EMS RESPONSE AVAILABILITY

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An applied research project submitted to the Ohio Fire Executive Program

June 2003

ABSTRACT

One of the problems at the South Euclid Fire Department is having three EMS responders available for second squad calls. The purpose of this descriptive research project was to explore implementation of a "Paramedic Chase Car" to determine if it would provide an efficient and cost-effective means of addressing this problem.

Through the use of a five-year retrospective review of EMS reports generated by the South Euclid Fire Department, data was collected in several key areas. This data was used to determine the percentage of calls that can be safely handled by a two-person transport team, the percent of transports requiring Advanced Life Support (ALS), the frequency of simultaneous alarms, average on-scene time, and average return to service time. The data was then used to provide an overall picture of the effects that would be realized if a paramedic chase car was to be implemented.

The data supported the paramedic chase car concept in several ways. It was determined that 73% of EMS transports could be safely handled by a two person transport team and that 69% of transported patients needed ALS procedures performed. Also, simultaneous requests for EMS alarms occur at a ratio of 6.5 to 1. The research also showed a 12% faster on-scene time when squads were staffed with three responders as opposed to two responders. Research also showed that regardless of the number of personnel used for transport, the amount of time required to return to service was virtually the same.

The research resulted in several recommendations. These recommendations included implementing a pilot chase car program, developing policies on its' use and reviewing the effects of implementation on a quarterly basis.

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INTRODUCTION

One of the problems facing the South Euclid Fire Department is having the manpower available to respond to multiple EMS alarms without a reduction in quality of service, or having a heavy reliance on our neighboring communities. In recent years, the incidence of having simultaneous medical emergencies has increased dramatically. The purpose of this descriptive research project is to determine the best utilization of the South Euclid Fire Department's current staffing levels in regard to EMS response and to answer the following questions:

1. What percentage of patient transports can be managed with a two-person transport team?
2. What percentage of patient transports require Advanced Life Support?
3. What is the frequency of simultaneous requests for medical assistance in the City of South Euclid?
4. Is there an "on-scene" time discrepancy between squads that are staffed with an initial response of three members compared to squads staffed with two members?
5. What is the average time from "enroute to hospital" to "squad inservice" for South Euclid Fire Department rescue squads?
6. What effects would implementing a paramedic chase car have for the South Euclid Fire Department?

BACKGROUND & SIGNIFICANCE

The City of South Euclid is a charter law city with a council/mayor form of government. The city is located in Cuyahoga County, Ohio. The city encompasses five square miles with a population of 24,000 people. The make-up of this suburban community consists primarily of single-family residential housing and garden style apartments. There is also a sizable retail area and small industrial area.

The South Euclid Fire Department staffs one station with three 24-hour shifts. Scheduled shift strength is ten members. Current staffing policies allow three members to take time off, leaving a minimum of seven on duty. Due to vacations, "kelly days", and compensatory time, the majority of shifts are staffed at minimum. This is especially true during the summer months, which coincidentally is the time of year that alarms for service are the highest.

The South Euclid Fire Department maintains four front line apparatus consisting of two rescue squads, one engine and one truck. When staffing levels are at minimum, these vehicles have the following manpower assignments: three are assigned to the first out squad, two on the engine, and two on the truck. The two members on the truck also serve as the crew for the second squad. The engine carries limited ALS equipment allowing it to serve as a first response unit when staffing permits a paramedic to be assigned to it. In the event the first out squad is on a call and a fire response is needed, the other four members respond on the engine. Should a request for medical assistance be needed at this time, mutual aid is requested from a neighboring community to handle the second EMS alarm. In 2002, the department answered 2,761 calls for emergency service. Of these, 1,928 were for medical assistance.

In the past, the South Euclid Fire Department was staffed with thirteen firefighters per shift. This was prior to the department providing a paramedic service and at a time when annual responses were approximately 25% less than current levels. When staffing levels were at this strength, the department responded with a rescue van to medical emergencies staffed by two Basic EMT's. The remainder of the shift was assigned to fire apparatus. Transport to a medical facility was via a police car/ambulance. The police officer drove to the hospital and one fire department member rode in the back with the patient, enabling the other EMT to return the rescue van to the station.

Around 1979, the department purchased its first transport ambulance. The ambulance was staffed with two Basic EMT's who would answer the call, provide basic assistance, and transport the patient to a medical facility.

In 1984, the department began providing a paramedic service, giving the residents access to ALS treatment. As more members became certified at the paramedic level, and calls for medical assistance increased, the first out squad staffing was increased to three members with at least one being a paramedic. During this time, the department's transport policy allowed transport to three emergency rooms in the greater Cleveland area. This policy remained in effect for the next sixteen years.

Hillcrest Hospital, located in Mayfield Hts., Ohio, serves as medical control for the South Euclid Fire Department. Their continued support has assisted the department in keeping current with EMS trends in the United States. This is evidenced by the fact that the South Euclid Fire Department was one of the first departments in the State of Ohio to provide field access to 12-lead electrocardiogram (EKG) technology and thrombolytic therapy.

In 1999, the Cleveland area saw the close of two major downtown hospitals, one of which was a frequent transport destination of South Euclid EMS squads. With the closing of these two facilities, other area hospitals had to accept the patient flow from the closed facilities. This caused the remaining hospital emergency rooms to fill beyond capacity. Due to no bed availability, hospital emergency rooms began to restrict patient access via ambulance. Often times the hospitals would go on full restriction, in effect completely closing to ambulance traffic except during life threatening circumstances. Some hospitals charted closure times of over 300 hours per month.

