

ENHANCING SAFETY DURING EMERGENCY MEDICAL RESPONSES

Fire Department Response to Emergency Medical Calls for Service: Balancing Response Safety
with Patient Intervention Needs

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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 indicate, and that appropriate credit is given where I have used language, ideas, expressions or writings of others.

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ABSTRACT

The Scottsdale Fire Department began operations in July 2005 responding with lights and siren to all medical incidents. The problem addressed was the Department's lack of a risk analyst prior to implementing this response protocol. The purpose of this descriptive research was to develop recommendations for medical response protocols which balance safety with positive patient outcome objectives. The impacts lights and siren responses have on travel time and risk were identified as were patient conditions that warrant this quantified risk. Priority dispatch protocols that balance risk based on critical patient needs were evaluated. In analyzing the risks associated with lights and siren responses and patient conditions that benefit from a faster initial response, research supports the use of lights and sirens for critical patients. For more stable patients, the use of lights and siren is unnecessary and poses an unwarranted risk to responders and the public.

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INTRODUCTION

A moderate sized suburban community, the City of Scottsdale is bordered by the cities of Phoenix and Tempe, the Salt River Pima Maricopa Indian Community, several unincorporated areas, and State of Arizona land. Home to a quarter million residents and stretching out over 184 square miles, Scottsdale prides itself in its reputation as a high-end community and its motto as “the West’s most western town.”

The City of Scottsdale Fire Department began operations on July 1, 2005. Prior to this date, fire and emergency medical services were provided through a contract with a large, publicly-held corporation, Rural/Metro Corporation. As a new municipal organization, the City of Scottsdale Fire Department contracted with the City of Phoenix Fire Department to provide 9-1-1 dispatch services. Under this arrangement, the City of Scottsdale adopted a dispatch protocol which recommends a lights and siren response for all emergency medical incidents. The problem in the City of Scottsdale Fire Department is the current emergency medical dispatch protocol was developed without specific regard for the impact response mode protocol has on the safety of the responders and the community. The purpose of this research is to develop an emergency medical response protocol that balances safety in response with the urgency of patient medical condition.

Descriptive research will be employed to gather, process, and analyze data to improve the safe response of Scottsdale Fire Department apparatus.

The following questions will be answered:

1. How does the use of lights and siren impact the travel time of Fire Department apparatus responding to emergency medical calls?

2. What are the risks posed lights and siren responses to Fire Department personnel and the general public?
3. What patient medical conditions are positively impacted by shorter response times realized through the use of lights and siren?
4. What emergency medical response protocols are in place in other communities, including the Phoenix Metropolitan Regional Dispatch system?
5. What emergency medical response protocol meets the needs of City of Scottsdale patient populations and should be considered for endorsement by the Scottsdale Fire Department Medical Director?

BACKGROUND AND SIGNIFICANCE

On the northeast edge of the Phoenix metropolitan area, the City of Scottsdale is home to 237,120 residents, many of whom may be drawn to the unique charm of Scottsdale's self-professed "The West's most western town" culture and environment. According to Maricopa Association of Governments (2007), Scottsdale has seen a sustained population growth of approximately 10% since 2000 when this community of 184 square miles recorded a population of 202,705 residents. Scottsdale is unique in the Phoenix metropolitan region in its efforts to maintain pristine Sonoran Desert land within City borders. The products of years of hard work and millions of City dollars invested in Sonoran Desert land, Scottsdale's Preserve land represents thirty percent of the City's total incorporated land, or 54 miles. The majority of this land lay on the northern and eastern edges of Scottsdale. The Preserve is more than just a sanctuary for indigenous plant and animal life; it is a major component in Scottsdale's marketing plan and economic engine.

Tied to on the cachet of the Preserve, the remaining 130 square miles of Scottsdale is a mix of residential, resort, commercial, and retail development. Home to a small but very active regional airport, Scottsdale maintains pockets of light industrial complexes most of which are located on or around the airport property. Another pocket of light industrial complexes is found in the oldest region of Scottsdale in the south part of the City.

Since its incorporation in 1951, development in Scottsdale grew from the south to the north. The older portions of south Scottsdale, typified by ranch-style tract homes on small residential lots, maintain a higher population density than the northern portions of the City. The typical home in the southern region is approximately 1,200 square feet on a 6,000 square foot parcel and was built in the period between mid-1950 to mid-1970. The central region of Scottsdale is typified by larger tract homes in gated communities. These homes may be either one or two stories, up to 3,500 square feet, and on lots only marginally larger than their southern neighbors. This region of Scottsdale developed from the mid-1970's to the early 1990's. The final area of major growth is the north and north east regions of Scottsdale. Growth in these regions has been steady over the past two decades. It is difficult to pinpoint the typical north Scottsdale home; however, homes in this region have one thing in common: they are among the most expensive and lavish homes in Arizona. Homes in these regions range from multimillion-dollar condominiums on private golf courses to 25,000-plus square foot mansions on multi-acre equestrian parcels.

Scottsdale is a hub of activity for signature regional and national events, and Scottsdale boasts many high-end resorts, restaurants, and retail centers which maximize the revenue potential of these events. According to Scottsdale Financial Director Art Rullo (2007), city-generated sales tax is the largest single revenue fund for operating dollars. The annual tourism

season from November to April is critical to the community's economic vitality. During this season, Scottsdale plays host to the Professional Golfers' Association FBR Open, the Barrett-Jackson Automobile Auction, the Arabian Horse Show, and several other major events that draw visitors and media from throughout the world. Scottsdale has a well articulated business and marketing plan.

Until July 1, 2005 Scottsdale's fire and medical services were contracted to the Rural/Metro Corporation. Scottsdale is the birthplace of Rural/Metro when in the early 1950's Scottsdale resident Lou Witzeman bought a fire truck to protect his property. At the time, the City did not possess any organized fire service capabilities. Many of Witzeman's neighbors became interested in financially contributing to offset the costs of Witzeman's investment in return for fire protection services. A subscription fire service model was born in Scottsdale during this era. As the interest spread throughout the community, so too did Witzeman's service. Before the end of Rural/Metro's 54-year history with Scottsdale, the City contracted directly with the corporation to provide both fire and medical services to all businesses and residents.

Scottsdale's contract for fire and medical services model abruptly came to an end on July 1, 2005 when the City of Scottsdale Fire Department became operational following an unusual series of events. In 2003, the labor union representing Scottsdale-based Rural/Metro firefighters was successful in bringing the fire contract to a vote of the citizens. The labor group proposed an end to the Rural/Metro contract while retaining the Scottsdale-based Rural/Metro firefighters as municipal firefighters with a newly formed Scottsdale Fire Department. To the chagrin of the labor union, the ballot measure failed to pass. The result was the continued political support for a contractual relationship between the City of Scottsdale and Rural/Metro Corporation. In a surprise turn six months after winning at the polls, the Rural/Metro Corporation announced that

it would not extend its contract with Scottsdale beyond the next contract extension opportunity, July 1, 2005. With just 18 months notice, the City of Scottsdale needed to develop a new municipal fire department. At this time, the only fire service resources the City owned were the capital assets: the fire stations and fire apparatus. The City did not employ a single fire service professional on staff, nor did the City own a single fire nozzle for the apparatus or a single spoon for the fire stations. One other key asset under Rural/Metro's control was the dispatch and radio system. Reliance on the Rural/Metro radio system and dispatch services was set to end at midnight on July 1, 2005.

City Manger Jan Dolan put together a citywide team to develop the new municipal fire department in time for the July 1, 2005 transition from private to municipal fire response. Dolan, who formerly worked in the San Francisco Bay area called on a former professional contact, then-Fremont Fire Department Fire Chief William McDonald, to lead this charge as the first Fire Chief working for the City of Scottsdale. McDonald accepted Dolan's offer and joined the City with approximately one year in which to put all the pieces in place for a new municipal fire department which operates 16 front-line response apparatus from 13 fire stations.

With 12 months to go until the transition, Chief McDonald and a small team hired 211 suppression personnel to fill the ranks of firefighter, engineer, fire captain, and battalion chief. Chief McDonald added to his team a command staff of eight chief officers: three former Rural Metro chief officers and five chief officers from outside agencies. A regional radio system owned and managed by the City of Phoenix was extended into Scottsdale requiring new radio towers, fire station radio packages, handheld and apparatus-based radios, and vehicle-mounted computers. Miles of fire hose were purchased, as was every single piece of equipment for the apparatus and fire stations. New uniforms and personal protective gear were purchased

including new self-contained breathing apparatus. A new set of policies and operating guidelines were developed, approved, and taught to the new workforce.

Fortunately, the regional municipal fire departments stepped forward to assist the City of Scottsdale. Foremost among the regional partners was the Phoenix Fire Department who negotiated a contract with the City of Scottsdale for radio and dispatch services. Under this contract, fire and medical calls for service in Scottsdale are routed to the Phoenix Fire Communications Center for processing. Phoenix Communications personnel dispatch Scottsdale Fire Department resources using the Phoenix-owned and maintained radio and computer-aided dispatch equipment. Although other priority dispatch options were available, the Scottsdale Fire Department chose a dispatch protocol calling for a lights and siren response to all emergency medical incidents, regardless of the patient's primary medical complaint. For the purposes of this research effort, the use of lights and siren for emergency response is synonymous with the term "code three" response whereas responding without lights and siren is synonymous with the term "code two" response. Without the benefit of historical data and out of deference to providing the highest level of service, the adoption of a total lights and siren response protocol for emergency medical incidents was a sound decision given the lack of community-specific data available at the time of the transition from private to municipal operations.

The Scottsdale Fire Department provides advanced life support (ALS) service from all sixteen frontline response engine and ladder companies. During the first 30 months of operations, the Scottsdale Fire Department responded to approximately 57,000 calls for service. Approximately 70% of those responses were for emergency medical incidents. During this same 30-month period, the Fire Department traveled 30,400 miles for every one apparatus collision. The average apparatus collision costs the Fire Department \$6,891 (Scottsdale, 2008). The City

of Scottsdale is self-insured for the first one-million dollars of damage in a vehicle collision. Each City department has an account code in its budget for “damage claims.” The budgeted expense related to damage claims is calculated based on the department’s historical vehicle collision costs. As a new department in the City, the Scottsdale Fire Department’s budgeted damage claim is dynamic based on the lack of sufficient historical data.

Reducing accident claims against the Fire Department is significant to the author of this research study for several reasons. The author, Scottsdale Fire Deputy Chief of Operations manages the damage claim budget for emergency response apparatus. Also, the City of Scottsdale maintains a small and comparatively unreliable fleet of older reserve apparatus. When significant damage requires frontline units to be placed out of service, the reliability of response capability is jeopardized. Finally, as the director of fire emergency services, the Deputy Chief of Operations is in a very visible and accountable position. Permitting a total lights and siren response protocol without the benefit of a risk analysis jeopardizes the author’s employment stability if responses produce outcomes that either exceed reasonable budget accounting or cause the public to lose faith in the decision and policy making ability of their fire department.

The National Fire Academy course “Leading Community Risk Reduction” encompasses a curriculum particularly germane to this research. The unit entitled “Getting Ready” introduces students to a frequency-risk matrix for analyzing community risk (National Fire Academy, 2007). Applying this matrix to lights and siren responses reveals the Scottsdale Fire Department is particularly vulnerable: the risk of vehicle accidents is high, and the frequency of response is high. Furthermore, this unit establishes the personal responsibility of leaders when confronting high-risk circumstances.

