Paramedic Engine Companies: Improving the EMS Model for the City of Baytown

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

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Abstract

The problem is with the Baytown Health Department Emergency Medical Services (EMS) only having three Advanced Life Support (ALS) units in service, there are areas within the community that are not receiving an appropriate response time for ALS emergencies. The purpose of this research study was to describe the advantages and disadvantages of adding paramedic engine companies to the fire department's first responder program. The method applied to this research was descriptive and was utilized to answer the following questions: a) What benefits will the community receive if the fire department ran paramedic engine responses? b) How would a paramedic engine company impact the department's operating budget? c) What are the advantages and disadvantages to the Baytown Fire Department (BFD) in hiring a certified paramedic over an EMT-Basic? d) What improvements have other fire departments accomplished when they successfully integrated ALS into their organizations? The procedures utilized in preparing this descriptive research document consisted of a literature review, a questionnaire, Firehouse response data, and communication with the EMS Coordinator. The research has identified some advantages to the Baytown Fire Department implementing a paramedic engine company to its first responder program. The recommendation was that the Baytown Fire Department staff Engine 5 with paramedic firefighters to provide ALS service in a quick and efficient manner to the citizens that were underserved. The recommendation would benefit the citizens and guest of Baytown by providing a high level of service through the teamwork of the fire department's ALS First Responder Program and the Baytown EMS paramedics.

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Introduction

The City of Baytown is a community located approximately 25 miles east of the City of Houston, Texas on the north end of Galveston Bay on the gulf coast of Southeast Texas. The population of Baytown is 71,802 climbing to approximately 96,000 during peak times. The problem is with the Baytown Health Department Emergency Medical Services (EMS) only having three Advanced Life Support (ALS) units in service, there are areas within the community that are not receiving an appropriate response time for ALS emergencies. The purpose of this research study is to describe the advantages and disadvantages of adding paramedic engine companies to the fire department's first responder program. The method applied to this research is descriptive and was utilized to answer the following questions: a) What benefits will the community receive if the fire department ran paramedic engine responses? b) How would a paramedic engine company impact the department's operating budget? c) What are the advantages and disadvantages to the Baytown Fire Department (BFD) in hiring a certified paramedic over an EMT-Basic? d) What improvements have other fire departments accomplished when they successfully integrated ALS into their organizations?

Background and Significance

The Baytown Fire Department is a full-time, career department that is trained in a variety of emergency responses including medical, vehicle rescue, structural firefighting, hazardous materials response, technical confined/structural collapse rescue, natural disasters, and various other emergencies. The department operates a first responder program with every member certified at a minimum Emergency Medical Technician Basic Level through the Department State Health Services (DSHS). There are a few members that have pursued upper level

certification and became Paramedics even though they are not allowed to utilize their training and no ALS equipment is carried on the engines. The first responder area for BFD and the Baytown Health Department EMS is 65 square miles which includes the City and its extra-territorial jurisdiction. Currently, the incident ratio for the fire department has emergency medical responses at 62% increasing annually with the continued growth of the area (see Figure 1).

The Baytown Fire Department has six stations with five engines and one quint that respond to the medical emergencies within the first responder program. Each of the fire apparatus are staffed with a minimum of four firefighters every shift. Baytown Health/EMS has three Medical Intensive Care Units (MICUs) that are staffed with two paramedics including one supervisor on a separate ambulance that responds to incidents. If one of the six paramedics is off duty, the supervisor is moved to the vacated spot leaving three ambulances to respond to emergencies. Two of the ambulances are housed at fire stations with the supervisor's and the third ambulance housed at the original location, an old fire station in the southern portion of the City.

The Baytown Fire Department was established in 1948 when Goose Creek, Pelly, and Baytown consolidated forming one city government. The department responded to fires and occasionally responded to provide first aid. The out of hospital care was provided by the local funeral home during the late 1970's and early 1980's. The fire department personnel were trained to the Emergency Care Attendant level through the Texas Department of Health. As history is told from veteran firefighters throughout the years, the funeral director remained in the transport business until the City of Baytown entered into a contract with a private ambulance transport company in the early 1980s. A few years later, that private company pulled stakes and

left the city without ambulance services. City Administrators contacted the funeral director and asked if he would be willing to resume his ambulance services until they could figure some other avenue. In 1985, the City of Baytown began the process of forming their own ambulance service and asked the fire chief at that time if he would be willing to operate EMS within the fire department. He refused stating that the department deals with fires not medical incidents. The city administrators then decided to ask the director of the health department who jumped at the opportunity. In November of 1986, Baytown EMS was established in the health department and began operations with two ambulances out of a vacated fire station. The staffing for the newly formed Baytown Emergency Medical Services was one EMS Coordinator, a firefighter/paramedic who left the fire department to pursue a career in EMS, and 12 paramedics.

The Fire Chief retired in 1992 and a newly appointed chief, from within the department, began to make changes immediately. One of his first priorities was to develop a first responder program. The main reason for the program was because there were only two ambulances to service the city from one location and the fire department was strategically located throughout the city. The fire department also responded to incidents when mutual aid was required from other EMS providers. After gaining support from the EMS Coordinator and the Medical Director for a first responder program he met with Administrators from the local junior college. They agreed to offer the Basic EMT course in an accelerated venue. In January of 1993, the first group of firefighters began the training and in July of 1993 the Baytown Fire Department instituted the BLS first responder program. What this meant for the citizens of Baytown was that for every life threatening medical emergency there would be three basic EMTs on a fire truck and two paramedics on an ambulance responding.

