specific high risk case types appears to be sporadic. The information that is sent out does not seem to be effectively communicated to all levels of the EMS system. The managers of the ambulance service and each of the fire departments do not have access to the raw data on cases handled by their agencies. This is probably a consequence of most provider agencies not having their own formal interval quality management program. This hampers their internal efforts to better understand their processes and initiate improvement efforts independently, but in concert with OMD.

In Pinellas County, the EMS medical director is provided to the system through a private firm that is chosen through an RFP process. This is not particularly unusual, but is certainly as less common approach. Many other government operated or managed EMS system directly employ the medical director. One of the principal advantages is having the services of the physician under municipal liability protection. This saves on the cost of obtaining commercial liability insurance coverage. One of the principal disadvantages is the degree of separation and independence that not being a County employee provides.

In the event that the System decides to implement a community paramedicine program, there are very limited relationships established between EMS, public health, third party payers, and other relevant stakeholders.

RECOMMENDATIONS

- OMD should consider implementing a more formal training, continuing education and professional development program for its MODs. It should be focused on higher level clinical and operational decision-making, knowledge and skills associated with OLMC issues and advanced level clinical EMS issues. It should also provide continuing education and professional development oriented towards OLMC issues for the physicians who provide OLMC.
- Consideration should be given to development of a program in which field paramedics are differentiated on the basis of their objectively demonstrated knowledge, skills, and experience. That differentiation would then be used to grant use of a more liberal set of trigger points in clinical policies and protocols.
    - This would:
        - create incentives to encourage professional development and clinical excellence beyond the minimum requirements of all field staff
        - reduce frustration among the best of Pinellas County's field staff members

        - add to administrative complexities by having to track and manage more than one level of field paramedic, but the benefits would seem to be worth the investment.
- Adopt electronic patient care reporting systems as soon as possible. This should be coupled with the aggressive development of robust tools that automate as much of the quality assurance review process as possible for all patient care reports.
- OMD should place a greater emphasis on conducting formal quality improvement / research projects.
    - Emphasize projects that align with the System's strategic and operational priorities – particularly from a clinical perspective
    - Demand that projects deems successful have objectively demonstrable evidence to substantiate their success
    - Use established process improvement methods to manage projects in an effort to improve the likelihood of success and simplify training and analysis (e.g., Six Sigma, lean, Institute for Healthcare Improvement process improvement programs)
- Improve the detail and frequency of routine clinical performance reporting and clinical quality improvement projects, at both system and provider agency levels
    - Provide access to source data on case registries (e.g., cardiac arrest and intubation) to provider agencies involved in those cases
        - Make accommodations to recognize internal provider agency quality management programs to be within the realm of protected activities of the EMS system's quality management program
        - Provide training, support to provider agencies to facilitate their internal quality management efforts.
- Maintain the separation of OMD from County government
- If a community paramedicine program is to be developed, OMD and the MCB should start working towards establishing deeper and more collaborative relationships with relevant stakeholders.
    - This may lead to a need for changes in how OLMC is provided and how stakeholders are represented on the EMS Advisory Council and Medical Control Board. This should be anticipated and planned for accordingly.

CONTINUING MEDICAL EDUCATION

The continuing medical education (CME) program, at minimum, is intended to maintain core knowledge and skills and to provide as the state of art and science in EMS evolves over time. The State of Florida mandates CME through its requirements

for recertification. Some EMTs and paramedics also maintain national certification through the National Registry of Emergency Medical Technicians (NREMT).

The CME program in Pinellas County satisfies the State of Florida recertification requirements. Additional, but optional, classes are also offered to satisfy CME requirements for those who maintain NREMT certification. These education services are made available to fire department personnel while they are on-duty. Ambulance staff, due to the nature of their shift schedules, attend off-duty but with compensation for their time. Pinellas County also offers remedial education services. These are used to address specific education issues with individuals or small groups.