The unit entitled “Assessing Community Risk” presents theories on hazard identification and determining causal factors (2007). Hazard identification is a product of probability and significance. In the case of this research study it is highly probably that based on current response protocols, the Scottsdale Fire Department will continue with its current emergency vehicle accident trend. The significance of this trend can have catastrophic consequences on department and City leadership, particularly if a collision produces tragic events such as a loss of life. In determining causal factors, those factors with the highest level of direct impact on life, property, environment and/or community involvement are the primary focus (2007). Research will explore if apparatus traveling with lights and siren activated pose a higher risk to life and property than apparatus traveling with the normal flow of traffic. The question of causal relationship will be analyzed through literature review and field-based survey.

Finally the Leading Community Risk Reduction unit on “Intervention Strategies” discusses the philosophy of identifying acceptable solutions (2007). This unit captures the ultimate intent of this research effort: to identify an acceptable emergency medical response protocol that balances safety in response with the urgency of patient medical condition.

Limiting the frequency of emergency responses using lights and siren to only those circumstances supported by data and expert advice may decrease the potential risk to responders and the community. This goal ties directly to the United States Fire Administration’s Operational Objective of developing comprehensive all-hazard risk reduction plans. Research will seek whether a quantifiable connection exists between the use of lights and siren and an increase in risk. The next step will be to identify medical conditions that may warrant a calculated increase in risk due to the benefit realized by earlier first-responder intervention.

Medical conditions that do not warrant an increased risk associated with lights and siren response will be identified as a potential focus for risk reduction planning.

LITERATURE REVIEW

According to Jonathan Sesel of Silicon Rose Risk Management Services (2007), modern risk management practices transitioned from a pure insurance industry practice into non-insurance business practices during the decades of the 1970's and 1980's. Until that point, risk management served as an analysis tool for calculating insurance rates. Realizing the financial power of reducing liability, government and other non-insurance organizations embraced risk management as a tool for positively impacting their bottom line (2007). The literature review for this applied research project collates information germane to a risk analysis of emergency response protocol for Scottsdale Fire apparatus when responding to emergency medical incidents. In doing so, the literature review provides a foundation to evaluate the five research questions.

Research Question One: The Impact of Lights and Siren on Travel Time

Conventional wisdom suggests that emergency vehicles arrive at their intended location faster by responding with emergency lights and siren activated. The first question for this research effort challenges and attempts to quantify conventional position by asking: how does the use of lights and siren impact the travel time of Fire Department apparatus responding to emergency calls?

In a 1977 publication entitled "Effectiveness of Audible Devices on Emergency Vehicles," the United States Department of Transportation National Highway Traffic Safety Administration concludes that the use of emergency devices such as sirens may "never become an effective warning device." While emergency warning devices such as flashing lights and

sirens may never guarantee total effectiveness, the degree to which these devices enhance response has been studied by several agencies.

In their November 1998 article titled “Time Saved with Use of Emergency Warning Lights and Sirens during Response to Requests for Emergency Medical Aid in an Urban Environment,” Jeffrey Ho and Brian Casey report findings following a nine-month field test of calls for service. During this period, Ho and Casey utilize a chase vehicle to follow the same route as the emergency response vehicle. The emergency response vehicle negotiated its route with lights and siren activated. The chase vehicle followed the emergency response vehicle by navigating the normal flow of traffic. This time trial captured data from sixty-four calls for service. From this research, Ho and Casey calculate the mean non-lights and siren response time as 7.48 minutes and the mean lights and siren response time as 4.46 minutes. The mean speed for the chase vehicle was 17.49 miles per hours while the mean speed for the lights and siren lead vehicle was 28.87 miles per hour. The difference in time associated with the use of lights and siren ranges from 0.37 minutes to 7.40 minutes with a mean saved time of 3.02 minutes (p. 586-587). Of particular importance when considering this data is the issue of time and route. The chase vehicle followed the path of the lead vehicle, thus navigating a route whose traffic flow was disrupted by the use of lights and siren attributed to the lead vehicle. Ho and Casey acknowledge the chase vehicles’ traffic impedance due to disruption of normal traffic by the lead vehicles, but they are unable to correct for this variable based on the structure of their study. Ho and Casey ultimately conclude, “code three operations by emergency medical services (EMS) personnel in an urban, two-tiered EMS setting saved significant time over code two operations when traveling to a call” (p. 585).

James O. Page, publisher and editor-in-chief of the *Journal of Emergency Medical Services (JEMS)*, discusses a 1992 study of ambulance response times that led to a different conclusion. In the 1993 *JEMS* article “Waking Primal Instincts,” Page cites a response time difference of less than 30 seconds when comparing lights and siren responses with non-lights and siren response. In Page’s study, the average difference in speed is a mere five miles per hour (p. 7). Page does not describe the methodology of this study so it is difficult to quantify Page’s correlation between units traveling with lights and siren from those traveling with the normal flow of traffic.

In 1994, Richard Hunt of the American College of Emergency Physicians studied the relationship between the use of lights and siren and response times. The objective of Hunt’s study was, “to determine whether ambulance transport time from the scene to the emergency department is faster with warning lights and siren than that without” (p. 507). Unlike the studies conducted by Ho and Casey, Hunt sought to remove the impact the lights and siren lead vehicle had on the chase vehicle traveling with normal traffic flow. To accomplish this goal, Hunt separated the time interval between the initial lights and siren response vehicle and the non-lights and siren chase vehicle. The time separation between responses by the lights and siren vehicle and the chase vehicle was at least one week. The chase vehicle responded on same day of the week and within five minutes of the time of day as the initial lights and siren response vehicle. This removed the effect of disrupted traffic patterns due to the use of lights and siren which influenced Ho and Casey’s results. After recording fifty responses with lights and siren and fifty responses without, Hunt calculates a 43.5-second mean savings in response time (p. 510) for vehicles traveling with lights and siren activated. Hunt’s final conclusion provides an apropos segue to the next two research questions: Hunt states, “The 43.5-second mean time savings with

warning lights and sirens does not warrant use of lights and sirens during ambulance transport, except in extremely rare situational or clinical circumstances” (p. 510-511).

Research Question Two: The Risk Associated with Response Modes

If a lights and siren response presented no greater risk than a response without lights and siren, the heart of this research would be largely moot. The second question for this body of research addresses the potential for increased risk associated with the use lights and siren by emergency response apparatus.

According to the National Fire Protection Association’s 2006 report on firefighter fatalities, “Deaths in crashes continue to account for a significant proportion of the annual fatalities. Crashes are, in fact, the second leading cause of on-duty fatalities” (p. 12) and accounted for 17 deaths in 2006 (p. 16).

Vehicle collisions involving emergency response units tend to garner media attention. Hunt (1995) analyzed media clippings as a measuring tool for such collisions. Hunt found 298 national press clippings documenting emergency response vehicle collisions during a one-year period from October 1989 to September 1990 (p. 508). Not all accidents involving emergency response vehicles generate national press clippings. In analyzing national statistics, Hunt projects “as many as 12,000 emergency medical vehicle crashes occur each year in the United States and Canada as a direct result of lights and siren use” (p. 510). Hunt concludes “there is substantial risk associated with ambulance crashes in terms of injury, death, and financial costs” (p. 508).

The City of Scottsdale Division of Risk Management collates accident data and publishes an annual report for each operational City department. Gathering emergency response vehicle accident data in the City of Scottsdale is a matter of policy. According to City Administrative

Regulation 245 all accidents, regardless of severity, must be documented using the City's approved form: the Supervisor's Report of Accident (2007). With 31 front-line emergency response apparatus in a fleet of 62 total fire department vehicles, Scottsdale Fire Operations division accounts for 50% of the total Fire Department fleet. For fiscal year 2006-2007, 87% of vehicle accidents involving Fire Department vehicles were attributed to Fire Operations emergency response vehicles. Logging 455,270 miles during fiscal year 2006-2007, the total Fire Department fleet experienced one vehicle accident for every 30,349 miles traveled at an average cost of \$6,891 per accident (2008). While these facts lend to comparative analysis, they don't paint the full picture regarding high risk outcomes in lights and siren responses.

More difficult to quantify are those vehicle collisions that result from, but do not directly involve, emergency response vehicles traveling with lights and siren. A 1997 article "The Wake-Effect – Emergency Vehicle-Related Collisions," identifies this widely observed but poorly documented phenomenon in which emergency responders observe accidents caused by the abrupt response of other drivers to emergency vehicles traveling with lights and siren (Clawson, Martin, Cady, & Maio, 1997, p. 274). In an interview with Brett Patterson (2003), Clawson concludes, "The blind use of lights and siren may be killing more people that it saves" (p. 65). Furthermore, Patterson refers to "the blanket use of lights and siren" as an "antiquated practice" (p. 64).

In 1931, H.W. Heinrich published his theory on the relationship between close calls or near misses and significant accidents with injury in the workplace. Heinrich's text, "Industrial Accident Prevention: A Scientific Approach," still stands as a quintessential reference for risk management analysis. Heinrich introduces the philosophy of a risk pyramid whereby the apex of the pyramid is a serious accident with injury and the base is a mathematically related number of

near misses. According to Heinrich, every one serious accident is preceded by 300 near misses. Under this premise, reducing the instance of near misses has a linear relationship with the reduction of serious accidents (Heinrich, 1931, p. 37).

Research Question Three: Patient Types that Benefit from Lights and Siren Responses

The efficacy of using lights and siren when responding to and/or transporting patients with is questionable according to James O. Page in his 1993 *JEMS* article, “Waking Primal Instincts.” Page sites a Pennsylvania study in which 723 patients were transported without the use of lights and siren. This study found, “that neither morbidity nor mortality is related to the theoretically longer times of non-emergency transports” (p. 7).

The relationship between lights and siren response and citizens’ expectations is explored in a March 2007 article by Mark Wallace. Wallace proposes, “Responding to emergency calls using red lights and sirens is an important marketing tool” (p. 167). Wallace questions whether the reluctance to discontinue the indiscriminate use of lights and siren may be tied to the desire among some fire service professionals to announce to the public “we are on the job” as a means of continuing community support (p. 169).

Brian Bledsoe (2003) identifies the perceived connection between the use of lights and siren and improved patient outcomes as a popular myth in his article “Emergency EMS Mythology.” Bledsoe sites lights and siren response time studies from throughout the United States. Of the literature that exists on emergency vehicle responses, none, according to Bledsoe, connect faster response times with improved patient outcomes (p. 72).

In October 2007, the Wisconsin EMS Association issued a position statement regarding emergency vehicle operations that scratched the surface for the more discriminate analysis of the

efficacy of using lights and siren. The position statement includes seven directives. Item six states:

The use of red lights and siren should be reduced as much as possible including during normal conditions on an interstate highway. Transporting patients to the hospital using red lights and siren should be reserved only for the most critical patients in whom life-saving or sustaining intervention will be performed at the destination hospital within minutes of the patient's arrival. Most ambulance services should be able to limit their use of red lights and siren during transportation to 10% or less (page 2).