As the City of Baytown continued to grow the emergency responders did not. In 1999, a supervisor's position was added to Baytown EMS. This position staffed an ambulance but was also considered a shift breaker to curtail overtime cost due to another paramedic taking off. It was not until 2005 that a third ambulance was permanently staffed placing the number of paramedics to 21 not including the EMS coordinator (D. Dalby, personal communication, December 15, 2011). The fire department went to the public with a referendum requiring the city to staff each engine and the quint with a minimum of four firefighters at all times. The referendum successfully passed and 15 new firefighters were added in 2002.

Today, Baytown EMS has a three shift rotation with three ambulances in service 24/7 with 18 paramedics and three supervisors staffing a fourth ambulance if there are no vacancies during a shift. Their call load for the calendar year 2010 was 8,083 with 5,137 of those patients being transported to a hospital (D. Dalby, personal communication, December 15, 2011). The rapid growth and service demand have increased the response times of Baytown EMS especially to the outlying areas in the northeast and west side of the city. These same incidents had fire apparatus on scene for long periods of time where personnel could have performed ALS care if they were cross trained to paramedic meeting the recommended practice and enhancing patient care. This has put a strain on our firefighters who feel they could assist their community more adequately if they were allowed to obtain paramedic certification and be allowed to perform those skills in our first responder program through a paramedic engine company.

This research project was conducted to provide information to City Administration on the advantages and disadvantages of paramedic engine companies and if the program would assist in meeting ALS recommended response criteria along with a description of the cost associated for such an endeavor. It is also intended to relate to the content of Executive Development,

specifically lead their dynamic and complex organization effectively and efficiently (*Executive Development*, 2011, p. SM 13-3). This research is also relevant to the United States Fire Administration (2010) Strategic Plan by improving the fire and emergency services' capability for response to and recovery from all hazards and by improving the fire and emergency services' professional status (*Applied Research*, 2010, p. 3).

Literature Review

There are many benefits that a community will receive from having their fire department respond paramedics on a fire engine. The citizens of a community pay their taxes and expect to receive high quality care and Baytown is no different. "Across the U.S. and Canada, citizens have come to demand high quality prehospital emergency medical care as part of routine public service (International Association of Firefighters [I.A.F.F.], 1999, p. 1). The survivability of patients in cardiac arrest with a fire department that has a first responder program that is able to make the scene within four minutes and initiates CPR is approximately an 18.2% improvement over those areas that do not have the same capability at 4.6%. The responders that are equipped and properly trained with automatic defibrillators increase the patient's survivability to approximately 25%. The responder that is cross trained to paramedic increases the survivability rate to 34.3% (International Association of Firefighters [I.A.F.F.], 1999, p. 60). The question then becomes, what is the best method of getting trained paramedics to the scene quickly and efficiently? Sachs (1998) writes,

> An option many municipalities utilize for the delivery of ALS first response is to place a paramedic on an engine company, which requires the individual to be trained not only in fire suppression but also in advanced life support initiatives, increasing efficiency for the ALS service before an ambulance arrives on the scene (p. 22).

Fire departments across the nation offer some type of medical response from basic first aid to ambulance transport. Compton (2006), states that:

> The fact is that more than 90 percent of the nation's 31,000 fire departments deliver EMS to the public. More than 60 percent provide ALS service delivered by firefighters or other fire department members arriving at emergency scenes on engines, ladder trucks, squads, rescues, or ambulances (p.26).

With the previous statement in mind it is apparent that those departments that do not provide medical responses will start to embrace the concept to better the quality of life for their community. If a department began delivering ALS care through paramedic engine companies the department would embrace the EMS mission which would enhance the quality of care. Gone are the days when a fire department will be looking for ways to avoid medical calls. Now is the time for the fire service to provide the service demanded by the taxpayer (Ludwig, 2008, p. 47). It is important to remember when adding or changing medical responses within the fire department that you stay vigilant to your personnel. Communication is vital for all concerned and explaining the importance of EMS is a critical component to the department's mission of delivering that quality service to their community (Compton, 2006, p. 26).

It is imperative that proper personnel arrive to an emergency scene to provide early interventions. A community can benefit from a fire department providing ALS care on an engine. The fire service will meet their response times more often than not because the members of the department accept the fact an emergency response is a random, isolated and unpredictable occurrence. The fire department responds to an emergency the same way at 0200 as they do for the emergency at 1400. The key factor in the success of fire-based EMS is this ability to respond

the same day or night 365 days a year (Burnett, 1999). Many fire departments are changing their first response programs from BLS to ALS engines. “Better and faster life support means better service to your citizens” (Ludwig, 2003, p. 32). The IAFF (1999) states:

> The fire service, with cross-trained/dual-role firefighters can deliver the response times and the interventions that result in optimal patient survival from cardiac arrest, stroke, traumatic injury, and other emergencies. The same personnel and resources that train and operate as a unit to extinguish fires can improve greatly the odds of community members in surviving trauma or illness (p. 62).

Many organizations are leaning towards or have implemented paramedic engine companies as their first response option. “The ability to arrive on the scene in five minutes or less with Advanced Life Support capabilities greatly impacts the chance for survivability during many medical emergencies” (Miller, 2002, p. 18).