Since the early 1990's, the County has had an exclusive non-competitive contract with St. Petersburg College (SPC) to manage and deliver these CME services to all field EMS personnel. A CME Steering Committee, composed of ambulance and fire department representatives, provides input on curriculum topics to be addressed. OMD works with SPC to provide editorial oversight of the CME curriculum development process. SPC, working in collaboration with the CME Steering Committee and OMD, develops and delivers an original CME class specifically for Pinellas County personnel each month. Classes that do not have a hands-on skills component are delivered online. For hands-on class sessions, they are scheduled at various stations and at EMS headquarters throughout the month. If anyone misses the class they were originally scheduled for, several make-up class sessions are made available.

The CME program in Pinellas County is excellent in many respects. Most of the field personnel and managers interviewed were generally satisfied with the CME program. Many expressed very strong satisfaction with the hands-on skills sessions that have been taken 'on-the-road' to fire stations.

A number of issues came out of the conversations which point to areas where there may be opportunities for significant improvement:

- Text and static images are the primary content delivery format for online class materials. They are not very engaging.
- CME, in general, has a 'one size fits all' approach that does not recognize different levels of knowledge and experience. New medics, ones with different learning styles, or ones with interests limited to 'just meeting the minimums' receive the same CME as long time veterans and those who have more interest in their professional growth and development through CME.

Conversations with OMD revealed that there seems to be a trend developing where more and more of the CME content development is taking place at OMD rather than by the CME contractor (SPC). OMD's role in the CME program design is supposed to be focused on editorial oversight. This would involve provision of some guidance on topics and areas to emphasize in classes to be developed. It would then be followed

up with review and comment on class curriculum drafts leading before final approval by OMD.

Measurement of CME program performance seems to be limited to quizzes that are taken upon completion of individual classes. Longer term knowledge and skills retention is not assessed. The impact of CME on actual clinical performance is not measured. Operational performance or student satisfaction is also not measured.

RECOMMENDATIONS

- Use more engaging online content delivery methods, such as videos, narrated slides, etc.
- The CME contractor should be doing all of the content development, allowing OMD to focus on providing CME content ideas and editorial review
- Expand the scope of the CME program still cover the minimum requirements, but consider a more advanced version as an elective 'honors' program
- Put the CME contract out to competitive RFP in order to bring in more engaging content and higher levels of value for the funds being spent. Even if the incumbent contractor wins the RFP, they will have to have stepped up their value in a competitive process.
- Develop more robust indicators of CME program performance, to include longer term retention, impact on clinical performance, operational performance of the program itself and student / stakeholder satisfaction levels.
- Apply quality improvement methods to CME processes

GLOSSARY

Ambulance Contractor – Private contractor that provide emergency and non-emergency transport services

Advanced Life Support (ALS) – Is care beyond that of basic life support. It includes advanced skills in the management of airway and use of medications to treat various medical conditions.

Basic Life Support – Basic skills and protocols used to support basic bodily functions.

Emergency Medical Technician (EMT) – An emergency care giver trained in basic life support.

EMS Authority – The Board of County Commissioners acting in its EMS oversight capacity

Fire First Response – First response calls that require services such as extrication or fire protection in additional to the medical mission of first response.

FTE – Full Time Equivalence

Marginal Cost Funding – The inherent cost of one additional response.

Marginal Engine Funding – The funding method based on the marginal cost of providing first response.

Medical Direction – Oversight of EMS activities by a designated physician

Medical Control Board (MCD) – A 11-member board appointed by the EMS Authority that provides medical oversight.

Medical First Response (MFR) – Fire department response to EMS calls without the intent to transport; Typically arrives first on-scene.

Medical Officer of the Day (MOD) – Paramedic staff members used to provide online medical control.

Online Medical Control (OLMC) – Medical control and consultation provided by radio to paramedics

Paramedic – An emergency care giver trained in advanced life support.

Proportional Response Funding – A funding method that proportions available funding based on call demand.