The United State Fire Administration (USFA) supports the calculated use of lights and siren in its 1991 Emergency Vehicle Driver Training manual. In this manual, the USFA defines a true emergency requiring rapid response as, "a situation in which there is a high probability of death or serious injury to an individual, or significant property loss, and action by an Emergency Vehicle operator may reduce the seriousness of the situation" (p. 68).

The 1994 position paper "Use of Warning Lights and Siren in Emergency Medical Vehicle Response and Patient Transport" by the National Association of Emergency Medical Services Physicians [NAEMSP] and the National Association of State Emergency Medical Services Directors [NASEMSD] adds specificity to the identification of patients conditions which may be positively impacted by the use of lights and siren. This position paper proposes:

Ideally, the use of lights and siren should be reserved for those situations or circumstances in which response and transport times have been shown to improve a patient's chances for survival include cardiac or respiratory arrest, airway

obstruction, extreme dyspnea, critical trauma, childbirth and problems with pregnancy, drowning, and electrocution (p. 135).

In developing emergency response and transportation protocol, NAEMSP and NASEMSD identify the local EMS medical director as the primary driver. NAEMSP and NASEMSD suggest the local EMS medical director should facilitate protocol development in light of local patient outcome statistics, quality improvement programs, and safety and risk management philosophies (p. 133). This position will be more thoroughly explored in addressing research question five.

Research Question Four: Exploring Emergency Medical Dispatch Protocol Options

In its 2001 publication, “Telecommunicator,” the International Fire Service Training Association (IFSTA), establishes a primary definition of a priority dispatch system. According to IFSTA, priority dispatch systems aid in prioritizing resources “when demands for service exceed the resources available” (p. 89). IFSTA identifies a detailed prioritization system with two to ten priority levels, ranging from the highest priority with an “imminent threat to life” to the lowest priority with a “developing or likely to occur incident” (p. 89).

Following developments by the U.S. Department of Transportation and the Phoenix Fire Department in the mid-1970’s, Salt Lake City Medical Director Dr. Jeff Clawson created the first widely accepted emergency medical dispatch (EMD) system in 1977 (Larson, 1998). Clawson’s system incorporates a series of questions in a decision-tree format. Dispatchers ask standardized questions and follow the responses in determining both the pre-arrival instructions provided to the caller as well as a standard recommendation for dispatch apparatus and personnel based on the nature of the emergency.

Renowned for its cutting edge EMS system design, King County (WA) implemented a priority dispatch system in 1990 based on a new philosophy, Criteria Based Dispatch (CBD). CBD differs from the stricter EMD system in its acknowledgement and incorporation of dispatcher skill and discretion. In the CBD model, “a key assumption... is that dispatchers are intelligent professionals who, with experience, recognize that information comes to them in many different ways” (Culley, Eisneburg, Horton, and Koonz, 1993, p. 30). CBD advocates three response criteria. The first set of patient criteria triggers the dispatch of advanced and basic life support units responding with lights and siren. The second set of patient criteria triggers the dispatch of basic life support units responding with lights and siren. Finally, the third set of patient criteria triggers the dispatch of basic life support units responding without lights and siren (p. 31).

The Scottsdale Fire Department exists within the priority dispatch philosophy of its contract dispatch agency, the Phoenix Fire Department. Eighteen other regional fire departments also contract with the Phoenix Fire Department for dispatch services (Phoenix Fire Department, 2008). The guiding principle of this philosophy is the “adequate, early, and pessimistic response of the closest units required to handle a particular medical emergency” (Phoenix Fire Department, 1997, p. 205.02-1). While response units and mode may be tailored to meet the protocol established by individual contact agencies, Phoenix dispatch personnel solicit information from callers to identify the incident nature code. Nature codes may be based on a patient’s primary medical complaint, such as difficulty breathing, or may be based on the circumstances, such as a motor vehicle accident involving a pedestrian. There are 68 discrete nature codes in the Phoenix dispatch system (Appendix A). These 68 nature codes are divided into five broad categories based on the response apparatus recommendation in place for Phoenix

Fire Department crews: Advanced Life Support Calls, Advanced or Basic Life Support Calls, Minor Medical Calls, Violent Medical Calls, and Auto Accidents (Phoenix, 2003, p. 205.01-4 – 205.01-5). For communities that make full use of the Phoenix emergency medical dispatch protocols, recommended apparatus and response mode (lights and siren or no lights and siren) differ depending on the parent category of the nature code. The City of Scottsdale utilizes all aspects of the Phoenix emergency medical dispatch except the recommendations pertaining to response mode.

Research Question Five: Emergency Medical Dispatch Protocols Meeting the Needs the City of Scottsdale and the Scottsdale Fire Medical Director

Similar to most large suburban communities, the City of Scottsdale is a diverse community in terms of socioeconomic demographics. According to the most recent statistics from the U.S. Census Bureau, the demographic composition of the City of Scottsdale is only subtly different than the State of Arizona (2008). The majority of those differences coalesce around the affluent nature of Scottsdale, including higher than average per capita income and educational achievement. Other demographic information suggests the City of Scottsdale follows national and regional trends, thus creating an environment who citizenry closely reflects regional and national disease, illness, and injury trends. No data was found to indicate the City of Scottsdale requires a custom emergency medical dispatch protocol based on injury or disease trends unique to Scottsdale.

Summary

The literature review influenced many critical aspects for this applied research. First, the literature review brought into question the presence of a link between faster response times and improved patient outcomes. As a result of this information, the emergency response survey

conducted for this research project searched for a link between the dispatched nature code and the relative stability of the patient to withstand longer initial response times without adverse medical effects. Second, the literature review shed light on a risk to the community not traditionally quantified: the risk of accident and/or injury to the general public occurring in the wake of emergency response apparatus. This prompted the author to include a narrative section in the emergency response survey to capture observations that would not have otherwise been quantified. Finally, the literature review pointed to the local EMS medical director as the primary expert in establishing a response protocol based on positive patient outcomes. This prompted the author to include the medical director in a data-driven model for emergency response that balances risk with positive patient outcomes.

PROCEDURES

The purpose of the applied research project is to develop meaningful data on which the Scottsdale Fire Department may review its emergency medical response procedures to decrease the risk associated with lights and siren responses while balancing patient outcome goals. The literature review focused on the major topics to support this purpose. The literature review influenced the development of an emergency medical response survey conducted in the City of Scottsdale during the month of January 2008. Furthermore, the literature review overwhelmingly recommended the active involvement of the local Medical Director in establishing prudent emergency medical response protocols.

Literature Review

First, the literature review focused on the time benefit associated with lights and siren response versus non-lights and siren response. Several communities performed time-trial studies attempting to quantify the amount of time saved by traveling with lights and siren. Since

emergency response apparatus respond with lights and siren to all emergency medical responses in the City of Scottsdale, an empirical analysis of the difference in response time outcomes was not feasible. Further, since travel time is influenced by a myriad of uncontrollable factors such as traffic, road construction, weather, time of day and others, recreating or approximating the difference between an actual lights and siren response and a theoretical or test-case response without lights and siren would not have created comparable data sets. Indeed, in the published time-trial studies, the data sets were illustrative of potential differences in response time but required much theoretical assumption.

Second, the literature review focused on the risks associated with responding with lights and siren. Trade journals for fire service and emergency medical services shed light on the increased risk associated with lights and siren responses. Research indicated the presence of a phenomenon more difficult to quantify known as the “wake effect.” This phenomenon suggests that many of the negative outcomes associated with light and siren response are not captured because of the lack of direct involvement of the responding emergency vehicle. This information influenced the research conducted for this study through the inclusion of accident and near-miss accident reporting in the emergency medical response survey of Scottsdale Fire personnel.

The literature review moved on to focus on identifying medical conditions that may be positively affected by a more rapid response protocol. This information influenced the research conducted for this study through the inclusion of specific data field in the emergency medical response survey. First, the survey solicited data regarding the nature code of the medical condition at the time of dispatch. The survey then solicited the actual nature code encountered by response crews. The difference between these two data sets provides a basis for analyzing the

accuracy of emergency dispatchers in identifying the correct nature code based on standardized emergency medical dispatch questions and responses. Second, the survey solicited data on patient condition upon arrival of emergency response personnel. This allows an analysis of the patients' presenting need for immediate intervention based on medical complaint. Finally, the survey requested emergency medical transport information. This allows an analysis of the relative success in stabilizing medical patients. Those patients transported with lights and siren present a more critical condition to the emergency medical personnel on scene as opposed to those patients who either receive no transportation to a medical facility, are transported without lights and siren by ambulance, or are transported by privately owned vehicle. This information provides more information regarding the timely need of emergency medical services.

Finally, the literature review focused on established emergency medical response protocols available to other communities. While there are many standardized systems available, an interview with Scottsdale Fire Deputy Chief Rich Upham revealed significant parameters on Scottsdale Fire Department's ability to amend its dispatch protocol. Upham serves as the department's liaison with Phoenix Fire Communications. According to Upham, the Scottsdale Fire Department is limited in its ability to affect wholesale changes in emergency medical dispatch protocol. Adopting an entirely new system is not possible. However, Scottsdale Fire has the ability to customize the protocols for each of the 68 nature codes defined by Phoenix Fire Communications. This interview influenced the scope of research gathered to answer the fourth research question. Rather than focus on all available emergency medical dispatch protocols, research focused on options available to the City of Scottsdale within the parameters established by the Phoenix Regional Dispatch contract.

Emergency Medical Response Survey: City of Scottsdale

A convenience survey of City of Scottsdale emergency medical responses was conducted over a two-week period. This survey gathered data on the reliability of initial nature code at time of dispatch, the risk associated with lights and siren response, patient presentation upon arrival of emergency response crews, and the stability of patients after emergency medical intervention. From January 9 to January 22, 2008, the company officers assigned to the sixteen emergency response units in the City of Scottsdale completed a survey form for all emergency medical dispatches (Appendix B). Hard copies of the survey form were placed on each unit, and the company officer was asked to complete the form at the end of each medical incident. The forms were routed back to Fire Headquarters via interoffice mail. At the end of this period, 469 individual surveys were submitted to the Deputy Fire Chief of Operations for analysis.

In completing the survey forms, company officers were instructed to complete a separate form for each medical dispatch. When multiple patients existed, the information gathered on the form was based on the most critical patient. Five example survey forms were included in the instruction packet to illustrate the information and format sought (Appendix C).

To ensure all emergency medical incidents were captured, the incident number listed on the survey form was compared to the daily run log for each apparatus. All medical incidents were captured for this study.

Several survey limitations must be noted. First, while a large number of incidents were captured during the study period, the reliability of the data as an accurate representation of year-round patient demographics is questionable. One obvious gap in reliability exists due to the weather conditions during which the survey was conducted: this survey failed to capture any

patient demographics associated with the impact of Scottsdale's oppressive summer weather on call volume statistics and the possible exacerbation of the patient's condition due to heat.

Second, the survey was conducted during the City's peak tourism season. The results of the survey may be unreliable in predicting medical incidents during the off-season due to the demographic shift of increased tourists who may more strongly represent a particular group, such as the elderly.