As with any other discussion of changes or technological advances, budget restrictions come into play. When trying to determine the best avenue of enhancing the fire department’s quality of care for its citizens we must consider what is best for the City as well. The City of Baytown’s budget is no different than any other city’s budget in the nation; a majority of the expenses are due to personnel wages. It is for this reason that many new programs are not funded or are placed on the back burner. The burden of paramedic engine companies on a city’s budget is minimal as compared to hiring additional personnel to staff extra ambulances to improve a strained system. “The potential benefits of a fire-based EMS system for San Jose, California, found that integration of the ambulance service into the fire service would result in savings of 12.5 percent” (Burnett, 1999, p. 17). This could be done to reduce overtime by making the paramedics cross-trained firefighters placing them into an exempt status. Overtime came about

during the second part of the New Deal Legislation where the Fair Labor Standards Act was enacted in 1938 trying to make employers pay their employees a minimum wage and a higher wage for working overtime (Cohn, 1999, p. 109). As with many local governments, it is more economical to pay an individual overtime than it is to hire additional personnel. Cohn (1999) states,

> The overtime issue was meant to have employers employ more people to spread the work in lieu of paying them overtime. However, today due to employee benefit packages, it appears to be cheaper to pay current employees overtime rather than hiring new employees (p. 109).

Paramedics within the Baytown Health Department EMS are not cross-trained to be firefighters and are not members of the Baytown Fire Department and must be paid overtime after they have worked 40 hours in a seven day workweek. State certified firefighters are exempt from the Fair Labor Standards Act of 1985 and must work over 53 hours in a seven day workweek before being paid overtime. Utilizing cross-trained dual role firefighters allows for a more efficient staffing and lower overtime costs (I.A.F.F., 1999, p. 31).

The majority of the cost for a fire department to begin a paramedic program is training, overtime, and ALS equipment to be carried on the engines. Ludwig (2003) writes,

> Equipment needed for the ALS engine consist of variety of technological equipment such as monitor/defibrillators. These units can cost upwards to $35,000 per unit and the department would need one for each Paramedic Company plus backup monitors in case of failure and repair times (p. 34).

The department will need to have the proper amount of paramedics on duty with the right equipment. In order to get the firefighters trained to paramedics, the department will need to

place the individuals into a certified paramedic program. The tuition and any overtime cost will be paid on behalf of the firefighter. There will also be overtime to cover their vacancy at the fire station while they attend class and perform the required clinical hours. Ludwig (2003) writes:

> Obviously you cannot operate an ALS first responder program without paramedics. Enough paramedics also mean having enough paramedics to cover all shifts, including vacancies created by paramedics because of vacation, illness, injury, etc. You cannot have the engine operate ALS one day and then BLS the next day. Once you establish a level of care in the community, you must maintain that level (p. 32).

By placing paramedics and ALS equipment on engine companies the fire department's service becomes valuable to the community. The personnel and apparatus that increase the cost of an EMS service already exist in the fire department allowing the cost for the paramedic training and ALS equipment negligible compared to hiring additional personnel and additional transport units (Miller, 2002).

The best scenario for any operating budget is to keep the cost to a minimum and still improve services. Miller (2002) quoted Stout (1987) in his research paper, "Generating the ALS service at low marginal costs, ALS engines are our industry's least expensive means of rapidly delivering paramedic capability to the scene" (p. 28). Gary Ludwig (1999) writes,

> By upgrading an existing engine company to the Paramedic level, a fire department can eliminate hiring additional personnel, buying another vehicle (ambulance), and the additional fuel and maintenance cost. The startup cost can easily save a fire department over $200,000 (p. 32).

Organizations can avoid adding additional ambulances by placing paramedics on engines.

A big concern for many departments contemplating the move to ALS responses is the burden placed on them in finding the best applicant during the hiring process. The training hours needed for someone to become a certified paramedic is equivalent to 15 months if they already possess a basic certification. A new applicant that has no formal training can take upwards of 24 months to gain the required certification. This time requirement compared to a basic firefighter certification of 860 hours has most departments requiring new applicants to be certified paramedic in order to be eligible for hiring. The only disadvantage that could be found during this research was the lack of qualified applicants able to take their entrance exams. Allowing new applicants to be certified firefighter and basic EMT will increase the eligibility pool but the department will still have to train the new firefighter to a certified paramedic.

While communities continue to grow so does the demand for service. Many fire departments are facing the challenge of increased demand for medical response, specifically life threatening incidents. A time saving effort used by the Midland Fire Department is to hire paramedics and train them to firefighter. This allows the department to train them in three months versus the required 15 month for medical training. It also equates to a cost saving measure for the Midland Fire Department and allowed them to get firefighters out into the stations faster (Kastner, 2011). A big advantage that a department received utilizing cross-trained firefighter/paramedics was their ability to rotate paramedics and utilize them in different areas within their department. This offered more opportunities and assisted with retaining personnel who may leave the service because of burnout (Miller, n.d., p. 36).

Across the nation, there are success stories of fire departments who integrated paramedic engine companies into their everyday emergency response. One success story is from the Chicago Fire Department. Smith (2004) wrote in his research paper for the Executive

Development course, “The Chicago Fire Department is another excellent example of how the fire service is expanding its role into the EMS field by implementation of ALS engine companies.” He goes on to cite an article by Donald Walsh on how the CFD cross-trained its firefighters to paramedics in the ‘90s enhancing the city’s prehospital care. Their response times were lowered and the CFD is a “model for other departments to follow” (p. 26). Miller (n.d.) wrote in his research paper for the National Fire Academy that Erlanger, Kentucky received the 2006 Gold Award for Municipal Excellence for their innovative approach to staffing their engines with cross-trained firefighter/paramedics increasing their service level (p. 19).

The Austin Fire Department noticed several benefits that were gained when they implemented paramedic engine companies. They were able to reduce their operational cost by recruiting paramedics and decreased their response times. Another example of a fire department that has shown success in implementing paramedic engine companies was the Phoenix Fire Department. PFD had greater flexibility with employees, response times were faster, and ALS care was administered to the community quickly. The Anaheim Fire Department has shown success with improved level of service and was able to alleviate burnout from occurring with their paramedics (Miller, 2002, p. 16).