In response to these changes, the South Euclid Fire Department changed its transport policy, and now transports to eight hospital emergency rooms. The increased amount of destinations have caused squads to travel further and through more dense traffic conditions. This, in turn, has increased the "round trip" time for calls that require patient transport, further reducing the South Euclid Fire Department's ability to adequately respond to subsequent emergencies.

The research conducted will have a significant operational impact on how the South Euclid Fire Department utilizes its personnel resources, as well as how the department provides emergency medical service in the future. Fire administrators must continually analyze the way they conduct business in order to meet the ever changing demands put on themselves and their departments by policy makers, and the public. Challenges from private EMS providers, and pressures from managed care organizations are having, and will continue to have, an impact on how public providers (fire agencies) streamline their EMS delivery systems.

LITERATURE REVIEW

The purpose of the literature review is to determine if paramedic chase cars established in other departments met the needs of their departments and communities by enabling them to be more cost effective and efficient in their delivery of emergency medical service.

In a press release issued by Bethesda-Chevy Chase Rescue Squad Inc. on April 9, 2002, regarding the use of a medic car, Assistant Chief Peter Morris describes it as "an emergency vehicle staffed with at least one paramedic and equipped to handle serious medical emergencies and trauma. Medic cars may also respond to minor emergencies particularly if the unit is only a short distance away from the emergency. It is widely accepted throughout the region and variations of the concept have been utilized with great success in the District of Columbia, northern Montgomery County and in other 911 systems throughout the nation. They are sometimes referred to as "chase cars" or "rapid response units." A medic car is not capable of transporting patients and is always dispatched with an ambulance. Medic cars provide flexibility to allow an evaluation of whether or not a particular emergency requires paramedic treatment or not. If skilled Emergency Medical Technician (EMT) care will suffice, the paramedic can relinquish care to the EMT's and become available for the next call much sooner. This improves the efficiency of the fire/rescue system while still maintaining excellent care. The small medic car also negotiates residential streets in a much more efficient manner than our large vehicles and is very cost-effective overall." (Peter Morris, 2002)

In January of 1997, Sachs published an article regarding the expansion of EMS systems. He estimates that "80% of the American fire service provides some level of

emergency medical service to their citizens through first responders, emergency medical technicians, and paramedics." (Gordon M. Sachs, 1997) Generally, first responders and EMT's provide basic life support (BLS), which involves medical treatment not including invasive procedures or medication administration. Paramedics provide advanced life support (ALS), a higher degree of medical service including the administration of medications, intravenous fluids, various cardiac monitoring functions, and invasive procedures. This higher degree of medical service provided by the paramedic does increase on-scene time while procedures are being performed prior to transport.

In March 1997, Sachs published an article stating the following: "It has been shown that, as an EMS system is growing, BLS personnel can staff transport units while paramedics staff engine companies or other first-response units. This type of arrangement requires fewer paramedics and, since the majority of transports are BLS, keeps the paramedics more available for ALS calls. When necessary, the paramedic rides with the patient in the ambulance." Sachs also briefly touches on staffing by saying, "Each ambulance on shift should be staffed with a minimum crew consisting of one state-registered emergency medical technician and one state-certified paramedic. Consideration must be given to the possibility that a fire may occur while a crew is out on an EMS call." (Gordon M. Sachs, 1997)

In his applied research project for the National Fire Academy, James Fiero, Division Chief for the Austin Fire Department in Austin, Texas, concluded that several benefits are gained in the implementation of alternative methods of paramedic delivery. These benefits include, "more productive and effective use of emergency personnel, reduced number of total emergency workers required to provide consolidated services

while enabling executives to enhance paramedic fire company manning levels, improved team effectiveness, furnishes administrators with the capability to manage the problem of worker burnout and rust-out, and improved service to the community at a lower cost." (James Fiero,1990)

These conclusions are consistent with other literature reviewed. Improved team effectiveness certainly leads to the overall continuity of care provided to the patient. Worker burnout and rust-out can be alleviated by incorporating a paramedic chase car as part of a three-person crew by eliminating them from transporting BLS patients to the hospital, which requires more time. This factor alone will increase the productivity of those personnel and free them up for ALS level calls that may come in during the transport of a BLS patient. By assigning one of the three-person squad crew to a chase car, you have increased your staffing during times that are currently taxing the delivery system by having a vital resource, the paramedic, out of service.

While fire prevention training and safety education have lead to a decrease in fires over the years, the number of EMS responses have steadily increased (Thorp, 1993). This fact alone should prompt the fire administrator to look at alternatives to service delivery, such as the paramedic chase car concept.

The question arises as to why three persons are needed for every response and why two of those should be certified at the paramedic level? NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments, recommends that "Personnel deployed to ALS emergency responses shall include a minimum of two members trained at the emergency medical technician-paramedic level and two members

trained at the emergency medical technician-basic level arriving on scene within the established response time."

The dispatch of two paramedics at receipt of the request can be supported in an article that appeared in Emergency Medical Services Magazine which states "When arriving on an emergency scene, good information is often scarce or ambiguous, and paramedics understand and appreciate the need for an immediate second opinion." It should be common sense that two paramedics working in teams provide the opportunity to collaborate on patient assessments, treatments, and care management. They can perform faster and more efficiently. An immediate second opinion from an equally trained and experienced colleague provides the extra margin of safety for both the patient and the new, inexperienced paramedic who might be his partner." This same article also supports the use of the paramedic chase car. "We know that two paramedics are not necessary on every call, but we don't know that until we get there." (Nordberg, 2000)

The use of a three-member squad crew with a minimum of two paramedics provides an efficient and high standard of care to the residents of South Euclid. While one paramedic is taking a history, the other can start IV's, draw blood, administer medication and interpret EKG readings as the Basic EMT administers oxygen and provides support duties by placing EKG patches and setting up the IV, and obtaining vital signs. When ALS treatment is required, the need for two paramedics attending to the patient during transport is only necessary on a small percentage of responses. The paramedic chase car provides a cost-efficient and flexible model for delivering this service.