Third, while the survey attempted to codify subjective observation into objective fields, there is room for variance in survey results attributed to the subjectivity of the company officer completing the report and the actions of the paramedic in assessing and treating the patient. For example, it is reasonable to suspect that what may be a "critical" patient to one crew may be viewed as "stable but symptomatic" to another. This subjective analysis impacts two primary data fields: the patient's condition upon arrival of first responders and the use of lights and siren for subsequent transportation. Other factors may have also impacted the decision to use lights and siren in transporting the patient including the proximity of the emergency scene to the receiving medical facility, traffic conditions, and time of day.

The survey tool contained eight possible data fields. The first three fields included response unit identification, date of response, and incident number. These fields allowed for a comparison between the total emergency medical responses listed on the daily run log for each response unit and the hardcopy survey forms submitted. This ensured total compliance with the survey during the assessment period.

The next two fields pertained to patient primary medical complaint. In the "Dispatch for" field, company officers entered the nature code as provided at time of dispatch. In the "Actual call type (only if different)" field, company officers entered the actual primary medical

complaint after the most critical patient was assessed. A non-response in this field indicated the dispatched nature code was accurate.

The next field requested information regarding response mode (with lights and siren or without) as well as an opportunity for the company officer to provide a narrative description of a near-miss or close call during response. Obviously, only those near miss circumstances observed by a crewmember could be recorded. It is reasonable to assume this survey failed to capture near-miss or actual accidents that occurred in relation to the emergency vehicle's response but outside of the crews' field of vision. It is also reasonable to assume some company officers may have been reluctant to self-report conditions that created a reportable situation based on fear of reprisal. Finally, it is possible company officer bias regarding the use of lights and siren influenced the data collected. For example, officers who prefer the current protocol may have tailored their data to support the current system.

The next field captures the patients' medical condition upon arrival of first-responders. This question asks the company officer to categorize the patient's presenting condition into one of six responses ranging from "critically in need of immediate advanced life support (ALS) intervention" to "no care necessary due to the absence of a medical emergency." The first three responses categorize patients whose condition warrants paramedic-level treatment, referred to as ALS-level care. Response 4 and 5 categorize patients whose condition warrants Emergency Medical Technician-Basic level treatment, referred to as BLS-level care. The final response is for medical incidents when no medical emergency is found. This would include such circumstances as a medical alarm malfunction or dispatch to a scene when the patient has already left.

The final question in the survey captures the relative stability of the patient upon transport to a medical facility. There are four possible responses ranging from no transportation required or requested, to transports without the use of lights and siren, to transports with lights and siren activated, and finally to transportation by a private means other than ambulance.

At the end of each shift, company officers compared the daily run log with the completed emergency medical response forms to ensure all medical incidents were captured. On a daily basis, the completed forms were sent to the Deputy Chief of Operations in Fire Headquarters. Upon receipt of the hard copy emergency medical response forms, the Deputy Chief of Operations entered the data into an Excel spreadsheet for analysis and distribution (Appendix D).

Emergency Medical Dispatch Survey: External

A second convenience survey was sent to the municipal fire departments in the western United States in January 2008 (Appendix E). Fire service agencies from Arizona, Nevada, and California were selected based on the size of the department and the topography in which the department responds. These factors were included to limit responses from non-comparable communities and departments. The web site SurveyMonkey.com was implored due to its ease of use, distribution, and analysis. The survey remained active online for a period of 21 days before results were tabulated. Requests for survey participation were sent directly to the primary contact for each department listed in the 2006 Training Research and Data Exchange (TRADE) roster. TRADE is an organization whose membership includes the Training Chiefs of large, municipal, career fire departments. Of the 36 fire service organizations polled, 14 responded to the online survey.

This survey method presents several limitations. First, while the departments solicited approximate the demographics and service levels provided by the City of Scottsdale, a true

benchmarking analysis would require a more in-depth analysis of each community. Factors such as population density, hospital location, transportation corridors, population demographics, and many others would need to be taken into consideration for a true like-for-like analysis. Including all these factors would have greatly lengthened the amount of time and effort each community would need to dedicate to completing the online survey. A conscious decision was made to keep the survey as simple as possible to improve participation.

Second, since the majority of communities participating in the survey indicated that their department does not track the statistic for miles traveled per emergency response accident, several conclusions may be drawn. Some communities may not feel at liberty to share this information while others may not have ready access to this information. It is possible this number is skewed with only those agencies comfortable with their statistic reporting and those not comfortable with their statistic reluctant to report. It is also possible that the person completing the report didn't pursue the information and simply completed the survey leaving this response blank.

The electronic survey tool contains nine questions. The first two questions ask the respondent to identify the agency being represented in the survey and the population served by this agency. Question three identifies the level of EMS care provided by the agency ranging from those agencies that do not provide EMS service to those that provide a mix of ALS and BLS level care to those that provide a total ALS system. Question four identifies the relationship between the agency responsible for medical transportation and the agency completing the survey.

Questions five identifies the emergency medical dispatch protocol for fire apparatus, and question six identifies the emergency medical dispatch protocol for ambulance units. The four options available for fire apparatus response range from no response to medical emergencies to a

lights and siren response on all medical emergencies. Six options are available for categorizing ambulance response with the variable being the automatic dispatch of an ambulance for medical emergencies and the use of lights and siren in response.

The seventh and eighth questions address emergency dispatch protocols. Question seven identifies the information processing related to the use of lights and siren in emergency medical responses. Variables in this relationship include the presence of a standard priority dispatch protocol, the discretion of the responding personnel, and response based solely on the presence of a medical emergency. Question eight explores the rationale for the response to question seven by inquiring how the agency developed its dispatch protocol. Responses range from systems without a formal priority dispatch protocol, to those with standardized protocol, to those with customized protocol, and finally those systems operating based on an undefined history of doing the same thing.

The last question in the survey inquires the relationship between emergency response vehicle accident and miles traveled. The previous eight questions could most likely be easily answered accurate most chief officers; however, question nine is not as intrinsically obvious. To aid in answering this question, the author includes potential resources for gathering this statistic. Agencies were given the option of either entering the numerical value of miles driven per emergency response vehicle accident or checking a box indicating that this statistic is not captured by the agency. Since this response would require follow up research by most respondents, the results of this question may be limited due to the lack of follow through. Two very important limitations to the information solicited for emergency vehicle accidents are the non-standardization of reporting procedures across departments and the potential for minor accidents to go unreported.

Interviews

Finally, personnel communications were conducted with two key members of Scottsdale Fire Department staff: Deputy Chief Rich Upham and Ben Bobrow, MD.

Deputy Fire Chief Rich Upham

Deputy Chief Rich Upham manages the Scottsdale Fire Department 9-1-1 dispatch contract with the City of Phoenix and is the Scottsdale Fire Departments liaison with the Phoenix Fire Communications. Upham has an in-depth working knowledge of alarm room operations. Upham managed fire-based alarm room operations for the City of Mesa prior to joining the City of Scottsdale where he has managed the Phoenix Fire Communications contract since its inception.

Prior to our meeting, Upham was informed about the nature of the research project. Upham's interview focused on the emergency dispatch protocol options available under the contract for dispatch services provided by the Phoenix Fire Department. The meeting with Upham occurred on February 11, 2008 in the administrative offices of the Scottsdale Fire Department.

Ben Bobrow, MD

Ben Bobrow, MD, is the Medical Director for the Scottsdale Fire Department. He also serves as the Medical Director of the Arizona Department of Health Services' Bureau of EMS & Trauma System. In a February 11, 2008 meeting Dr. Bobrow shared his professional insights on the relationship between the use of lights and siren and emergency medical patient outcomes.

Prior to the interview, Dr. Bobrow was advised of the nature of the interview and the focus of the research. In the invitation to the meeting, Dr. Bobrow was informed that the interview would focus on the identification of patient medical conditions whose intervention

needs warrant a faster EMS response. During the interview, Dr. Bobrow reviewed the results of the City of Scottsdale emergency medical response survey. Dr. Bobrow provided his professional opinion regarding the types of medical complaints which would benefit from a more rapid response from fire department and ambulance-managed resources.

The interview with Dr. Bobrow took place near his North Scottsdale office. Battalion Chief Jay Ducote, the Battalion Chief of EMS for the Scottsdale Fire Department, attended the meeting due to his interest in the subject matter.

RESULTS

Research Question One: The Impact of Lights and Siren on Travel Time

The results of the literature review indicate a range in the impact the use of lights and siren has on emergency response travel times. From the studies, the range for suburban settings, such as Scottsdale, is 43.5 seconds to 3.02 minutes (Bledsoe, p. 72). Since these studies were conducted in urban and suburban settings, these results may effectively be used to approximate the difference in response time statistics for the City of Scottsdale. The City of Scottsdale is restricted in its ability to perform similar road tests due to the lack of reserve apparatus to be used as non-lights and siren chase vehicles similar to the study models referenced by Bledsoe.

Research Question Two: The Risk Associated with Response Modes

An online emergency medical response survey was completed by 14 fire departments in the western United States. The survey targeted larger, municipal fire departments to gather information from agencies with similar resources as the City of Scottsdale. Fire departments in the western United States were targeted to minimize the inclusion of risk outcomes associated with weather and topography conditions not typical for Scottsdale. Of the agencies participating in the survey, only 28.6% track emergency response vehicle accidents per miles travel. During

fiscal year 2006/2007, City of Scottsdale Fire Department vehicles experienced an average of one accident for every 30,351 miles driven. Table 1 illustrates vehicle accidents per thousand miles traveled by Scottsdale vehicles and those surveyed fire agencies that track this information.

Table 1

Vehicle Accidents by Thousands of Miles Traveled	
City of Scottsdale Fire Department	30.4
City of Phoenix (AZ) Fire Department	25.0
City of Tucson (AZ) Fire Department	23.8
Nevada Department of Forestry	10.0
Elko Country (NV) Fire Protection District	10.0
Average	19.8
Standard Deviation	7.9

During a two week period of operations, Scottsdale Fire company officers recorded observed near misses during emergency vehicle response. Of the 469 emergency medical incidents reported, there were six observed near misses. In two of the six near miss events, the near miss was directly involved the responding emergency vehicle. The remaining four near miss events involved civilian vehicles threatening damage to other civilian vehicles on the road. During this evaluation cycle, the Scottsdale Fire Department experienced one near miss accident for every 78 emergency medical responses. Table 2 illustrates the primary patient medical complaint, the urgency of the patient’s presenting condition upon arrival of the first EMS crew, and urgency of subsequent medical transport for each of the six near miss events:

Table 2

Risk Analysis of Near Miss Incidents			
	Primary Patient Medical Complaint	Patient Intervention Needs Upon Arrival of EMS	Transportation Needs
Incident A	Chest Pain	Advanced life support care	Transported without lights and siren
Incident B	Fall	Basic life support care	Transported without lights and siren
Incident C	Ill Person	Basic life support care	Transported without lights and siren
Incident D	Injured Person	Basic life support care	No transport necessary
Incident E	Medical Alarm	No medical emergency present	No transport necessary
Incident F	Motor vehicle accident	Basic life support care	Transported without lights and siren

Research Question Three: Patient Types that Benefit from Lights and Siren Responses

During the two week EMS response survey, Scottsdale Fire crews responded with lights and siren to 448 incidents. This accounts for 95.5% of all emergency medical incidents. In these cases, a non-lights and siren response resulted either from the absence of a known medical condition (such as a welfare check or medical alarm) or from a specific request by the person initiating a response (such as a police officer requesting a non-lights and siren response for a minor injury or illness). Of these non-emergency calls for service, 9.1% of the incidents were inaccurately dispatched as a non-emergency when the patients' medical complaint warranted otherwise. Overall, the patients' actual medical complaint differed from the dispatched nature code 16.0% of the time.