Procedures

The procedures utilized in preparing this descriptive research document consisted of a literature review, a questionnaire, Firehouse response data, and a meeting with the EMS Coordinator. While attending the National Fire Academy the Learning Resource Center was utilized to gather a wealth of literature for the review process. Several Executive Fire Officers’ ARPs were browsed for information along with journals and trade magazines. A personal communication and an email with budget information was conducted with the current EMS

Coordinator for facts and cost estimates. Response time data for the west and northeast side of Baytown were gathered from the department's Firehouse software, which included the response times for the Medical units.

A questionnaire was distributed electronically to fifteen departments within the State of Texas with eleven of the questionnaires being returned. The questions asked were:

1. What type of fire department do you represent?
2. How many line personnel are in your fire department?
3. What is the population served by your fire department?
4. Does your fire department provide first responder?
5. Does your fire department have a paramedic engine program in operation?
6. If not, has your fire department considered expanding its role into paramedic services?
7. How does your fire department provide Advance Life Support services (ALS)?
8. If you have a paramedic program, please list the approximate associated start-up costs in the following categories:
9. Does your fire department provide paramedic pay?
10. If you provide paramedic pay, please list the percentage or fixed amount per month per employee.
11. What type of requirements is required for new applicants?
12. If your fire department requires paramedic certification, have you encountered any problems in hiring qualified personnel? Please explain.
13. As a fire department, do you have a set number of paramedics to be employed (i.e. all members, percentage of firefighters)?

14. If you have a paramedic engine program, what would you perceive as the number one problem/issue your department encountered during the implementation process?
15. When your fire department instituted a paramedic engine company first responder, were there any factors that needed to be addressed (i.e. employees' attitudes toward EMS, major cost factors)?
16. Emergency Medical Services (EMS) response represents what percentage of the total call volume for your fire department?
17. What is the fractile response time for your fire department using the 90% of the time standard for BLS responses?
18. What is the fractile response time for your fire department using the 90% of the time standard for ALS responses?

As with any research there are assumptions and limitations. One assumption is that all respondents of the questionnaire answered the questions objectively and correctly. Another assumption is that the EMS Coordinator did not have any bias towards or against the topic. The limitation found was that not all questionnaires were returned and the data retrieved from Firehouse may have some data errors since the time stamps are initiated by the dispatcher into the CAD system in lieu of utilizing the mobile data terminals in the apparatus.

Results

The research has identified some advantages to the Baytown Fire Department implementing a paramedic engine company to its first responder program. Answers to the research questions:

1. What benefits will the community receive if the fire department ran paramedic engine responses?

The research illustrates that there are many departments that have faced an increase in demand for quality service with no increase in resources. Many of the solutions have been to add ALS services to the department's response criteria. This has shown an improvement in quality care and better ALS response times. "The ability to arrive on the scene in five minutes or less with Advanced Life Support capabilities greatly impacts the chance for survivability during many medical emergencies" (Miller, 2002, p. 18).

Utilizing the Firehouse software to gather response times for both the fire department and the Health Department's EMS for the west and northeast side of the city illustrates the response times not in sync with the recommendations from the National Fire Protection Association and the American Heart Association. Data was retrieved for calendar years 2008 – 2011. The responses recorded for the west side outnumbered the responses to the northeast side because of the size and density of the locations. The west side responses dealt mainly with the area west of Bayway which is a longer distance from the station housing one of the ambulances. Engine 5 responded to 412 ALS emergency medical incidents within four minutes or less, whereas the ALS responded to 470 ALS incidents at over eight minutes with 212 of those responses taking over 10 minutes (see Figure 2).

Fire station #6 was opened on April 1, 2011 in the northeast side of the city. This location has assisted the fire department with its response times because the station that was required to respond as first due is approximately a seven minute response to station #6. As stated, there have been less emergency incidents in this area, a total of 489 ALS medical incidents; however, the area continues to grow. Since 2008, the fire department had 72 incidents where they arrived on

scene within four minutes or less. Baytown EMS responded to 77 incidents over eight minutes with 37 of those responses taking over 10 minutes (see Figure 3).

In the personal communication, personnel costs were discussed. The main reason why the request for another staffed ambulance was rejected is personnel wages and benefits. To hire one paramedic at the lowest salary would be $38,702 a year. In order to staff an additional ambulance would require six new paramedics costing the City of Baytown $232,212 in personnel cost alone (D. Dalby, personal communication, December 15, 2011). The fire department is in the process of building a new station and should have it complete and staffed in 2014. If the hiring requirement is modified specifying that applicants must carry a paramedic certificate to be eligible for the job opening there will be no training cost. The cost associated with sending individuals to a paramedic training course would be approximately $1,200 per trainee for an accelerated course that would take 12 months in total. The trainee would attend the class for one full week once a month and would perform their clinical requirements the rest of the time. This would help in limiting the need for overtime since the individual would not be away from his scheduled duties for a whole year however their will be overtime cost during the training process.

2. *How would a paramedic engine company impact the department's operating budget?*

The research shows that the operating budget will be affected with initial start up costs consisting of equipment, training, and overtime. Ludwig (2003) states,

> Equipment needed for the ALS engine consist of variety of technological equipment such as monitor/defibrillators. These units can cost upwards to $35,000 per unit and the department would need one for each Paramedic Company plus backup monitors in case of failure and repair times (p. 34).

The training costs can vary depending upon the individual needs. A department can send firefighters to become paramedics or they can hire paramedics and train them to be firefighters. A time saving effort used by the Midland Fire Department is to hire paramedics and train them to firefighter (Kastner, 2011).