In January 2003, a newsletter issued by the Ohio Department of Public Safety, Division of Emergency Medical Services, titled "The Run Report", contained an interesting piece of data that may have some relevance to this research project. This newsletter gives information received by the State of Ohio EMS Incident Reporting System that collects data from hundreds of thousands of EMS reports throughout the state. This article revealed an average "on scene" time for all submitted EMS reports during the 2002 calendar year. The average "on scene" time for this period was 20.63 minutes per alarm. Although this figure does not contain data pertaining to the number of personnel that responded, it provides an excellent benchmark to use comparatively with the performance of South Euclid Fire Department EMS units.

There is no classification system or set of federal specifications for chase cars. In general, whatever a fire department is using as its staff car or command vehicle should suffice for EMS duties. In some systems, the chase cars carry extra supplies (backboards, oxygen, etc.), specialized equipment (command boards, disaster kits), or other items as needed. The key is to match the vehicle to the job it is used to perform.

PROCEDURES

A literature review was conducted using resources obtained from the Learning Resource Center at the National Fire Academy, articles from professional journals, National Fire Codes, and internet web sites.

To answer question one, "What percentage of patient transports can be managed with a two-person transport team?", it needs to be determined what constitutes a "routine" transport that can be managed with one Basic EMT driver and one attending

paramedic. Criteria were established to assist in this decision. In order to determine this criteria, the difference between ALS patients and BLS patients must first be defined. To provide this definition, a document obtained from Nationwide Medicare titled Medicare Ambulance Fee Schedule, clearly outlines service levels as used by the Health Care Financing Administration (HCFA). ALS level care is defined as, "the provision of an assessment by an ALS provider or the provision of one or more ALS interventions". These interventions include the following ALS procedures: manual defibrillation/cardioversion, endotracheal intubation, central venous line, cardiac pacing, chest decompression, surgical airway, intraosseous line, medication administration, and EKG monitoring/interpretation.

A retrospective review of EMS reports generated by the South Euclid Fire Department over the past five years will be used to determine the percentage of calls that could be handled by a two person transport team. It is very difficult to determine on a retrospective basis the percentage of calls that would necessitate a three-person transport team. The decision to transport with two or three people is a decision based on the experience and comfort level of the paramedics assigned to the alarm. For the purpose of this study, ALS alarms where only one of the paramedic interventions mentioned above are provided will be considered as those that can be safely handled with a two person transport team. All BLS alarms will also be two person transports. ALS alarms where the paramedics performed more than one of the interventions listed above will be considered to necessitate the use of the three person transport.

One modification was made to the criteria and applied to the retrospective review. This was the criteria of EKG monitoring. As part of the South Euclid Fire Department's

standard of care, we include the application of "precautionary EKG" to all patients that we suspect of having a problem that may be cardiac in nature. Due to this, it is very common for the paramedics to put a patient on a cardiac monitor as part of their assessment. This may not always be indicated based on the current protocols the paramedics follow. For this reason, the retrospective review also included a more in-depth analysis of the criteria "EKG monitor". EKG monitoring was further defined to include only the following rhythms:

- Sinus Bradycaria
- Paroxysmal Supraventricular Tachycardia (PSVT)
- Supraventricular Tachycardia (SVT)
- Second Degree Heart Block
- Third Degree Heart Block
- Ventricular Tachycardia (V-Tach)
- Ventricular Fibrillation (V-Fib)
- Idioventricular Rhythm
- Agonal Rhythm
- Asystole
- Pulseless Electrical Activity (PEA)

When conducting the retrospective review for the past five years, the above criteria was used to determine whether a call was at the BLS level or ALS level. This information will be used to answer question two, "What percentage of patient transports require Advanced Life Support?". This was easily determined from the procedure and medication elements collected on the patient run reports. The ALS level call is defined as

a call in which at least one ALS procedure was performed or at least one medication was administered. All other calls by default were classified as a BLS level call.

To answer question three, "What is the frequency of simultaneous requests for medical assistance in the City of South Euclid?", a comparative analysis will be used to provide a ratio of first-out squad to second-out squad responses. This information will be taken from the Daily Log Book maintained in the Captain's office at the South Euclid Fire Department.

With regard to question four, "Is there an "on-scene" time discrepancy between squads that are staffed with an initial response of three persons compared to squads staffed with two persons?", the same retrospective review will be used. To determine if an average on-scene discrepancy exists between these two types of responses, on-scene times will be broken down into two categories. These categories, two-person response & three person response, will be averaged to determine the answer. This should show the importance of an initial three person response.

Again, the retrospective review will be used to answer question five, "What is the average time from "enroute to hospital" to "squad inservice" for South Euclid Fire Department rescue squads?". To determine if the "enroute to hospital" to "squad inservice" time has had an increase since the South Euclid Fire Department changed its transport policy, an average will be charted on an annual basis.

Question six, "What effects would implementing a paramedic chase car have for the South Euclid Fire Department?", relies on the combined results of the data collected during the retrospective review.

The results of question one should show that a high percentage of patient transports can be handled by a two-person transport team. If this is the case, the effects of implementing a chase car would be that an initial response of three persons could be maintained while providing a method for one person to return to quarters and become available for another call.

This is related to question three because current assumptions are that responses by the second out squad are rising. Often times, the second response is staffed with two people because there are three people out on the first alarm. Implementing a chase car could potentially allow the number of two person responses to decline. The first call could be a routine call where a two person team could safely transport the patient, allowing the third responder to divert to the second call and provide immediate assistance.