Few patients presented with an initial condition that required immediate advanced life support intervention. In twenty-two cases (4.7%), patients presented with a condition requiring the immediate intervention of the initial-arriving paramedic. Of those twenty-two patients, five

were pronounced dead on the scene and were not transported to a medical facility. The net result is only 17 viable patients encountered by the Fire Department required immediate paramedic intervention. This accounts for 3.6% of all emergency medical incidents during this time period.

Another indicator of patient condition is the urgency with which the patient is transported to a medical facility. Twenty four patients had a medical condition requiring the use of lights and siren for transportation to a medical facility. This accounts for 5.1% of all emergency medical incidents during the evaluation period.

Research Question Four: Exploring Emergency Medical Dispatch Protocol Options

While a myriad of emergency medical dispatch programs exist, the communication with Scottsdale's liaison to Phoenix Fire Department Communications, Deputy Chief Rich Upham, identified strict parameters on the options available to the City of Scottsdale. Under the existing contract, the Scottsdale Fire Department has the latitude to customize certain dispatch fields but may not adopt an entirely new protocol. Areas of customization fall into three categories: pre-arrival information provided to individuals who call 9-1-1, recommended apparatus for dispatch, and response mode recommendation.

Of the 14 fire departments participating in the online dispatch protocol survey, ten (71.4%) utilize a priority dispatch system to determine whether lights and siren are required. Half of the agencies (50.0%) tailored their dispatch protocol to meet local needs while five agencies (35.7%) adopted either a regional or national standard program. Three agencies (21.4%) utilize the same all-lights and siren response protocol currently in place in Scottsdale. One agency leaves the determination of lights and siren use to the sole discretion of the responding company officer. In terms of community size, 81.8% of the responding agencies serve communities with greater than 100,000 residents, and only one agency provides a total ALS

system in which all front-line response apparatus provide advanced life support, as Scottsdale does. The majority of agencies (54.5%) manage EMS transportation using the same model as Scottsdale, a mix of fire department and non-fire department managed assets.

Of the five responding agencies from the State of Arizona, all utilize a priority dispatch system which determines whether units respond with lights and siren. Two of these agencies adopted a regional dispatch protocol; two tailored a protocol for their community's needs; and one adopted a national dispatch protocol.

Research Question Five: Emergency Medical Dispatch Protocols Meeting the Needs the City of Scottsdale and the Scottsdale Fire Medical Director

Based on the communication with Scottsdale Fire Department Medical Director Dr. Ben Bobrow, balancing safety in response while meeting the response time needs of critical patients can be accomplished given the existing structure of the Phoenix Fire Communications emergency dispatch program. According to Bobrow, Scottsdale should focus on the response mode recommendation for each of the 68 nature codes. Based on the 469 incidents recorded during the medical response survey, Bobrow provided direction on the use of lights and siren (Appendix F). Bobrow identified 247 emergency medical incidents which, in his expert opinion, should have been dispatched with a response recommendation of no lights and siren due to the absence of a critical patient condition requiring a more rapid response. The net effect is a reduction in lights and siren response for emergency medical incidents from 447 incidents (95.3%) to 222 incidents (47.3%). Based on the recorded average of one observed lights-and-siren near-miss incident per 78 responses, amending response protocol to reflect the Medical Director's directive reduces the instance of near misses by greater than half. If, based on H.W.

Heinrich's theory, a direct correlation exists between near misses and a serious accident, changing dispatch protocols decreases the probability of serious accidents as well.

DISCUSSION

While the field studies in the literature review concluded that emergency response vehicles arrive at their final destination more rapidly when utilizing lights and siren, the amount of time saved by using lights and siren varies within a relatively small window. Bledsoe (2003) finds the greatest average difference between response times with lights and siren and those without to be just over three minutes. Page (1993) finds no evidence linking faster response times with improved patient outcomes. Clawson (1997), Hunt (1995), and Patterson (2003) all point to empirical data connecting the use of lights and siren in response with a higher risk of injury and/or damage. The results of the Scottsdale Fire emergency medical response survey indicate the department experiences one near miss event related to lights and siren response every 56 hours. Heinrich (1931) advocates a direct, linear relationship between near misses in the workplace and significant accidents. According to Heinrich, a reduction in near misses proportionally reduces serious accidents. City of Scottsdale Risk Management analyzes the Fire Department's accident statistics and finds the department is involved in an accident that results in damage and/or injury once for every 30,400 miles traveled. The average expense for each accident is just under \$7,000 (City of Scottsdale, 2008).

Wallace (2007) suggests the indiscriminate use of lights and siren is more about marketing than it is about meaningful service. Patterson (2003) states, "As public expectation and industry standards change, so does our legal duty to act" (p. 64). Scottsdale Fire Department Medical Director Ben Bobrow, MD, echoes this call to act. In reviewing response data from the Scottsdale Fire Department, Bobrow concludes the use lights and siren is warranted for less than

half (47.3%) of the total responses documented during this study. The emergency medical response survey indicates in only 4.7% of emergency medical incidents are the patients in critical need of immediate paramedic intervention. Despite 9.1% of emergency medical nature codes being inaccurately entered at time of dispatch, none of the critical patients treated during this survey would have been reprioritized for a non-lights and siren response had Dr. Bobrow's recommendations been in place prior to the study.

Deputy Chief Rich Upham reports the current dispatch system, administered by the Phoenix Fire Department, provides the City of Scottsdale with the latitude to adjust response recommendations regarding the use of lights and siren. Dr. Bobrow communicates confidence that positive patient outcome objectives can be met by adjusting response recommendations utilizing the current emergency medical dispatch protocol and nature codes of the Phoenix system.

In the course "Leading Community Risk Reduction," the National Fire Academy establishes the personal responsibility of leaders when confronting high-risk circumstances (2007). The negligible difference between lights and siren and non-lights and siren response times combined with the increase in risk associated with lights and siren responses and the lack of criticality in responding with great haste to well-defined medical incidents create a call for action for responsible leadership to evaluate change. The structure of the current dispatch system for the Scottsdale Fire Department combined with the medical expertise of the local Medical Director creates an opportunity for positive change. Finally, the dual responsibility the Scottsdale Fire Department has to its potential medical patients and those whose well-being depends on reduced risk in medical response requires change.

RECOMMENDATIONS

The Scottsdale Fire Department is now armed with a wealth of information regarding the risks and benefits associated with its current emergency medical response protocol. Based on this research, three major initiatives should be engaged. First, the Scottsdale Fire Department should partner with the local hospitals to immediately begin benchmarking patient outcome data based on the current response model. Second, the Scottsdale Fire Department should reconfigure its emergency medical response protocol to reflect guidelines established by the local Medical Director. Third, the Scottsdale Fire Department should monitor patient outcome trends after implementing the new, standard emergency medical response protocol.

Benchmarking Current Patient Outcomes

The Scottsdale Fire Department has a clear baseline to evaluate the change in accident frequency associated with a modification to dispatch protocol. However, the department does not have a baseline to measure changes in patient outcome statistics subsequent to a change in dispatch protocol. The department should immediately partner with the four regional hospital emergency departments to begin gathering patient outcomes prior to any changes in dispatch protocol. The local Medical Director should play a lead role in determining measurement criteria.

Reconfigure Emergency Medical Response Protocol

While the local Medical Director has already provided expert opinion regarding the use of lights and siren for those incidents reviewed during this research effort, a more formal and comprehensive emergency medical dispatch protocol should be implemented. The local Medical Director should begin by reviewing the 68 nature codes in the Phoenix Fire Department's emergency medical dispatch program. Together with the Fire Department's leadership group,

the Medical Director should recommend changes to the dispatch protocol. The inclusion of the Fire Department's leadership group is desired to assist the Medical Director in understanding other factors that may influence response mode. For example, the Medical Director may propose a non-lights and siren response for a motor vehicle accident. Fire Department leadership may opt for a lights and siren response attributed to factors other than the probability of encountering critically injured patients at these scenes. Other factors may include the instability of the scene or the presence of other hazards such as downed power lines or a fuel spill. Together, this team should be charged with developing a balanced response for all 68 nature codes. Working through the department liaison with Phoenix Fire Communications, these dispatch protocol changes should be implemented at the conclusion of the baseline patient outcomes study.

Training for field crews should precede any changes in dispatch protocol. Company officers should have a clearly defined level of discretion in changing their response mode based on a multitude of factors. These factors may include traffic conditions, distance to the incident scene, and additional information provided prior to arrival at the scene.

Monitor Future Patient Outcomes

Following the training and implementation of a new emergency medical dispatch protocol, the Scottsdale Fire Department should measure patient outcomes using the same measurement tools utilized to establish the baseline. The department should continue to monitor the nature code accuracy of the Communications personnel.

The department should begin to measure the difference in response times attributed to the use of lights and siren. The department should evaluate the geographic distribution of its medical incidents by quarter-mile section. This capability is already in place. If the distribution

of lights and siren medical incidents is consistent with the distribution of non-lights and siren medical incidents, a direct comparison of aggregate response time averages would be illustrative and reliable. If for some reason, the distribution is skewed, a more in-depth process for comparing response times will be necessary. The geographic distribution of response times may be skewed if, for example, a statistically significant number of incidents were attributed to one location and the distribution of lights and siren versus non-lights and siren responses did not follow typical patterns. For example, if the department responded with great frequency without lights and siren to a geographically remote care facility, the data would reflect the use of lights and siren is more significant than actually realized.

The department should continue to partner with the local hospitals to measure patient outcomes statistics. If morbidity and mortality rates increase for any patient medical demographic, the information should be reviewed by the Medical Director and department leadership. If, for example, the morbidity and mortality of patients whose original nature code was “ill person” increases, indicating a less favorable outcome, the Medical Director and department leadership may seek to adjust one of the three variables in the dispatch system: pre-arrival instructions, recommended apparatus for dispatch, and/or response mode regarding the use of lights and siren.

The department should continue to measure emergency response vehicle accidents using the same metrics. While the department does endorse near miss reporting, the compliance of this program is highly questionable. The department should evaluate the reason for this perceived lack of compliance and implement the necessary changes.

Finally, the Scottsdale Fire Department should market this effort internally and externally. Communicating with internal partners increases buy-in and communicates the

department's true desire to make the work environment safer for all employees. Communicating with the community aids in establishing a new set of expectations: the Scottsdale Fire Department will carefully negotiate the increased risk associated with responding to patients when the seriousness of the medical condition warrants an increased risk. Communicating with the community also establishes the Scottsdale Fire Department as a responsible organization that cares about serving patients with appropriate haste, preserving community safety when responding to an emergency scene, and maintaining community tranquility when responding to emergency scenes that do not warrant the use of lights and siren. The net result of this marketing initiative reflects responsible leadership focused on reducing community risk.