Public Utility Model (PUM) – A EMS design model that provides accountability for the provision of all components of the emergency medical care system.

Target Response Interval – The time target for arrival at the scene of a call

Unit Hour – An hour that an unit is staffed and ready to respond to a request for service.

Unit Hour Utilization – An efficiency measure of the use of unit hours. It is calculated as the ratio between total unit hours and number of transports.

APPENDICES

RFP PROCESS

After review and consideration of both policy and financial implications of the EMS system, a decision was made to seek an objective assessment of the System and offer recommendations. The County Administrator and County EMS staff worked in collaboration with stakeholders to develop an RFP for the System review study. The RFP was widely circulated throughout the EMS industry and bids were received from several firms throughout the United States. A committee was used to review proposals and consisted of:

- a local city manager and an assistant city manager;
- two local fire chiefs;
- a representative from Sunstar Paramedics;
- two staff members from the Public Safety Services department;
- a representative from the Purchasing Department (acting as a facilitator)

The committed reviewed and scored them in accord with pre-established criteria. The highest score was given to the proposal from Integral Performance Solutions, LLC (IPS) based in Lakeland, FL The scoring results were presented to the Board of County Commissioners / Pinellas County EMS Authority with a subsequent decision to award the contract to IPS.

STUDY PROCESS

The process of conducting the study began with an extensive initial document review that encompassed:

- Prior consulting studies of EMS in Pinellas County, as far back as 1980.
- Documents pertaining to the 1989 St. Petersburg lawsuit against the EMS Authority
- Consulting studies being performed for the City of St. Petersburg and the City of Clearwater regarding their fire and EMS services
- Contracts between the County and the EMS providers – to include each of the fire departments, the ambulance contractor, the medical direction contractor, and the continuing medical education contractor.
- Any other recent EMS related studies or proposals to include those from the Reconfiguration Committee, the Charter Review Commission, Pinellas Legislative Assembly, Pinellas County Fire Chief's Association, or Pinellas County Firefighters Council
- Copies of all current laws, ordinances, and EMS Authority resolutions regarding EMS
- Any strategic plans pertaining to EMS and Fire Administration from Pinellas County Government
- Current and prior EMS budgets
- CAD data for all EMS and fire responses

During the course of the study, many additional documents were also requested.

IPS also conducted many meetings over the course of several months with various stakeholders to get their perspectives on the EMS System. These meetings included city officials, fire chiefs, ambulance service managers, Office of the Medical Director representatives, members of the EMS Advisory Council and Medical Control Board, and members of County staff. IPS also met with various union officials and front line personnel from the fire departments and ambulance service.

IPS collected data on EMS responses from the computer-aided dispatch (CAD) system from the County 9-1-1 Communications Center and the ambulance contractor's dispatch center.

The CAD data was used to independently analyze response interval performance and for MFR, ambulance service, and their collective performance. Analyses were also made to determine geographic and temporal requirements for MFR and ambulance deployment. Several aspects of the deployment analyses were conducted by IPS working in collaboration with faculty from the Department of Industrial and Systems Engineering at the University of Arizona.

Analyses of EMS billing data were made working in collaboration with billing process experts from EMS Management & Consultants, Inc.

Through the course of the study, IPS met with the EMSRC to present preliminary findings and discuss potential recommendations. This exchange was vital to the study process as it provided a mechanism to draw upon the enormous collective experience and expertise of the stakeholder represented on the committee. The EMRC served as sounding board that provided invaluable feedback and suggestions for other issues and ideas to consider as a part of the study.