By determining if an on-scene discrepancy exists between squads staffed with two or three persons, this will reveal whether or not an initial response of three members is necessary. If a three person response to transported patients has a shorter on scene average than those staffed with two people, this shows that a three person response is in the best interest of the patient and should be maintained. This further supports implementation of a chase car by initially maintaining a three person response to all alarms, and allowing the possibility that the third provider is available for any subsequent responses that would currently be staffed with two people.

The data collected to determine the average time from “enroute to hospital” to “squad inservice” will be graphed to see if this time has increased over the past five years and if it has, does this increase correlate with the change in South Euclid’s transport

policy by transporting to hospitals that are further from the City of South Euclid. If an increase exists, this would support the chase car concept because EMS alarms have increased in duration. This increases the amount of time a paramedic could be available for subsequent alarms if allowed to return to quarters when not needed for a routine transport.

RESULTS

A total of 9,027 EMS reports, generated by the South Euclid Fire Department over a period spanning January 1, 1998 to December 31, 2002, were reviewed for information to answer the questions this project has proposed. No computer data was available to the author, and all figures were assembled by hand with the assistance of a "Research Project Worksheet" designed specifically for this task. Of the 9,027 reports reviewed, patient transports accounted for 5,786 of this total. This represents the fact that 64% of our EMS alarms required transport over the past 5 years. Conversely, 3,241 or 36% of these alarms ended with the patient refusing transport and signing a release or simply needing some sort of medical assistance.

Regarding question one, "What percentage of patient transports can be handled with a two person transport team?", the research revealed that using the established criteria, 73% (4,214) of our transported patients could be safely and effectively handled with a two-person transport team. The remaining 27% (1,572) would require the use of all three responders to transport the patient (See Appendix A-1 for annual figures).

Question two, "What percentage of patient transports require Advanced Life Support?" had the following results. Advanced Life Support procedures, which can only

be administered by a certified paramedic, were performed on 69% (3,998) of all transported patients during the five year review period. Only 31% (1,781) of the alarms required no ALS intervention (See Appendix A-2 for annual figures).

Question three, "What is the frequency of simultaneous requests for medical assistance in the City of South Euclid?", compared the total responses of first out squad 341, to the total responses of second out squad 342. It is important to keep in mind that 342 only responds when 341 is unavailable due to commitment at a previous emergency. This comparison showed a 6.5 to 1 ratio in responses regarding the two squads. This can be realistically converted to show that every seventh request for EMS service occurs at a time when the 341 crew is already out of service handling a medical emergency. Please note that the research conducted did not include any non-EMS alarms that the department handles. It is important, however, to include the fact that the department responds to almost one thousand non-EMS alarms annually. This figure, if applied, would drastically increase the frequency of multiple emergencies that occur within the response area. Although it was assumed that the frequency of simultaneous requests for medical assistance were on the rise, the data collected did not support this theory and actually showed only a slight variation over the five year span.

In answer to question four, "Is there an "on-scene" time discrepancy between squads staffed with an initial response of three person compared to squads staffed with two persons?" the following results were found. On-scene times for squads staffed with three persons averaged an on-scene time of 18.35 minutes per alarm over the five year review period. In contrast, squads staffed with two persons averaged 20.56 minutes per alarm during the same period (See Appendix A-3 for annual comparison). This

represents a 2.21 minute difference based solely on the staffing situation. Therefore, it could be said that squads with reduced staffing take 12% longer to perform their on scene procedures than those that respond with a full compliment of three responders. This directly affects the efficiency with which the South Euclid Fire Department delivers service to its customers.

Question five asked, "What is the average time from "enroute to hospital" to "squad inservice" for South Euclid Fire Department rescue squads?". In simpler terms, this question measures the amount of time it takes the squad to become available for another alarm once it initiates transport by leaving the scene with a patient prepped and loaded for delivery to an Emergency Department. The research revealed an average "round trip" time of 40.07 minutes per alarm for squads staffed with three persons compared to 40.96 minutes for squads staffed with two persons (See Appendix A-4 for actual figures). This is less than three percent different. This proved that the benefit of having the third responder during a transport situation in no way affects the speed with which the squad becomes available for response to another alarm. It also showed no increase in the "round trip" time since the South Euclid Fire Department increased its' transport policy to include transport to eight hospitals.

Finally, the results for question six, "What effects would implementing a paramedic chase car have for the South Euclid Fire Department?". This question can only be answered by taking into account the data collected for the other five questions, and summarizing those results to determine the effects of chase car implementation. The most astounding and positive effect pertained to the results of question one. This showed that, if a paramedic chase car were implemented, one paramedic could return to quarters

after prepping the patient for transport on 73% of our alarms requiring transport. This 73% averages out to 844.7 alarms annually where the paramedic could be available after the patient is prepped for transport. By multiplying this number by the 40.96 minutes it takes for our squads to become available for another alarm after transporting, and reducing it to hours, this figure alone would increase that paramedics availability by 576.6 man hours annually. If we also factor in the average on scene time of 18.35 minutes per alarm and assume the paramedic could respond for a more severe emergency after an initial on scene assessment, this figure increases to 834.9 man hours annually. In reality, the increase in availability would fall somewhere between these two figures, which is rather substantial.

With 69% of our EMS alarms requiring the use of ALS procedures, the importance of dispatching an initial response of three persons, consisting of two paramedics and one Basic EMT, remains an important component of our delivery system. When this is coupled with the "on scene" discrepancy that was proven with the data pertaining to question three, which revealed a 12% improvement when squads were staffed with three persons as opposed to two, again the importance of the initial response of three persons cannot be overstressed. This allows our rescue squads to provide the most efficient service without unnecessarily utilizing our most valuable EMS resource, the paramedic.