The results of the questionnaire pertaining to the operating budget illustrates that eight of the respondents provide some type of ALS service to their community with seven of those operating a paramedic engine company. Four of the respondents replied that they faced initial start up costs to operate their paramedic engine companies. Two departments had a very negligible amount in ALS equipment at $3,000 while the other two had the equipment costs at $30,000 and $40,000. Four of the respondents show an increase of $6,000 to $11,000 in training costs for firefighters to become paramedics with an extra $14,000 associated to overtime cost. Out of the seven departments operating paramedic engine companies, two of them give incentive pays of $200 - $299 per month, two of them give incentive pay of $100 - $199 per month, one is at $75 per month, and one is at $300 per month.

During the personal communication, information was gathered pertaining to the Health department's budget for ALS equipment and what would be considered as a necessity to begin operations. The major item needed would be the Zoll E series monitor/defibrillator which is carried on the Baytown ambulances. This would allow for seamless transfer of patient care from the paramedic on the engine to the paramedic on the transport unit. The cost for this piece of equipment is $30,000. Another piece of equipment that would need to be purchased is the Knox Medvault that would be installed inside the cab of the engine. The cost for the Medvault is $950 and would be a requirement in order to carry the ALS medications. CPAP and suction equipment are other cost that will be over $3,000 (D. Dalby, personal communication, December 15, 2011).

3. *What are the advantages and disadvantages to the BFD in hiring a certified paramedic over an EMT-B?*

It is clear that one of the disadvantages to hiring only certified paramedics will be a decrease in the candidate pool of eligible applicants. The advantage is that the training cost is less and the amount of training required is shorter placing personnel out on the streets quicker. It also equates to a cost saving measure for the Midland Fire Department and allowed them to get firefighters out into the stations faster (Kastner, 2011). The fire service is facing economic hard times like any other entity and any cost savings in the hiring process will be a big advantage to the department.

The questionnaire revealed that the departments that responded, six of them are in communities with populations of 25,000 to 50,000. Three of them have populations over 50,000 and two of them are less than 25,000. Five of the eleven respondents have a requirement of paramedic and/or firefighter paramedic as qualifications needed to be considered for a job opening. Seven require certification in firefighter and EMT Basic in order to be considered eligible to apply (see Figure 4). Of the five requiring paramedic certification, four responded that the only problems they have encountered in hiring qualified personnel is a limited candidate pool.

4. *What improvements have other fire departments accomplished when they successfully integrated ALS into their organizations?*

During the literature review there were many articles and other research papers that demonstrated a huge success rate for departments that instituted paramedic engine companies. Departments were successful in lowering their response times and they were able to provide a better quality of service without costing the taxpayer an abundance of money. Their response

times were lowered and the CFD is a “model for other departments to follow” (Smith, 2004, p. 26). There were also some departments that added ALS transport to their responses with success. By having both transport ambulances and paramedic engine companies they were able to move personnel from one assignment to another. The Anaheim Fire Department has shown success with improved level of service and was able to alleviate burnout from occurring with their paramedics (Miller, 2002, p. 16).

Respondents to the questionnaire illustrate their success in providing a better service to their community. Sixty-four percent of the responses showed a 60% - 70% in EMS incidents for their respective departments (see Figure 5). In response to what they perceived as their number one issue during the implementation process, they answered storage concerns on the apparatus as well as at the fire stations; notices to public to educate them on paramedic engine companies; and the fear from firefighters of transferring to other stations because of certifications. Another concern that must be addressed for a successful program was to determine if there were any factors that needed to be addressed before implementation. The answers received were once again storage issues and refrigeration for the drugs; making sure their medical protocols were aligned with the ALS transport; and making certain that they had the adequate number of paramedics and equipment before implementation.

Discussion

The applied research for this paper revealed that there are many fire departments that utilize paramedics on their engines. This practice has lowered their response times to ALS incidents, potentially saved their communities money by utilizing resources in a dual role capacity, and gave them more flexibility with their personnel. The PFD had greater flexibility with employees, response times were faster, and ALS care was administered to the community

quickly (Miller, 2002, p. 16). Every department had to deal with an increase in service demand as it pertained to emergency medical incidents and each department had to find the best economical way of meeting those demands. Most of them went to placing paramedics on engine companies which was cost effective for the city's overall budget and the department's operating budget. "In fulfilling this mission, fire service personnel well know how critical it is to respond in the shortest possible time with adequate numbers of knowledgeable and experienced personnel" (I.A.F.F., 1999, p. 1). Having fire stations strategically located throughout the city and personnel staffing the engine companies already in place, the cost for implementing paramedic engine companies were minimal. The fire department of Tracey, California added paramedics to their force. This was the first ALS engine in the city. They believed it would help them provide a better service in the area and make sure the people who called them got the best care possible as quickly as possible. "At least one member of the three-person crew will be specially trained as a paramedic, allowing them to take life-saving skills with them to the scene of an auto accident or medical complaints of chest pains in the critical minutes before the ambulance arrives" (Martinez, 2006).

The idea of lowering one's response time to ALS incidents will make a huge impact on a community's perception of the level of care they are receiving from their emergency responders. The Austin Fire Department was able to reduce their operational cost by recruiting paramedics and decreased their response times (Miller, 2002, p. 16). As illustrated in the response times for the outer areas of the City of Baytown, citizens waiting for an ambulance with a paramedic for over 10 minutes may feel like an eternity but it is even worse if the fire engine is on location with just basics and not having the ALS equipment available. The basic EMT/Firefighter will begin CPR for the heart attack victim and they will utilize their automatic external defibrillator but

when the paramedic arrives on scene and begins administering drugs and other ALS protocols family members begin to question the long response time and the lack of skills and equipment of the firefighters. Tatiana Prophet (2006) reported in the Daily Press,

> Marty Brown recalls a woman who died, with firefighters standing by, after eating barbecue sauce containing peanut oil. The fire engine had arrived first and the ambulance was still on its way. But because Victorville firefighters are not equipped to give medication, the woman didn't stand a chance (p. 1).