In development of options to be considered, IPS took a 'blank page' approach that began with consideration of what communities like Pinellas County needs in terms of emergency medical response and transportation. The assessment of needs was based on:

- Review of CAD records for the nature of actual EMS requests that were made in Pinellas County
- Review of applicable major studies that have been made of community EMS needs:
    - Institute of Medicine: Emergency Medical Services at the Crossroads[1]
    - Office of Emergency Medical Services (NHTSA): EMS Agenda for the Future[2]

IPS also considered:

- new ideas;
- available and emerging research and technology;
- best practices in other communities;
- collateral impact that an option may have outside of EMS (particularly to fire protection);
- Specific ideas already being debated in the System that need to be objectively reviewed (i.e., fire department operated ambulance service)

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[1] Institute of Medicine: Emergency Medical Services at the Crossroads. 2006. National Academy Press, Washington, DC

[2] http://www.nhtsa.gov/people/injury/ems/agenda/emsman.html

In development of options to consider in meeting those needs, IPS placed a very strong emphasis on how existing resources could be leveraged to the community's advantage, if those resources offered a particular benefit or advantage.

The clinical perspective was kept primary in these considerations. However, it has to recognized that decisions need to be made that also address financial, operational and political considerations.

Inevitably, these perspectives conflict. Ideally, one would have physicians on all ambulances that are prepared to make immediate surgical or medical interventions which are beyond the scope of a paramedic. From a financial and operational perspective, one must consider how often such needs actually occur and how much additional benefit comes from make such interventions a few minutes earlier in the field before they could be done at the hospital.

The argument is often made in EMS system design that "lives will be lost" if the highest possible level of capability are not on all ambulances and first response units. Such arguments fail to consider that community resources are not infinite. Elected and appointed officials have to consider all of the community's needs and do their best to choose options that offer the most value for the most reasonable cost. This involves finding those options that meet most needs in most circumstances.

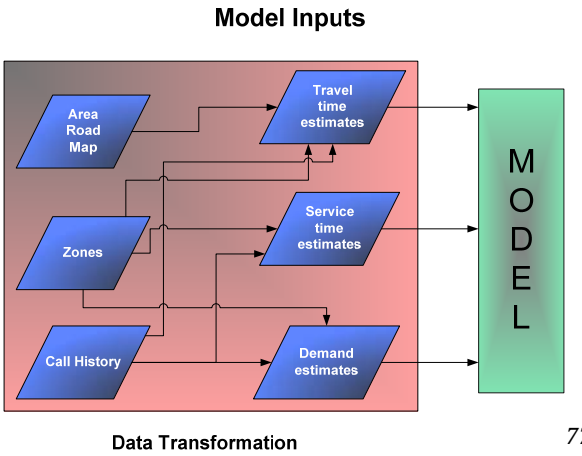
Consequently, elected and appointed officials have to make difficult choices that attempt to balance clinical, financial, operational, and political perspectives. What may be best clinically may not fit in a budget that the community is willing to pay for (e.g., emergency response intervals of 4 minutes or less with 90% reliability would save more lives than the current system, but would add many millions to the annual operating cost). What may be best operationally may not have enough political support to be a reasonable option (e.g., consolidating all 19 fire departments into a single County fire department would be simpler to manage on an operational basis but would require the 19 cities to relinquish control of fire protection services to the County). In developing it recommendations, IPS did its best to best to provide intellectually honest recommendations that provide a reasonable balance from a clinical, financial, operational, and political perspective.

DEPLOYMENT ANALYSIS METHODS

IPS uses highly sophisticated processes for emergency resource deployment assessment and planning. Our methods can be used in a variety of ways. They can be used to find:

- a combination of locations that provides the most effective use of resources at the lowest potential cost
- the optimal placement of stations from a set of available locations (e.g., from a set of locations where already have stations and where we can purchase property, which locations would offer the best emergency response coverage)
- the optimal set of a desired number stations from a larger set of available stations (e.g., what 50 stations would provide the best coverage from a set of 75 available stations);
- the number and types of units to place at stations to optimize multi-mission coverage.

The IPS approach to deployment analysis involves detailed computer modeling to give decision makers insight into critical system design issues such as the number and location of stations/posts, the number of crews to deploy, and the scheduling of crews. The IPS approach uses methods from operations research that are backed by decades of peer-reviewed operations research analysis. This approach, coupled with IPS' close ties with the Department of Systems and Industrial Engineering at the University of Arizona, have enabled us to go far beyond traditional system status (dynamic) and static deployment methods of analysis used by other consulting firms in the EMS and fire industries.