With the increased availability of another paramedic, we should also be able to reduce the number of two person responses. While taking into account that there is no way to accurately predict exactly when a second alarm can occur, it can be assumed there

will be plenty of instances where the chase car medic can become available for a second response.

The final positive outcome will be the reduction of "burn-out" effects for the senior medics. Paramedic burn-out is a very real condition that effects almost all paramedics at various points in their career. This is especially true in EMS systems that experience a high call volume with limited paramedic resources. Although attempts are made to reduce the amount of assigned squad time for senior paramedics, the call volume remains steady. The junior paramedics are the only ones who can then fill this assignment, often giving them a very difficult and stressful start to their career. This lends itself to making paramedic burn out an issue experienced earlier in that persons career.

Several negative results should also be addressed in this section. The first is that the paramedic chase car would need to be left at the scene when the call requires the usage of the three person transport team. With 27% of our transports needing three persons, that equates to 327 alarms annually. This study is not intended to deal with security issues, therefore, there will be no attempt to address them. It will take slightly longer for the squad to return to quarters because the car will need to be picked up prior to returning. It should also be noted that the squad crew would still be available for another response during this time.

Lastly, there is the initial purchase cost and upkeep of adding another vehicle to our current fleet. This subject will be addressed in more detail in the following section, however, cost must not be overlooked to see if this program is cost effective. Money issues are a concern, and value needs to be proven prior to implementation.

DISCUSSION

The intent of the "Discussion" section is to give the researcher an opportunity to provide his own personal conclusions about the study results, and compare those conclusions with the findings of others discussed in the "Literature Review". Also, he can give his own interpretation/evaluation of the results, and impart any implications of the results for the organization.

One item that contradicted the literature reviewed for this research subject is reflected in a statement by Gordon Sachs saying the "majority of transports are BLS". In the case of the South Euclid Fire Department, research has proven this statement to be false. In fact, 69% of EMS alarms handled by the department require ALS intervention, which can only be provided by a certified paramedic. This provides a solid base to show the importance of having two paramedics on the initial response.

Another item of concern regards the amount of time it takes for the squad to become available for another response once transport is initiated. This has become more of a problem since the department changed it's transport policy to increase the number of hospitals it transports to. The research showed no appreciable difference since initiating these changes, however, the researcher noticed a definite trend regarding the time of day. During the hours from 0700 to 1800, the amount of time it took for squads to become available were significantly longer. This can only be attributed to more dense traffic patterns, and longer waiting periods at Emergency Departments during peak times. If further research is conducted in this area, the need to break down this subject into time of day would be beneficial.

The South Euclid Fire Department currently maintains a Standard Operating Procedure for "Non-Emergency Transports". This procedure, which establishes guidelines for taking non-urgent patients to the hospital, was initiated for safety and legal reasons. This policy is rarely followed and rarely enforced. The researcher believes the reason for this is closely related to the total alarm time. With a paramedic chase car, this policy could be more easily utilized, furthering the importance of having a method of returning one responder to the station when not needed.

The research related to the reviewed literature in several ways. To cite Peter Morris, "the paramedic can relinquish care and become available for the next call much sooner" and "this improves the efficiency of the fire/rescue system while still maintaining excellent care". The researcher fully agrees with this statement and can support it with data collected regarding the actual instances where a three person transport team is necessary. With only 27% of our alarms needing a three person transport team, the data has shown that the remaining 73% of EMS alarms would allow one paramedic to clear the scene and become available for another response much sooner. It would effectively free one responder from transporting "routine" emergencies and, as previously stated, increase the responders availability by approximately 576 hours annually.

This figure can be added to with one of the ancillary effects of the research conducted, which was not used to answer the specific research questions. Data was collected regarding non-transport alarms and "on scene" times with a three person response compared with a two person response. During the five year review period, a total of 3,241 non-transport EMS alarms were reported. This gives an average of 648 non-transport EMS alarms annually. The figures on a per alarm basis are as follows:

14.07 minutes/ alarm when staffed with three, 16.39 minutes/alarm when staffed with two. Typically, non-transport alarms can be effectively handled with two persons after an initial evaluation of the problem. The chase car medic could divert from the scene of these alarms while report information is gathered and necessary signatures are collected on the medical release form. This reflects a 15% improvement to "on scene" time with three responders and could add approximately 152 man hours of availability annually. This brings the potential total availability of man hours to 728.6 annually with chase car implementation.

Another relation to the reviewed literature can be illustrated by citing Gordon Sachs who stated, "consideration must be given to the possibility that a fire may occur while a crew is out on an EMS call". A key component of any fire department is to have the resources available for response to any type of incident that can occur in it's response area. Fires and other alarms that are not EMS in nature are another reason that assigning one responder to a chase car can be beneficial. In an ideal setting, initial response to a working structure fire should have fifteen to nineteen qualified personnel, depending on various sources. Although responses of this nature are beyond the financial capability of most jurisdictions with a comparable size and budget, the ability to increase initial response, even if only by one responder, adds to fireground safety and increases our capability to perform tasks in priority.

The researcher is also in agreement with literature cited by James Fiero referring to "more productive and effective use of emergency personnel" and "the capability to manage the problem of worker burnout and rust-out, and improved service to the community at a lower cost". The initial pool of paramedics trained to provide ALS

service to the community in 1984 still comprise a portion of the employees qualified to provide this service today. The mental and physical stresses experienced during an employees' career cannot be measured. Suffice to say, this is a real problem. Any improvement to our EMS system that results in assisting the employer manage worker stress, shows that fire service leadership has a valid concern for the employees overall happiness, health, and well being.