This puts a strain on the whole system and the community feels a low level of service was provided and the firefighters feel they could have been more productive if allowed. “Individuals with serious injuries or acute cardiac problems must receive appropriate medical treatment as quickly as possible” (I.A.F.F., 1999, p. 12); a paramedic engine company would definitely improve response times for the community and improve moral of the firefighters.

Another point that needs to be discussed is whether it is best for a fire department to require an applicant to hold certain certifications to be eligible for an opening. There are some cities that currently have no requirements for certification but place a higher value on those who do have basic firefighter and/or basic EMT certification. Most of these departments do not have paramedic engine companies but they do respond with a basic first responder program. For those departments that do have paramedics on their engines, a majority of them require an individual to possess a paramedic certification to be eligible. Then there are some that will accept individuals that have both firefighter and basic EMT so the city can send them to paramedic training. The best economical value for the department and the city is to hire an applicant that holds certification as a paramedic. The cost will be less to send the new employee to a fire academy to

receive the required training and allow them to get the firefighter out into the station quickly. Price (2004) writes,

> As fire departments continue to handle an increasing number of medical calls, more and more departments are recruiting paramedics and EMTs and training them to be firefighters. The math is simple: Turning a firefighter into a paramedic means taking the firefighter out of service for nine months or more, which means additional expense to the fire department to pay for training and overtime to cover lost shifts, plus a temporary loss of unit cohesion. However, turning a paramedic into a firefighter costs the fire department less, takes no one off the line and takes less time (Price, 2004).

The only disadvantage to requiring a paramedic certification to be qualified to apply for an opening is that some departments have found the candidate pool to be limited in numbers. This is not a problem for those departments that hire one or two firefighters at a time but can be a hardship for those that will need to hire multiple firefighters.

There are some individuals that have concerns about paramedics responding on an engine company and how that will affect their skill levels. Opponents of the paramedic engine company concept claim that the more paramedics there are the more likely their skills will deteriorate because they will have less of chance to perform their skills regularly. Miller (n.d.) writes in his research paper that a few studies were conducted on paramedic skill deterioration due to lack of patient contact and fewer opportunities to perform invasive procedures. His conclusion cited works from Dr. Zautcke in 1987 and at the Los Angeles Biomedical Research Institute at Harbor- UCLA. In both of these studies, the research was based on low patient contact and the final thoughts from Miller was that continuing education along with training programs assist paramedics in maintaining an acceptable level (p. 22). Other opponents, such as doctors and

health organizations, claim that fire based EMS will not save communities money and the level of care is inefficient to other forms of EMS providers, Ludwig (2008) writes,

> a medical doctor who sits on the Judiciary Oversight Commission for EMS in Washington, DC, wrote in an email to other commission members last year, 'the truth is fire-based EMS is expensive, inefficient care.' His bias comments cannot be supported with any studies or scientific evidence" (p. 36).

Recommendations

Improving ALS response times to the citizens of Baytown should be the top priority. The original thought was to provide documentation to staff two paramedic engine companies in the Baytown Fire Department's First Responder Program. However, after reviewing the number of ALS medical incidents in the northeast side of the city the recommendation is to staff one paramedic engine company on the west side as soon as possible. Utilizing the current system would require an additional ambulance and hiring of six paramedics in order for the Baytown EMS to meet the standard of 8-minute or less consistently in the west side of the city. The recommendation is that BFD staff Engine 5 with paramedic firefighters to provide ALS service in a quick and efficient manner to the citizens that are currently underserved. Engine 5 responded to 890 ALS medical incidents at six minutes or less with 412 of them at four minutes or less in the four year period reviewed.

Contact with the Medical Director would need to be made to get the First Responder Medical Protocols aligned with the Paramedic Protocol. Advance Life Support equipment should be purchased and the station should have at a minimum of two paramedic firefighters per shift so that at least one paramedic is on the engine at all times. This would require training at least six members to paramedic. As research has shown, this endeavor would take approximately one year

to get the program initiated. The initial cost for the program would be approximately $34,000 for ALS equipment, another $7,200 for training of six personnel, and overtime cost which would vary depending on staffing issues. The collective bargaining contract would need to be opened for negotiation on certification pay for paramedics and would be a cost associated with the department's operating budget. The recommendation for certification pay would be for those paramedics that are assigned to a paramedic engine company receive the extra pay.

Consideration should be taken in future paramedic engine companies for areas that may be affected by long response times from the Baytown EMS paramedics. With continued growth expected for the city and the current struggles with budgets it is imperative that we look at every avenue. To meet the service demands that the emergency responders will face in the near future, a recommendation of more firefighters trained to paramedic is suggested which will allow the BFD to add a paramedic engine company to the resources of the fire department quickly. An avenue that should be considered is that of changing the hiring requirements as it pertains to certifications. Currently there are no demands for certification, anyone can apply, be hired, and be sent to the fire academy and EMT basic training. The recommendation is to require applicants to be in possession of a basic firefighter certification thru the Texas Commission on Fire Protection and a Paramedic certification thru the Department of State Health Services; and/or an applicant with only a Paramedic certification. This will lower the number of applicants as research has shown however it will be more economical to require the prior training instead of the department bearing the cost.