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Appendix A

Phoenix Fire Department Medical Incident Nature Codes

ALS Medical Calls

Nature Code	Description	Nature Code	Description
ALLRG	Allergic Reaction	DR	Drowning
ALOC	Altered Level of Consciousness	DR2	Drowning with 2 patients
BOATA	Boat Accident	DR3	Drowning with 3 patients
CB	Childbirth	ELEC	Electrocution
CHOKC	Choke	GSW	Gun shot wound
CHOKEC	Child Choking	HA	Heart problems
CHOKEP	Pediatric Choking	HANG	Hanging
CODE	Code	INTB	Internal bleeding
CODEC	Child code	MAT	Maternity problem
CODEP	Pediatric code	OD	Overdose
CP	Chest pain	POISN	Poison ingestion
CVA	Stroke	STAB	Stabbing
DB	Difficulty breathing	TASER	PD Used Taser
DIAB	Diabetic problem	UNC	Unconscious person

ALS or BLS Medical Calls

Nature Code	Description	Nature Code	Description
ABD	Abdominal pain	HEAD	Headache
ASSLT	Assault	HEAT	Heat
BACK	Back injury/pain	ILL	Ill person
BITE	Animal bite	INJ	Injured person
BURN	Burn injury	LAC	Laceration
CKWELF	Check welfare	MEDALRM	Medical alarm
CUT	Cutting	NOSE	Nose bleed
DOWN	Person down	SEIZ	Seizure
EYE	Eye injury	UNKM	Unknown medical
FALL	Fall injury		

Minor Medical Calls

Nature Code	Description	Nature Code	Description
ASSLTM	Assault minor	EYEM	Eye injury minor
BACKM	Back injury minor	FALLM	Fall minor

Minor Medical Calls

Nature Code	Description	Nature Code	Description
BITEM	Animal bite minor	INJM	Injured person minor
BURNM	Burn Minor	CUTM	Cut minor

Violent Medical Calls

Nature Code	Description	Nature Code	Description
GSWS	Gun shot wound stage	STABS	Stabbing stage

Auto Accidents

Nature Code	Description	Nature Code	Description
962	Auto Accident	962P	Auto Pedestrian
962A	Auto Accident	962PD	Auto Accident Inv. PD
962BC	Auto Accident Inv. Bike	962R	A/A w/Rollover
962F	Auto Accident w/Fire	962W	Car in Canal
962HM	A/A w/Haz Materials	962X	A/A w/Extrication
962MC	Auto Motorcycle		

Appendix B

EMS Response Research Form

Unit/Shift: _____

Date: _____

Incident number: _____

Dispatched for: _____

Actual call type (only if different): _____

Response mode:

- Code 2
- Code 3
- Check this box if there were any remarkable circumstances during response such as a close call, a required evasive maneuver, or an accident involving SFD apparatus and/or other vehicles in our response “wake.” Describe situation briefly:

Most critical patient’s condition upon arrival of first responders:

- Critical, **immediately** in need of the following field ALS procedure(s):
- _____
- Critical, immediately in need of transport to a hospital for definitive care
 - Stable but symptomatic, in need of ALS supportive care (IV, oxygen, cardiac monitoring, medication administration) and transport to a hospital for evaluation and/or care
 - Stable, requiring BLS level care and transportation
 - Stable, requiring BLS level care and NO transportation
 - No care/transportation required due to the absence of a medical emergency

EMS Transportation:

- Not required/requested
- Code 2 by ambulance
- Code 3 by ambulance
- Patient preferred POV transport

Appendix C

EMS Response Research Examples

EXAMPLE 1

Scottsdale Fire Department
EMS Response Research

Unit/Shift: E608-C

Date: 1-9-07

Incident number: 5342

Dispatched for: SEIZURE

Actual call type (only if different): CHEST PAIN

Response mode:

Code 2

Code 3

Check this box if there were any remarkable circumstances during response such as a close call, a required evasive maneuver, or an accident involving SFD apparatus and/or other vehicles in our response "wake." Describe situation briefly:

Most critical patient's condition upon arrival of first responders:

Critical, **immediately** in need of the following field ALS procedure(s):

Critical, immediately in need of transport to a hospital for definitive care

Stable but symptomatic, in need of ALS supportive care (IV, oxygen, cardiac monitoring, medication administration) and transport to a hospital for evaluation and/or care

Stable, requiring BLS level care and transportation

Stable, requiring BLS level care and NO transportation

No care/transportation required due to the absence of a medical emergency

EMS Transportation:

Not required/requested

Code 2 by ambulance

Code 3 by ambulance

Patient preferred POV transport

EXAMPLE 2

Scottsdale Fire Department
EMS Response Research

Unit/Shift: E608-C

Date: 1-9-07

Incident number: 5347

Dispatched for: MINOR INJURY

Actual call type (only if different): _____

Response mode:

Code 2

Code 3

Check this box if there were any remarkable circumstances during response such as a close call, a required evasive maneuver, or an accident involving SFD apparatus and/or other vehicles in our response "wake." Describe situation briefly:

CAR PULLED IN FRONT OF US - HAD TO BRAKE & SWERVE

Most critical patient's condition upon arrival of first responders:

Critical, **immediately** in need of the following field ALS procedure(s):

Critical, immediately in need of transport to a hospital for definitive care

Stable but symptomatic, in need of ALS supportive care (IV, oxygen, cardiac monitoring, medication administration) and transport to a hospital for evaluation and/or care

Stable, requiring BLS level care and transportation

Stable, requiring BLS level care and NO transportation

No care/transportation required due to the absence of a medical emergency

EMS Transportation:

Not required/requested

Code 2 by ambulance

Code 3 by ambulance

Patient preferred POV transport

EXAMPLE 3

Scottsdale Fire Department
EMS Response Research

Unit/Shift: E608-C

Date: 1-9-07

Incident number: 5357

Dispatched for: 962

Actual call type (only if different): _____

Response mode:

Code 2

Code 3

Check this box if there were any remarkable circumstances during response such as a close call, a required evasive maneuver, or an accident involving SFD apparatus and/or other vehicles in our response "wake." Describe situation briefly:

Most critical patient's condition upon arrival of first responders:

Critical, **immediately** in need of the following field ALS procedure(s):

Critical, immediately in need of transport to a hospital for definitive care

Stable but symptomatic, in need of ALS supportive care (IV, oxygen, cardiac monitoring, medication administration) and transport to a hospital for evaluation and/or care

Stable, requiring BLS level care and transportation

Stable, requiring BLS level care and NO transportation

No care/transportation required due to the absence of a medical emergency

EMS Transportation:

Not required/requested

Code 2 by ambulance

Code 3 by ambulance

Patient preferred POV transport

Please send directly to Garret Olson via interoffice mail at mail code FDHQ-600

EXAMPLE 4

Scottsdale Fire Department
EMS Response Research

Unit/Shift: E608-C

Date: 1-9-07

Incident number: 5364

Dispatched for: DIABETIC

Actual call type (only if different): _____

Response mode:

Code 2

Code 3

Check this box if there were any remarkable circumstances during response such as a close call, a required evasive maneuver, or an accident involving SFD apparatus and/or other vehicles in our response "wake." Describe situation briefly:

THERE WAS A MINOR REAR-END ACCIDENT AS WE
CLEARED HAYDEN AND INDIAN BEND. NO FIRE DAMAGE.

Most critical patient's condition upon arrival of first responders:

Critical, **immediately** in need of the following field ALS procedure(s):

IV GLUCOSE AND ASSISTED VENTILATION VIA BVM.

Critical, immediately in need of transport to a hospital for definitive care

Stable but symptomatic, in need of ALS supportive care (IV, oxygen, cardiac monitoring, medication administration) and transport to a hospital for evaluation and/or care

Stable, requiring BLS level care and transportation

Stable, requiring BLS level care and NO transportation

No care/transportation required due to the absence of a medical emergency

EMS Transportation:

Not required/requested

Code 2 by ambulance

Code 3 by ambulance

Patient preferred POV transport

EXAMPLE 5

Scottsdale Fire Department
EMS Response Research

Unit/Shift: E608-C

Date: 1/9/07

Incident number: 5374

Dispatched for: CHECK WELFARE

Actual call type (only if different): HEART PROBLEMS

Response mode:

- Code 2
- Code 3
- Check this box if there were any remarkable circumstances during response such as a close call, a required evasive maneuver, or an accident involving SFD apparatus and/or other vehicles in our response "wake." Describe situation briefly:

Most critical patient's condition upon arrival of first responders:

- Critical, **immediately** in need of the following field ALS procedure(s):

- Critical, immediately in need of transport to a hospital for definitive care
- Stable but symptomatic, in need of ALS supportive care (IV, oxygen, cardiac monitoring, medication administration) and transport to a hospital for evaluation and/or care
- Stable, requiring BLS level care and transportation
- Stable, requiring BLS level care and NO transportation
- No care/transportation required due to the absence of a medical emergency

EMS Transportation:

- Not required/requested
- Code 2 by ambulance
- Code 3 by ambulance
- Patient preferred POV transport

Please send directly to Garret Olson via interoffice mail at mail code FDHQ-600

Appendix D

EMS Response Research Data

	Call type, dispatched	Call type, actual	Response mode (3=lights&siren; 2=no lights&siren)	Pt condition (1=in need of immediate ALS care; 2=in need of immediate transport; 3=in need of ALS supportive care; 4=in need of BLS and transport; 5=in need of BLS support and no transport; 6=no medical emergency)	Transport mode	Company Officers Note
1	901-H	same	3	6	0	
2	Abdominal pain	same	3	3	2	
3	Abdominal pain	same	3	3	2	
4	Abdominal pain	same	3	3	2	
5	Abdominal pain	same	3	3	2	
6	Abdominal pain	same	3	3	2	
7	Abdominal pain	same	3	4	2	
8	Abdominal pain	same	3	4	2	
9	Abdominal pain	same	3	5	2	
10	Allergic	Ill person	3	3	2	

	reaction					
11	Allergic reaction	same	3	3	2	
12	Allergic reaction	same	3	3	2	
13	Allergic reaction	same	3	5	POV	
14	ALOC	Code	3	1	3	
15	ALOC	CP	3	1	2	
16	ALOC	CVA	3	3	2	
17	ALOC	Diab	3	3	0	
18	ALOC	ETOH	3	4	2	
19	ALOC	Ill person	3	3	2	
20	ALOC	Ill person	3	4	2	
21	ALOC	same	3	2	2	
22	ALOC	same	3	2	2	
23	ALOC	same	3	3	2	
24	ALOC	same	3	3	2	
25	ALOC	same	3	3	2	
26	ALOC	same	3	3	2	
27	ALOC	same	3	3	2	
28	ALOC	same	3	3	2	
29	ALOC	same	3	3	2	
30	ALOC	same	3	3	2	
31	ALOC	same	3	3	2	
32	ALOC	same	3	5	0	
33	ALOC	same	3	6	0	
34	ALOC	same	3	6	0	
35	ALOC	Seizure	3	4	2	
36	ALOC	Weakness	3	3	2	
37	Animal bite	same	2	4	2	
38	Animal bite	same	3	4	2	
39	Animal bite	same	3	4	POV	
40	Arm pain	same	2	5	2	
41	Arm pain	same	3	4	2	