Another topic for discussion is the duration of "on scene" time, and the goals the EMS Division sets for itself. As presented in the literature review, "The Run Report", a newsletter distributed by the State of Ohio, Division of EMS, average "on scene" time from the EMS Incident Reporting System was 20.63 minutes per alarm. This represents a database with hundreds of thousands of EMS incidents, and provides an opportunity to benchmark our performance. When staffed with three responders, our performance exceeds this benchmark by 12% or 2.28 minutes per alarm. When staffed with two responders, our performance mirrors that of the state average at 20.56 minutes per alarm, a less than 1% improvement. The South Euclid Fire Department maintains a high degree of excellence, and has a history of improving its operations to best meet the needs of the community. The paramedic chase car allows us to increase that degree of excellence, and improve our operational readiness.

Lastly, it is only appropriate to search for value when funding becomes a factor in a program's ability to be implemented. Although it is difficult to provide a cost comparison of real dollars to imagined, the researcher felt it necessary to do just that. In April, 2003, the South Euclid Fire Department took delivery of a new Ford Explorer as replacement for the Chief's Car 351, which was purchased through the State Bid

Program. A vehicle of this type would serve perfectly as a paramedic chase car. It could provide the obvious benefit of increasing the paramedics availability, and also be used to carry some of the departments one-of-kind EMS equipment such as Mass Casualty Incident (MCI) supplies, body armor, etc. As a dual role vehicle, it could also be used for Fire/EMS Incident Command. In a telephone interview with the Fire Chief, it was learned that the initial cost of this vehicle was $19,600. To outfit this vehicle with emergency lighting, audible warning device, communication equipment, and stenciling, he estimated this cost at $4,000. To place an annual operating expense for fuel, tires, oil, etc., we will assume a five-year service life. With an annual estimated expense of $1,000 and adding $250 annually, operating expenses for five years are estimated at $7,500. The sum of these expenses for five years is $31,100 or $6,220 annually. To place a cost to the amount of paramedic availability this same vehicle would provide, an estimated hourly salary of $20.00 was used. By multiplying the hourly cost of the responder by the number of hours of availability provided annually (576 hours), a five year cost for this employee is $57,600. This equates to $11,520 annually. This figure places no assumptions on employee raises or increased cost of benefits, just a base hourly salary. As can be seen, this is an annual cost difference of $5,300 favoring the responder, effectively allowing the vehicle to pay for itself in less than three years.

To summarize, the author feels the research definitely supports the paramedic chase car concept as an efficient and cost-effective method of improving Emergency Medical Service delivered to the community. The improvement to EMS delivery, coupled with the benefits of addressing worker stress benefits all who are involved in this

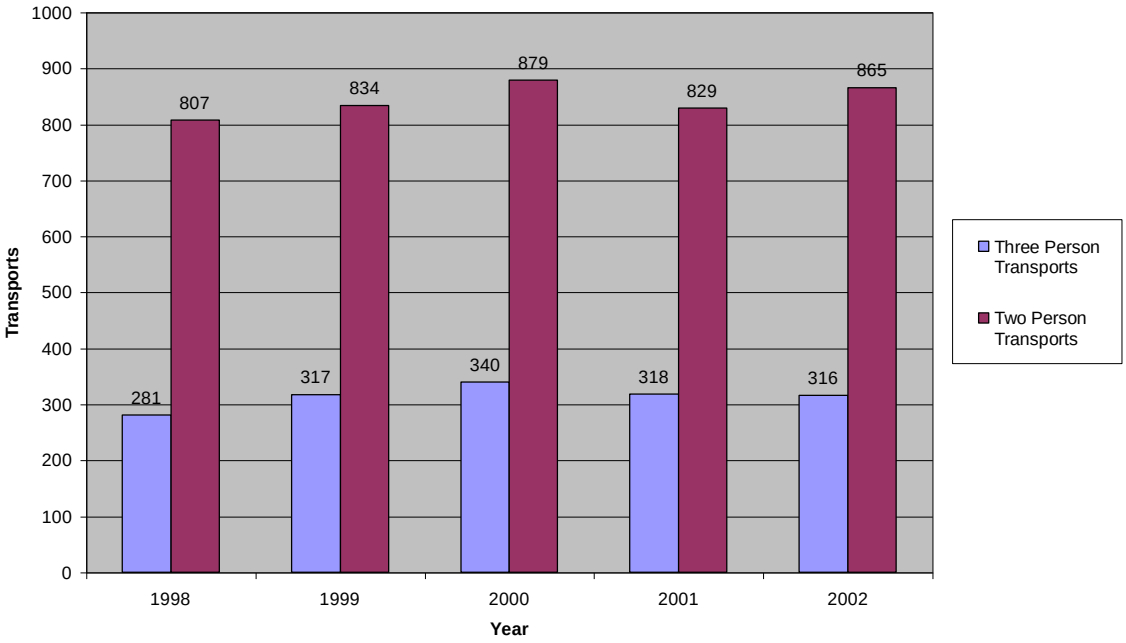
process. It shows our commitment to the external customer, the patient, and the internal customer, the paramedic employee.