The City of Baytown will start building a new fire station in 2014 and this will open fifteen new positions in the fire department. The recommendation is that the new firefighters be paramedics to meet the suggestion mentioned earlier. If the city leaders approve the

recommendations and change the qualifications for applicants, the fire department will be able to hire the employees and have the needed resources in personnel to staff at least two paramedic engine companies. The city could also consider hiring six of the fifteen firefighters early so they can be placed on the paramedic engine company at station 5. This will get the ALS First Responder Program enacted without sending current members to training and saving the initial cost of overtime. The department can then send those interested firefighters from station 5 to paramedic training in a two year period keeping the overtime cost to a minimum. These recommendations will benefit the citizens and guest of Baytown by providing a high level of service through the teamwork of the fire department's ALS First Responder Program and the Baytown EMS paramedics.

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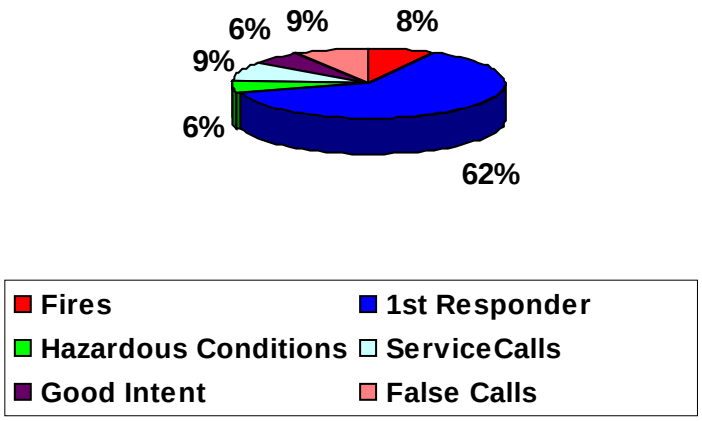

Figure 1. A pie graph illustrating BFD's incident response ratio for calendar year 2011. This data was extracted from the Firehouse software utilized by the BFD for reporting purposes. The total number of incidents for 2011 was 5,981 with 3,743 of those incidents being medical.

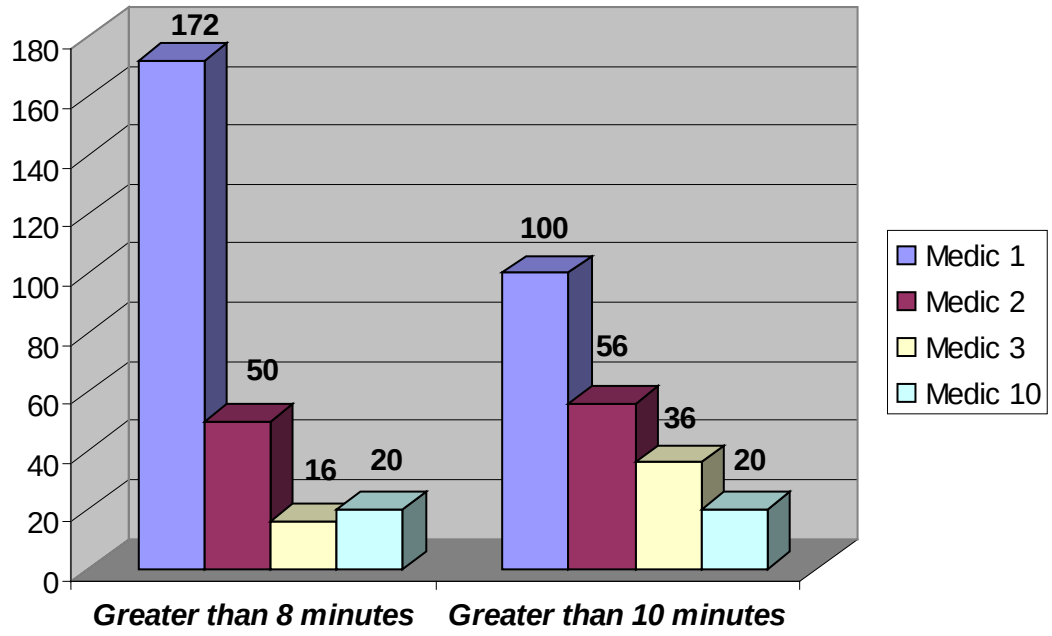

Figure 2. A bar graph illustrating the number of responses over 8-minutes to the west side of Baytown by Baytown EMS for calendar years 2008-2011.