42	Assault	same	2	4	2	
43	Assault	same	2	6	0	
44	Assault	same	3	4	2	
45	Assault	same	3	4	2	
46	Assault	same	3	5	0	
47	Assault	same	3	5	0	
48	Assault	same	3	5	POV	
49	Assault	same	3	6	0	
50	Back pain	Fall	3	4	2	
51	Back pain	same	3	4	2	
52	Back pain	same	3	4	2	
53	Back pain	same	3	4	2	
54	Burn	same	3	5	POV	
55	Cardiac	Ill person	3	3	2	
56	Cardiac	Ill person	3	3	2	
57	Cardiac	Psych problem	3	4	2	
58	Cardiac	same	3	1	3	
59	Cardiac	same	3	3	2	
60	Cardiac	same	3	3	2	
61	Cardiac	same	3	3	2	
62	Cardiac	same	3	3	2	
63	Cardiac	Weakness	3	3	2	
64	Car-Pedestrian	same	3	2	3	
65	Car-Pedestrian	same	3	4	2	
66	Car-Pedestrian	same	3	6	0	
67	Car-Pedestrian	same	3	6	0	
68	Check welfare	Ill person	2	3	2	
69	Check welfare	Injured person	2	4	0	
70	Check welfare	Injured person	2	4	POV	
71	Check welfare	same	2	5	0	
72	Check welfare	same	2	6	0	
73	Check welfare	Suicide attempt	2	4	2	
74	Childbirth	same	3	3	2	
75	Childbirth	same	3	3	2	
76	Choking	No medical	3	6	0	

		emergency				
77	Code	ALOC	3	3	3	
78	Code	Code	3	1	0	<<Trauma Code. Pronounced dead at scene>>
79	Code	same	3	1	0	
80	Code	same	3	1	0	<<Pronounced dead at scene>>
81	Code	same	3	1	3	
82	Code	same	3	1	3	
83	Code	same	3	6	0	<<Pronounced dead at scene>>
84	Code	SOB	3	2	2	
85	Code	Unconscious person	3	2	2	
86	CP	General transport	3	3	2	
87	CP	Ill person	3	3	2	
88	CP	Ill person	3	3	2	
89	CP	same	3	1	2	
90	CP	same	3	1	2	
91	CP	same	3	2	2	
92	CP	same	3	3	2	
93	CP	same	3	3	2	
94	CP	same	3	3	2	
95	CP	same	3	3	2	
96	CP	same	3	3	2	
97	CP	same	3	3	2	
98	CP	same	3	3	2	
99	CP	same	3	3	2	
100	CP	same	3	3	2	
101	CP	same	3	3	2	
102	CP	same	3	3	2	
103	CP	same	3	3	2	
104	CP	same	3	3	2	
105	CP	same	3	3	2	
106	CP	same	3	3	2	

107	CP	same	3	3	2	Close call at intersection. Cars would not stop for engine--which was stopped -- in an intersection. Multiple vehicles with late, erratic reaction to engine.
108	CP	same	3	3	2	
109	CP	same	3	3	2	
110	CP	same	3	3	2	
111	CP	same	3	3	2	
112	CP	same	3	3	2	
113	CP	same	3	3	2	
114	CP	same	3	3	2	
115	CP	same	3	4	2	
116	CP	same	3	4	2	
117	CP	SOB	3	3	2	
118	CP	SOB	3	3	2	
119	CVA	ETOH	3	3	2	
120	CVA	ETOH	3	4	2	
121	CVA	Ill person	3	3	2	
122	CVA	Ill person	3	3	2	
123	CVA	same	3	1	2	
124	CVA	same	3	2	3	
125	CVA	same	3	2	3	
126	CVA	same	3	2	3	
127	CVA	same	3	3	2	
128	CVA	same	3	3	2	
129	CVA	same	3	3	2	
130	CVA	same	3	3	2	
131	CVA	same	3	3	2	
132	CVA	same	3	3	2	
133	CVA	same	3	3	2	
134	CVA	same	3	3	2	
135	Diab	same	3	1	0	<<Patient refusal post glucose.>>
136	Diab	same	3	3	0	
137	Diab	same	3	3	2	

138	Diab	same	3	3	2	
139	Diab	same	3	3	2	
140	Diab	same	3	3	2	
141	Diab	same	3	3	2	
142	Diab	same	3	3	POV	
143	Diab	same	3	6	0	
144	Dizziness	same	3	3	2	
145	Dizziness	same	3	3	2	
146	Dizziness	same	3	3	2	
147	ETOH	same	3	3	2	
148	ETOH	same	3	4	2	
149	Fall	ALOC	3	3	2	
150	Fall	ALOC	3	6	0	
151	Fall	Back pain	3	5	0	
152	Fall	ETOH	3	3	2	
153	Fall	same	2	4	2	
154	Fall	same	3	2	2	
155	Fall	same	3	3	2	
156	Fall	same	3	3	2	
157	Fall	same	3	3	2	
158	Fall	same	3	3	2	
159	Fall	same	3	3	2	
160	Fall	same	3	3	2	
161	Fall	same	3	3	2	
162	Fall	same	3	3	2	
163	Fall	same	3	3	2	
164	Fall	same	3	3	2	
165	Fall	same	3	3	2	
166	Fall	same	3	3	2	
167	Fall	same	3	3	2	
168	Fall	same	3	3	3	
169	Fall	same	3	4	0	
170	Fall	same	3	4	2	
171	Fall	same	3	4	2	
172	Fall	same	3	4	2	

173	Fall	same	3	4	2	
174	Fall	same	3	4	2	
175	Fall	same	3	4	2	
176	Fall	same	3	4	2	
177	Fall	same	3	4	2	
178	Fall	same	3	4	2	
179	Fall	same	3	4	2	
180	Fall	same	3	4	2	
181	Fall	same	3	4	2	
182	Fall	same	3	4	2	
183	Fall	same	3	4	2	
184	Fall	same	3	4	2	
185	Fall	same	3	4	2	
186	Fall	same	3	4	2	
187	Fall	same	3	4	2	
188	Fall	same	3	4	2	
189	Fall	same	3	4	2	
190	Fall	same	3	4	2	
191	Fall	same	3	4	2	
192	Fall	same	3	4	2	
193	Fall	same	3	4	2	
194	Fall	same	3	4	2	Near missed with 2 cars that almost crashed into each other.
195	Fall	same	3	4	2	
196	Fall	same	3	4	3	
197	Fall	same	3	4	POV	
198	Fall	same	3	5	0	
199	Fall	same	3	5	0	
200	Fall	same	3	5	0	
201	Fall	same	3	5	2	
202	Fall	same	3	5	POV	
203	Fall	same	3	6	0	
204	Fall	Syncope	3	3	2	
205	Fall	Syncope	3	3	2	
206	Foot pain	same	2	4	2	

207	Gunshot	PD assist	3	6	0	
208	Hanging	same	3	1	0	<<Pronounced dead at scene>>
209	Hip pain	same	3	4	2	
210	Hypertension	same	3	3	2	
211	Ill person	Back pain	3	3	2	
212	Ill person	Cardiac	2	3	2	
213	Ill person	Cardiac	3	3	2	
214	Ill person	CP	3	2	3	
215	Ill person	CP	3	3	2	
216	Ill person	ETOH	3	4	0	
217	Ill person	Ill person	3	3	2	
218	Ill person	Leg pain	3	4	2	
219	Ill person	Nose bleed	3	4	2	
220	Ill person	OD	3	3	2	
221	Ill person	Psych problem	3	3	2	
222	Ill person	same	2	5	0	
223	Ill person	same	3	3	2	
224	Ill person	same	3	3	2	
225	Ill person	same	3	3	2	
226	Ill person	same	3	3	2	
227	Ill person	same	3	3	2	
228	Ill person	same	3	3	2	
229	Ill person	same	3	3	2	
230	Ill person	same	3	3	2	
231	Ill person	same	3	3	2	
232	Ill person	same	3	3	2	
233	Ill person	same	3	3	2	
234	Ill person	same	3	3	2	
235	Ill person	same	3	3	2	
236	Ill person	same	3	3	2	
237	Ill person	same	3	3	2	
238	Ill person	same	3	3	2	
239	Ill person	same	3	3	2	
240	Ill person	same	3	3	2	
241	Ill person	same	3	3	2	

242	Ill person	same	3	3	2	
243	Ill person	same	3	3	2	
244	Ill person	same	3	3	2	
245	Ill person	same	3	3	2	
246	Ill person	same	3	3	2	
247	Ill person	same	3	3	2	
248	Ill person	same	3	3	2	
249	Ill person	same	3	3	2	
250	Ill person	same	3	3	2	
251	Ill person	same	3	4	0	
252	Ill person	same	3	4	0	
253	Ill person	same	3	4	2	
254	Ill person	same	3	4	2	
255	Ill person	same	3	4	2	
256	Ill person	same	3	4	2	
257	Ill person	same	3	4	2	
258	Ill person	same	3	4	2	
259	Ill person	same	3	4	2	
260	Ill person	same	3	4	2	Forced into oncoming traffic. No accident.
261	Ill person	same	3	4	2	
262	Ill person	same	3	4	2	
263	Ill person	same	3	4	2	
264	Ill person	same	3	4	2	
265	Ill person	same	3	4	2	
266	Ill person	same	3	4	2	
267	Ill person	same	3	4	2	
268	Ill person	same	3	4	2	
269	Ill person	same	3	4	2	
270	Ill person	same	3	5	0	
271	Ill person	same	3	5	2	
272	Ill person	same	3	6	0	
273	Ill person	same	3	6	2	
274	Ill person	Syncope	3	3	2	
275	Injured person	No medical	3	4	0	

		emergency				
276	Injured person	Psych problem	3	4	2	
277	Injured person	same	2	4	2	
278	Injured person	same	3	3	2	
279	Injured person	same	3	3	2	
280	Injured person	same	3	3	2	
281	Injured person	same	3	3	2	
282	Injured person	same	3	4	2	
283	Injured person	same	3	4	2	
284	Injured person	same	3	4	2	
285	Injured person	same	3	4	2	
286	Injured person	same	3	4	2	
287	Injured person	same	3	4	2	
288	Injured person	same	3	4	POV	
289	Injured person	same	3	5	0	
290	Injured person	same	3	5	0	As E616 approached a red light, a civilian vehicle pulled into the cross traffic to get out of our way (unnecessarily). Put vehicle in line of cross traffic. No accident occurred.
291	Injured person	same	3	5	0	
292	Injured person	same	3	5	POV	
293	Injured person	same	3	6	0	Dispatched to stage for SPD. Unit arrived before scene was secure and pt found. Ultimately no pt found.
294	Injured person	same	3	6	0	
295	Injured person	same	3	6	0	
296	Injured person	Suicide attempt	2	4	2	
297	Injured person	Suicide attempt	3	3	2	
298	Internal bleeding	same	3	3	2	
299	Internal bleeding	same	3	3	2	
300	Internal	same	3	4	2	

	bleeding					
301	Internal bleeding	same	3	5	0	
302	Internal bleeding	SOB	3	3	2	
303	Internal bleeding	SOB	3	3	2	
304	Invalid assist	Fall	2	3	2	
305	Invalid assist	same	2	5	0	
306	Invalid assist	same	2	6	0	
307	Invalid assist	same	2	6	POV	
308	Leg pain	same	2	4	2	
309	Leg pain	same	3	4	2	
310	Leg pain	same	3	4	2	
311	Leg pain	same	3	4	2	
312	Leg pain	same	3	4	2	
313	Medical alarm	No medical emergency	3	6	0	A car moving out of the way for our engine abruptly pulled to the curb and hit the curb at low rate of speed.
314	MVA	No medical emergency	3	5	0	
315	MVA	No medical emergency	3	6	0	
316	MVA	No medical emergency	3	6	0	
317	MVA	same	3	1	3	
318	MVA	same	3	2	2	
319	MVA	same	3	2	3	
320	MVA	same	3	2	3	
321	MVA	same	3	3	2	
322	MVA	same	3	3	2	
323	MVA	same	3	3	2	
324	MVA	same	3	3	3	
325	MVA	same	3	4	0	
326	MVA	same	3	4	2	