RECOMMENDATIONS

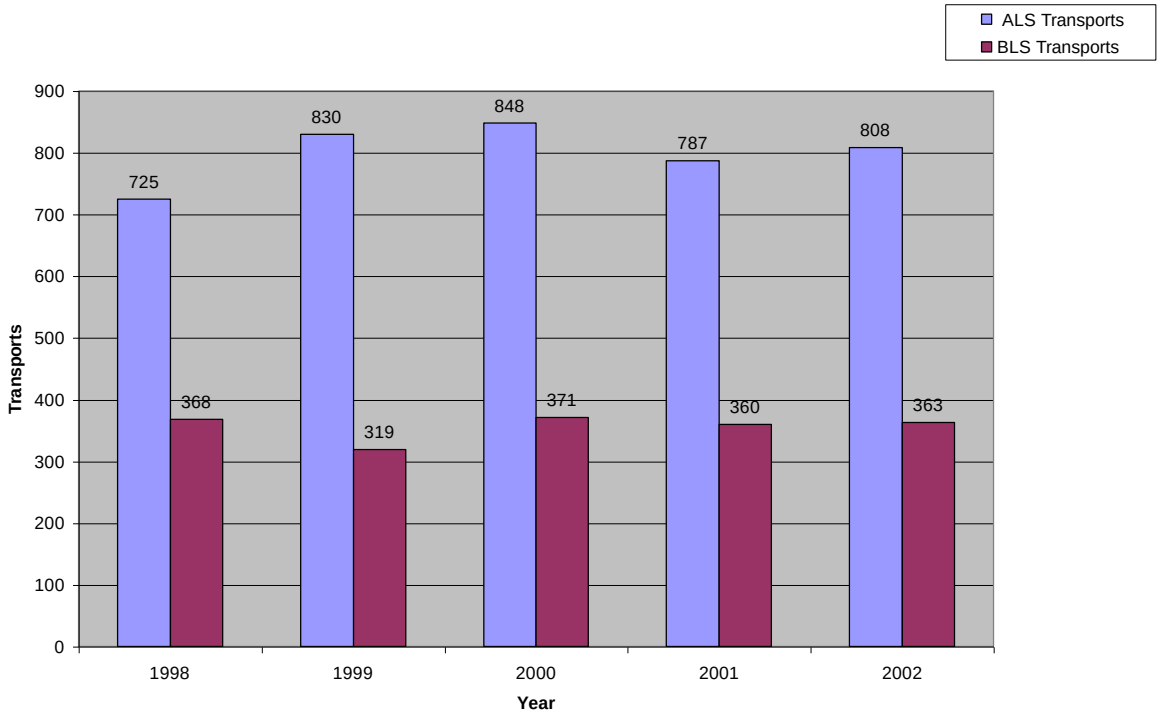
The following recommendations are based on the research conducted with the goal of improving EMS delivery:

1. Gain approval for implementation of a Paramedic Chase Car Pilot Program.
2. Gain approval for purchase of a vehicle that best meets current and projected needs of the South Euclid Fire Department.
3. Develop a Standard Operating Procedure for use of Chase Car personnel (See Appendix B for sample policy).
4. Review and enforce the Standard Operating Procedure for non-emergency transports.
5. Evaluate Chase Car effectiveness on a quarterly basis for a period of one year to make comparisons to the research conducted.

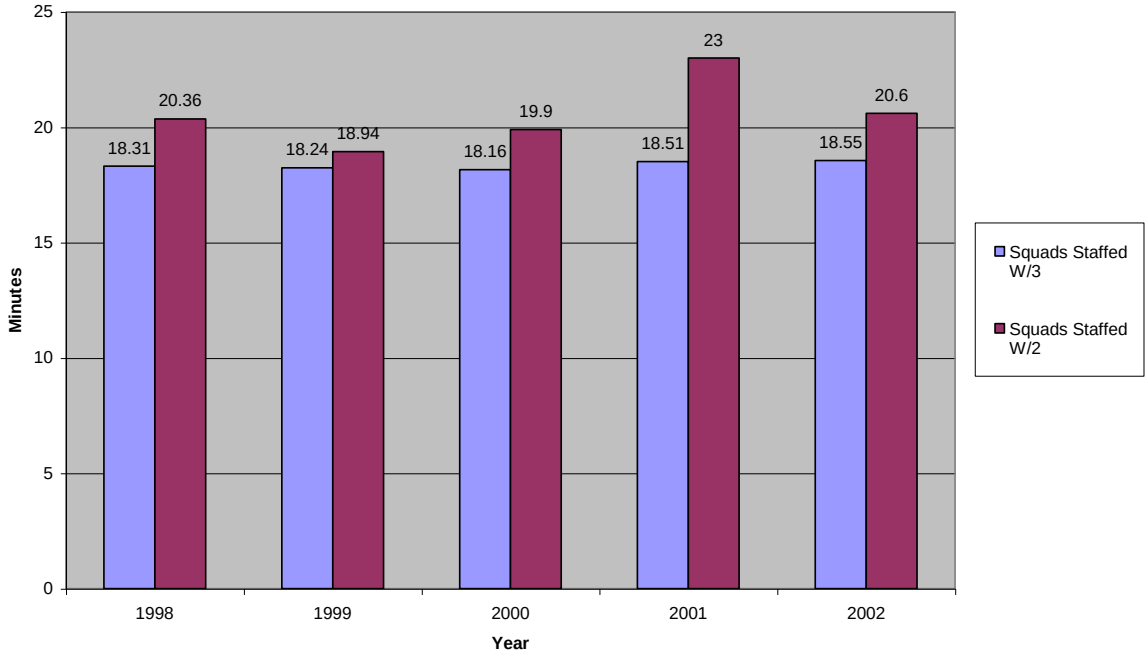
A-1: Retrospective of Criteria Based Transports