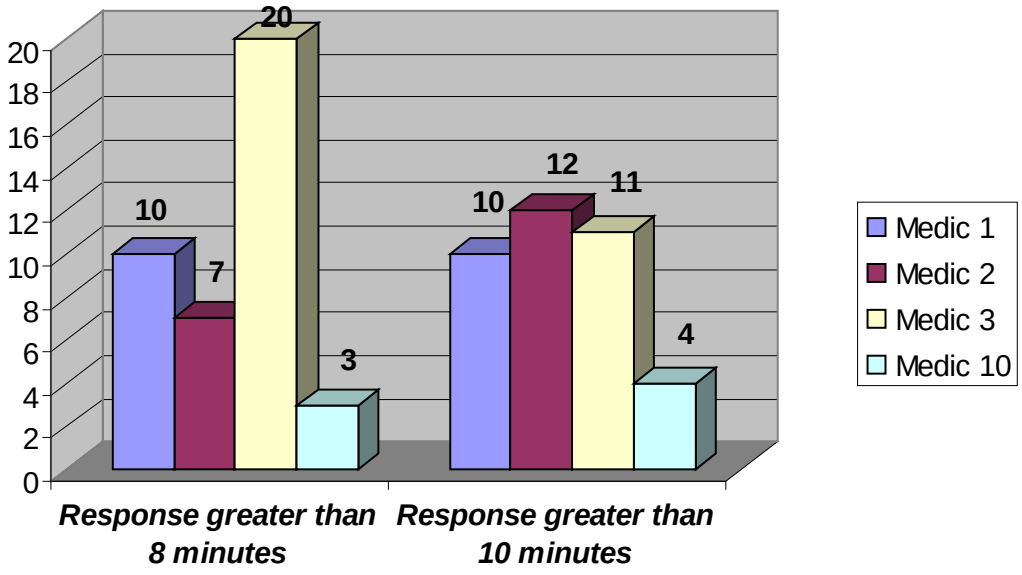

Figure 3. Bar graph illustrating the number of responses over 8-minutes for the northeast side of Baytown by Baytown EMS for calendar years 2008-2011

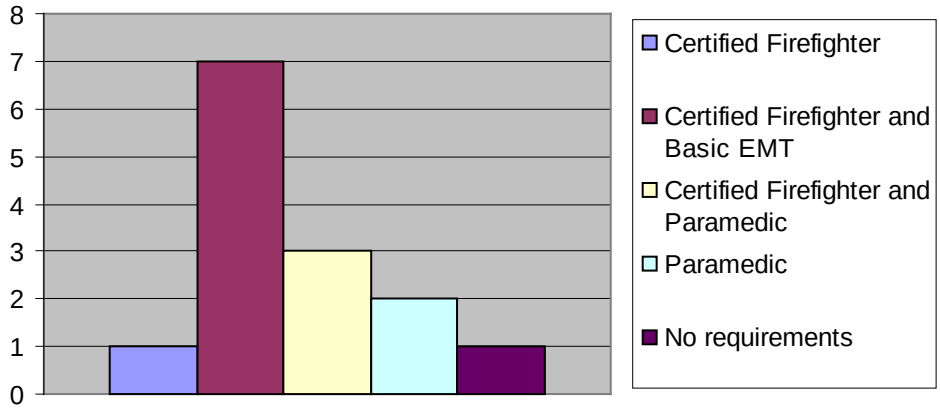

Figure 4. Bar graph illustrating the response to the questionnaire considering the certification requirements an applicant must possess to be eligible for a position in the fire department.

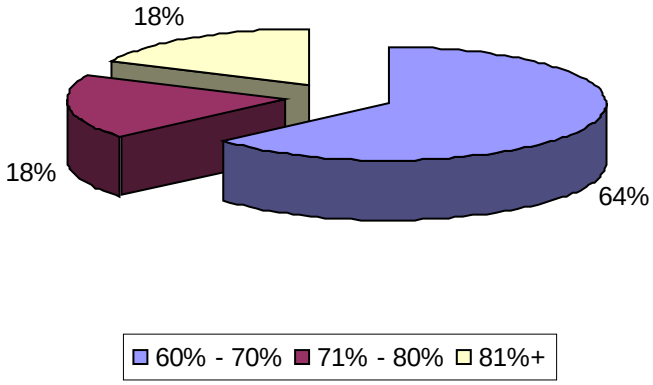

Figure 5. A pie graph that illustrates the medical response ratio for the respondent's fire department.

Appendix

Paramedic Engine Company Questionnaire
EFO Applied Research Paper – Victor Medrano

1. What type of fire department do you represent?
    a. Volunteer
    b. Part-time/Volunteer
    c. Career

2. How many line personnel are in your fire department?

3. What is the population served by your fire department?
    a. 100-10,000
    b. 10,001-25,000
    c. 25,001-50,000
    d. 50,001-100,000
    e. 100,001+

4. Does your fire department provide first responder?
    a. BLS only
    b. BLS/ALS
    c. ALS only
    d. None

5. Does your fire department have a paramedic engine program in operation?

6. If not, has your fire department considered expanding its role into paramedic services?

7. How does your fire department provide Advanced Life Support services (ALS)?
    a. Fire First Responder
    b. Fire Based EMS & Transport
    c. Third Service

8. If you have a paramedic program, please list the approximate associated start-up costs in the following categories:
    a. Training costs per person
    b. Paramedic engine EMS equipment upgrade costs
    c. Associated overtime costs per person

9. Does your fire department provide paramedic pay?

10. If you provide paramedic pay, please list the percentage or fixed amount per month per employee.

11. What type of requirements is required for new applicants?
    a. Certified Firefighter
    b. Certified Firefighter and Basic EMT
    c. Certified Firefighter and Paramedic
    d. Paramedic
    e. No requirements

12. If your fire department requires paramedic certification, have you encountered any problems in hiring qualified personnel? Please explain.

13. As a fire department, do you have a set number of paramedics to be employed (i.e. All members, percentage of firefighters)?

14. If you have a paramedic engine program, what would you perceive as the number one problem/issue your department encountered during the implementation process?

15. When your fire department instituted a paramedic engine company first responder, were there any factors that need to be addressed (i.e. employees' attitude towards EMS, major cost factors)?

16. Emergency Medical Services (EMS) response represents what percentage of the total call volume for your fire department?

17. What is the fractile response time for your fire department using the 90% of the time standard for BLS response?
    a. 60%-70%
    b. 71%-80%
    c. 81%-90%
    d. 91%-100%

18. What is the fractile response time for your fire department using the 90% of the time standard for Advanced Life Support (ALS) response?
    a. 60%-70%
    b. 71%-80%
    c. 81%-90%
    d. 91%-100%