At a general level, IPS' deployment modeling involves three major steps:

- Developing a clear understanding of the current system's performance;
- Developing a model of the operations of the system based on the client's business rules; and

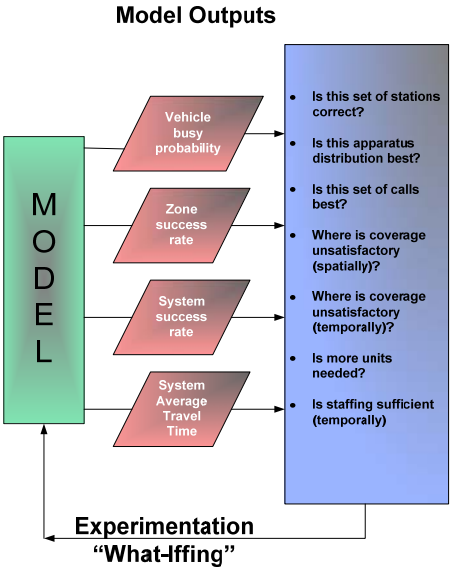
- Creating iterative adjustments to the model to enhance its effectiveness at predicting performance accurately and then using the model to give insight on the impact of different decisions.

IPS will begin by reviewing the current strategies and by working closely with Pinellas County stakeholders to gain a thorough understanding of the basis for the current station and posting placements. We will create various performance measures for comparing the outcomes of potential changes. We will investigate any potential barriers and work with stakeholders to determine whether these are true constraints or whether they can be removed or mitigated.

We will then take data from the current system (see diagram labeled 'Model Inputs') including the zone structure, ambulance and ALS first response demand, travel times, service times, and transport times and build our computer model or representation that will predict system performance as measured by vehicle utilization, inter-zone pickups, average travel time, fractions of calls that do not meet the service level criterion.

We will pay particular attention in this modeling process to the validation of the output to ensure that the model is predicting reliably and accurately. Our experience has shown that this provides an opportunity to further investigate outcomes from the model that may be different from that expected – typically dispatch decisions. The model might identify that the vehicle dispatched by the current system might not be the vehicle it selects. It is important that Pinellas County stakeholders are involved in this validation process as it may otherwise result in some delays in the subsequent step.

In a final step, we will carry out iterative experimentation with the model. We can rapidly investigate the wide range of scenarios and various strategies and thereby optimize performance – something that would be impractical with the actual system. This iterative process is depicted in the figure labeled 'Model Outputs'. Once we establish the reliability of the model, we can use it to consider alternative strategies. We will seek stakeholder's direct involvement in suggesting improvements and then noting the outcomes of these adjustments across the model. This will be especially helpful as one of the model's key features is its ability to predict the effects of load sharing. We now discuss some of the features of our general approach.



In the traditional systems status management approach, one estimates the number of crews required (by hour of the day), in order to meet demand 90% of the time. The computational method underlying this approach typically uses 20 weeks worth of data and is largely ad hoc. Our approach uses queuing theory to set crew levels. In contrast, we use our demand analysis, which makes it easier to validate assumptions that that calls come to the system based on a Poisson process distribution, rather than a 'normal' distribution. With the correct parameters and values given any number of crews and any service time mean (and distribution), IPS can compute the probability distribution on the number of busy crews. For example, if we consider a scenario where we want to deploy 15 crews, then we can compute the probability of 0, 1, 2, … 15 busy crews. The decision makers can then see the tradeoff in performance for adding additional crews. Our approach is interactive in that it is a simple matter to experiment with different numbers of crews, see performance, and then make a decision. This is a far stronger approach than the 'single value' output seen with traditional system status management methods of analysis.