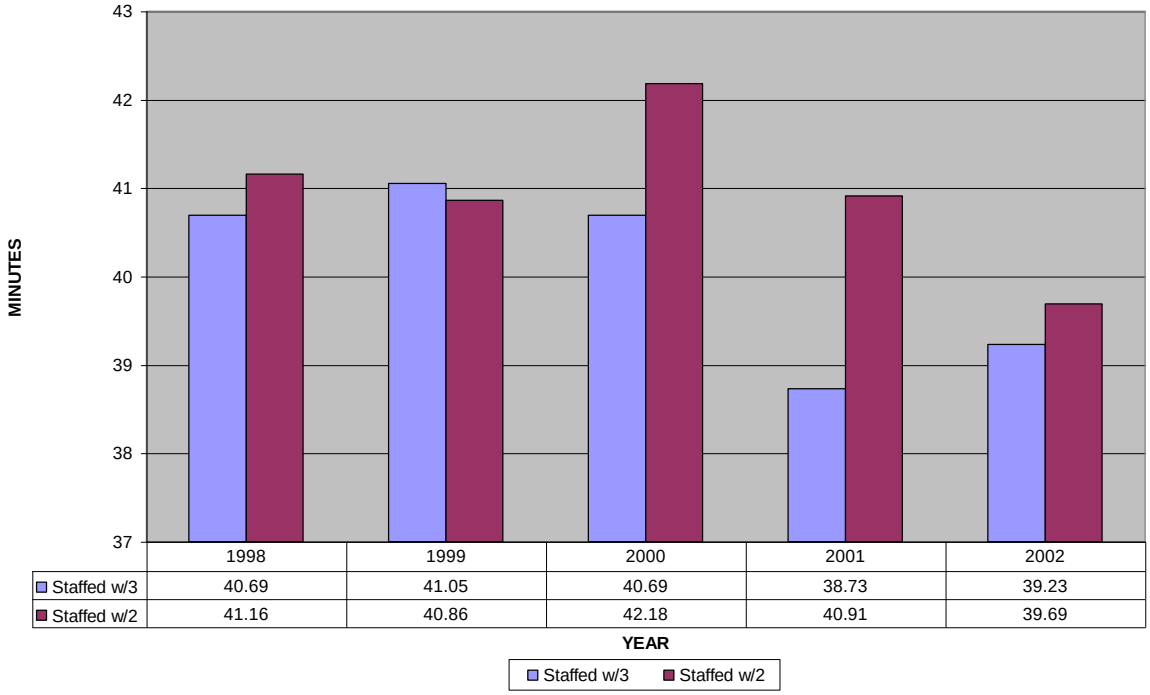
Transports by Level of Care



A-3: On-Scene Time Comparison



A-4: Return to Service Comparison



APPENDIX B

SOUTH EUCLID FIRE DEPARTMENT

STANDARD OPERATIONAL POLICIES & PROCEDURES

PARAMEDIC CHASE CAR	**S.O.P. #_____** **NEW: 6/03**
_____, CHIEF	**PAGE 1 OF 2**

.10 PURPOSE

.11 To provide an efficient EMS delivery system, it has been determined that implementing a "Paramedic Chase Car" will enhance the response capability of the South Euclid Fire Department.

.12 To reduce the number of EMS Alarms that are dispatched with a two person response crew.

.13 To provide an avenue for the third responder to return to service when that responder is not needed for patient transport.

.20 DIVISIONS AFFECTED

.21 All Fire Department Personnel

.30 RESPONSIBILITY

.31 It shall be the responsibility of all officers to insure the proper compliance and adequate training of personnel under their command.

.32 All personnel have the responsibility to adequately learn and follow this procedure.

.40 PROCEDURE

.41 The unit designation of the paramedic chase car shall be 353.

.42 The senior paramedic assigned to the three person squad crew will be assigned to 353.

.43 Upon receipt of an EMS alarm, 353 shall be dispatched along with squad 341.

.44 After arriving at the scene, completing the patient assessment, determining if the patient needs transport and completing on-scene procedures, the squad crew shall decide if the transport necessitates the use of a three person or two person transport.

.45 The decision to transport with two persons shall be an agreement between the paramedics on scene. Should one paramedic feel more comfortable utilizing all three responders, 353 will be left at the scene and the squad crew will transport with all three responders.

.46 In the event all three responders transport, 353 will be secured by locking the doors and the car will be left at the scene. Upon returning to service, the squad shall pick-up 353 and then return to quarters.

.47 In the event only two responders are needed for transport, 353 will notify dispatch that they are inservice and return to quarters.

.48 All personnel are responsible to listen for other alarms that occur while they are on scene. If another alarm occurs and the 353 responder is no longer needed at the first alarm, 353 will notify dispatch they are responding to the second alarm and proceed to the second alarm.

.49 Should 341 be returning to the response area with three persons and an alarm is received prior to picking up 353, the squad shall respond immediately and pick up 353 at the earliest opportunity.

REFERENCE LIST

Fiero, James. (1990, August) "Refining Fire and EMS Services Using Paramedic Fire Companies." Applied Research Project, Executive Fire Officer Program.

Health Care Financing Administration, (2000). *Medicare Ambulance Fee Schedule.*

Morris, Peter. (2002, April) *Bethesda-Chevy Chase Rescue Squad, Inc.* Home Page. Retrieved June 13, 2002. From http://www.bccrs.org/news/fhss_open_house.htm

National Fire Protection Agency. (2001). *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (2001 ed.). 1710-5.3.3.4.4

Nordberg, Marie. (2000,July). Ambulance Staffing: When 1+1 = Confusion. *Emergency Medical Services,* 47-55.

Ohio Department of Public Safety, Division of Emergency Medical Services, (2002, Dec.). *The Run Report, Volume 1, Issue 4 December 2002.*

Sachs, Gordon M. (1997) Expanding EMS: Upgrading from BLS to ALS [Electronic Version]. *Fire Engineering, January 1997.*

Sachs, Gordon M. (1997) Expanding EMS: Getting into the Transport Business [Electronic Version]. *Fire Engineering, March 1997.*

Thorp, Fred (1993, May) A Fire Service Survival Tool. *Fire Chief,* 44-48.