Once the number of crews is determined, then one must schedule actual crews to best meet these needs. If one cannot do this well, then costs can quickly get out of control (or there will be hours where crew requirements are not met). Here, we use mathematical programming to model the scheduling problem. We schedule 2 weeks at a time and allow a variety of shifts (for example, 24 on-24 off, 4 10-hours days, 12 hour shifts) and a variety of starting times. The use of these decisions will be tailored to the user's system business rules (for example, you may not want to use certain shifts or you may want to constrain to only two shift starting times) and one can evaluate the impact of those rules on total cost. Once the model is solved, a schedule is generated and can be implemented. The computer software that constructs and solves the model was completed last spring at the University of Arizona and we are continuing to add new functions. To our knowledge, this is the only software and modeling approach that integrates the crew capacity decision with the scheduling decisions and is a clear example of how we go beyond traditional system status management approaches to deployment analysis and planning.

Once the number of crews is set, then one must deploy vehicles over the geographical area. Here again, we use a computer model to help make decisions. At a detailed level, the model employed simulates the operation of a spatially distributed queuing system. These systems have multiple servers (ambulance units in this case) and customers/demands (patients) that have a preference for particular servers based on some criteria such as proximity or appropriateness. These systems have been used to model the performance of emergency vehicle systems, mobile repair systems, distributed database systems, and weapon fire control systems. The models have been shown to be valid when applied to specific

systems and there are many instances of successful application in the operations research literature.

To implement the model, the service area(s) are partitioned into zones and the zone location of each vehicle station is known. For each zone, past data is used to estimate demand, call service time including possible hospital and transport times, and turnout times. Also, for each station-zone pair, the travel time and the probability that a call is answered within a set time standard (8 minutes for example) are estimated. The model then estimates performance of the system by estimating the following statistics:

- Fraction of time that each vehicle is busy
- Number of calls that each vehicle answers
- Fraction of answered calls that meet the time standard (by vehicle)
- Fraction of calls that meet the time standard (by zone and system wide)
- Fraction of calls that go to a system operating parallel (e.g., mutual aid) due to all vehicles being busy for example
- Average travel time for each vehicle (based on the calls it answers)
-

The model used by IPS is based on the Hypercube Approximation Model. This was developed by Dr. Richard Larson at M.I.T. in 1975 and extended by Dr. James Jarvis at Clemson in 1985 and extended further by Dr. Jeff Goldberg at the University of Arizona in 1990. Each call is assumed to require one vehicle and it is assumed that each zone has a unique preference ordering of the available vehicles/stations. This unique preference order simply implies that for any call, there is a dispatch preference order. The dispatcher then goes down the order and dispatch the first idle vehicle on the list. The model simulates this process by computing the probability that each vehicle/station on the dispatch list actually gets the call.

Our analysis provides several types of reports including detailed call analyses that include:

- 90th (or any other) percentile of reaction and response time thresholds
- 90th (or any other) percentile of call volumes
- Unit Hour Activity and Utilization levels
- Spatial (geographic) and temporal (time) mapping of response performance patterns stratified by time of day, day of week, etc.

It is important to appreciate that the level of sophistication and scope of analyses provided by IPS go well beyond the traditional scope of 'system status management'. Our system modeling technologies and methods also permit us to evaluate the combined impacts of ambulance responses and fire department 'first' response in reducing 'system' response intervals and reliability rates to specified thresholds (e.g. AED on-scene within 6 minutes).

Our approach can identify appropriate deployment of resources for:

- Evaluating the current placement of ambulance and ALS first responder locations
- Evaluating a proposed priority posting plan with a specified number of posting locations
- Establishing and evaluating the performance of priority posts
- Comparing performance of current schedule plan to alternate plans
- Identifying the best locations for smaller 'satellite' stations and / or larger 'hub' stations.
- Evaluating possible synergies or value of fire department first response in conjunction with any ambulance deployment strategy.
- Preparation of maps and diagrams that contain the projected performance of the system as well as primary response areas.