327	MVA	same	3	4	2	
328	MVA	same	3	4	2	
329	MVA	same	3	4	2	
330	MVA	same	3	4	2	
331	MVA	same	3	4	2	
332	MVA	same	3	4	2	
333	MVA	same	3	4	2	
334	MVA	same	3	4	2	
335	MVA	same	3	4	2	
336	MVA	same	3	4	2	
337	MVA	same	3	4	2	
338	MVA	same	3	4	2	The rescue was in front of us. A car attempted to pass a dump truck that had pulled over -- the dump truck pulled out suddenly and almost hit them.
339	MVA	same	3	4	2	
340	MVA	same	3	4	2	
341	MVA	same	3	4	2	
342	MVA	same	3	4	2	
343	MVA	same	3	4	2	
344	MVA	same	3	4	2	
345	MVA	same	3	4	2	
346	MVA	same	3	4	2	
347	MVA	same	3	4	2	
348	MVA	same	3	4	2	
349	MVA	same	3	4	2	
350	MVA	same	3	4	2	
351	MVA	same	3	5	0	
352	MVA	same	3	5	0	
353	MVA	same	3	5	0	
354	MVA	same	3	6	0	
355	MVA	same	3	6	0	
356	MVA	same	3	6	0	
357	MVA	same	3	6	0	

358	MVA	same	3	6	0	
359	MVA	same	3	6	0	
360	MVA	same	3	6	0	
361	MVA	same	3	6	0	
362	MVA Rollover	same	3	1	3	
363	Nausea	same	3	3	2	
364	Nose bleed	same	3	4	2	
365	Nose bleed	same	3	4	2	
366	Nose bleed	same	3	4	2	
367	Nose bleed	same	3	4	2	
368	Nose bleed	same	3	4	2	
369	Nose bleed	same	3	5	2	
370	OD	ETOH	3	4	2	
371	OD	No medical emergency	3	6	0	
372	OD	same	3	1	3	
373	OD	same	3	2	2	
374	OD	same	3	2	2	
375	OD	same	3	3	2	
376	OD	same	3	3	2	
377	OD	same	3	3	2	
378	OD	same	3	3	2	
379	OD	Suicide attempt	3	2	2	
380	PD assist	same	3	3	0	
381	Pregnancy	same	3	3	2	
382	Psych problem	same	3	4	2	
383	Psych problem	same	3	5	0	
384	Seizure	Diab	3	3	0	
385	Seizure	same	3	3	2	
386	Seizure	same	3	3	2	
387	Seizure	same	3	3	2	
388	Seizure	same	3	3	2	
389	Seizure	same	3	3	2	
390	Seizure	same	3	3	2	
391	Seizure	same	3	5	0	

392	SOB	Abdominal pain	3	3	2	
393	SOB	ALOC	3	3	2	
394	SOB	Code	3	1	3	
395	SOB	CP	3	1	2	
396	SOB	CP	3	2	2	
397	SOB	CP	3	3	2	
398	SOB	ETOH	3	4	2	
399	SOB	Ill person	3	3	2	
400	SOB	Ill person	3	3	2	
401	SOB	same	3	1	2	
402	SOB	same	3	1	2	
403	SOB	same	3	1	2	
404	SOB	same	3	1	3	
405	SOB	same	3	2	3	
406	SOB	same	3	2	3	
407	SOB	same	3	2	3	
408	SOB	same	3	3	2	
409	SOB	same	3	3	2	
410	SOB	same	3	3	2	
411	SOB	same	3	3	2	
412	SOB	same	3	3	2	
413	SOB	same	3	3	2	
414	SOB	same	3	3	2	
415	SOB	same	3	3	2	
416	SOB	same	3	3	2	
417	SOB	same	3	3	2	
418	SOB	same	3	3	2	
419	SOB	same	3	3	2	
420	SOB	same	3	3	2	
421	SOB	same	3	3	2	
422	SOB	same	3	3	2	
423	SOB	same	3	3	2	
424	SOB	same	3	3	2	
425	SOB	same	3	3	2	
426	SOB	same	3	3	2	

427	SOB	same	3	3	2	
428	SOB	same	3	4	2	
429	SOB	same	3	4	2	
430	SOB	same	3	4	2	
431	SOB	same	3	5	0	
432	SOB	same	3	6	0	
433	SOB	same	3	6	0	
434	SOB	Weakness	3	3	2	
435	SOB	Weakness	3	3	2	
436	SOB	Weakness	3	4	2	
437	Stabbing	Injured person	3	4	2	
438	Stabbing	No medical emergency	3	6	0	
439	Stabbing	same	3	2	3	
440	Unconscious person	Abdominal pain	3	3	2	
441	Unconscious person	ALOC	3	3	2	
442	Unconscious person	ALOC	3	3	2	
443	Unconscious person	Ill person	3	3	2	
444	Unconscious person	Ill person	3	3	2	
445	Unconscious person	Ill person	3	3	2	
446	Unconscious person	Ill person	3	3	2	
447	Unconscious person	No medical emergency	3	6	0	
448	Unconscious person	OD	3	3	2	
449	Unconscious person	same	3	3	2	
450	Unconscious person	same	3	3	2	

451	Unconscious person	same	3	3	2	
452	Unconscious person	same	3	3	2	
453	Unconscious person	same	3	3	2	
454	Unconscious person	same	3	4	2	
455	Unconscious person	same	3	4	2	
456	Unconscious person	Seizure	3	3	2	
457	Unconscious person	Seizure	3	3	2	
458	Unconscious person	Syncope	3	3	2	
459	Unknown problem	Cardiac	2	3	2	
460	Unknown problem	ETOH	3	4	2	
461	Unknown problem	Ill person	3	6	0	
462	Unknown problem	No medical emergency	3	5	POV	
463	Unknown problem	Suicide attempt	3	4	2	
464	Weakness	same	3	3	0	
465	Weakness	same	3	3	2	
466	Weakness	same	3	3	2	
467	Weakness	same	3	3	2	
468	Weakness	same	3	4	2	
469	Weakness	same	3	4	2	

Appendix E

External Online EMS Response Survey

Responding to medical emergencies in your community...

Eight lightning-fast questions for you...

Please complete these nine questions and click the "Done" button when complete. Thank you very much!

Garret Olson
Deputy Fire Chief, Operations
Scottsdale Fire Department
GMOlson@ScottsdaleAZ.gov

1. What fire service agency do you represent?

2. What is the population of the community your Fire Department serves?

Less than 10,000

10,000 - 50,000

50,000 - 100,000

100,000 - 250,000

250,000 - 500,000

Greater than 500,000

3. Which of the following best describes the level of care provided by your Department's engine and ladder crews?

All fire response apparatus provide ALS-level care

There is a mix of ALS and BLS fire response apparatus in our system

All fire response apparatus provide BLS-level care

We are not the provider of emergency medical services for our community

4. Which of the following best describes the EMS transportation system in your community (ground transportation only)?

EMS transportation is provided by fire department personnel operating fire department managed ambulances

EMS transportation is provided by a non-fire department entity (private provider, hospital-based provider, etc.)

EMS transportation is provided by a mix of fire department managed assets and non-fire department managed assets

5. The initial dispatch to medical emergencies includes a minimum of:

A fire truck (engine or ladder) responds with lights and siren to all medical emergencies

A fire truck (engine or ladder) responds with lights and siren to some but not all medical emergencies

A fire truck (engine or ladder) never responds with lights and siren to medical emergencies

A fire truck (engine or ladder) is never dispatched to provide medical treatment in our system

6. Which of the following best describes your protocol for dispatching ambulances?

An ambulance is automatically dispatched to all medical emergencies and responds with lights and siren every time it is dispatched

An ambulance is automatically dispatched to all medical emergencies and responds with lights and siren to some but not all medical emergencies

An ambulance is automatically dispatched to all medical emergencies and never responds with lights and siren

An ambulance is NOT automatically dispatched to all medical emergencies but responds with lights and siren every time it is dispatched

An ambulance is NOT automatically dispatched to all medical emergencies but responds with lights and siren to some but not all medical emergencies

An ambulance is NOT automatically dispatched to all medical emergencies but never responds with lights and siren

7. Which of the following best describes your department's Emergency Medical Services dispatch protocol?

All medical emergency dispatches are prioritized for lights and siren response

All medical emergency dispatches are prioritized for a non-lights and siren response

A priority dispatch protocol determines whether units respond with lights and siren

Responding with lights and siren is purely at the discretion of the responding unit/officer

8. How did your department develop its priority dispatch protocols?

We do not have a priority dispatch system

We adopted a national standard program

We adopted a regional program

We have a program uniquely tailored for our communities needs (this would include modifying a national or regional program)

Nobody remembers how we ended up with what we have

9. Approximately how many miles per emergency response vehicle accidents does your department experience (this is commonly tabulated by either your fleet management, risk management, or safety personnel)?

My agency does not capture this information

Miles driven per accident recorded (please enter as a number value):

Done >>

Appendix F

EMS Response Medical Director Directives on Response Mode

<p>Call type, dispatched (Response mode recommendation by Dr. Bobrow: black=no lights&siren; red=lights&siren)</p>	<p>Call type, actual</p>	<p>Response mode (3=lights&siren; 2=no lights&siren)</p>	<p>Pt condition (1=in need of immediate ALS care; 2=in need of immediate transport; 3=in need of ALS supportive care; 4=in need of BLS and transport; 5=in need of BLS support and no transport; 6=no medical emergency)</p>
901-H	same	3	6
Abdominal pain	same	3	3
Abdominal pain	same	3	3
Abdominal pain	same	3	3
Abdominal pain	same	3	3
Abdominal pain	same	3	3
Abdominal pain	same	3	4
Abdominal pain	same	3	4
Abdominal pain	same	3	5
Allergic reaction	Ill person	3	3
Allergic reaction	same	3	3
Allergic reaction	same	3	3
Allergic reaction	same	3	5
ALOC	Code	3	1
ALOC	CP	3	1
ALOC	CVA	3	3
ALOC	Diab	3	3
ALOC	ETOH	3	4
ALOC	Ill person	3	3

ALOC	Ill person	3	4
ALOC	same	3	5
ALOC	same	3	6
ALOC	same	3	6
ALOC	same	3	2
ALOC	same	3	2
ALOC	same	3	3
ALOC	same	3	3
ALOC	same	3	3
ALOC	same	3	3
ALOC	same	3	3
ALOC	same	3	3
ALOC	same	3	3
ALOC	same	3	3
ALOC	Seizure	3	4
ALOC	Weakness	3	3
Animal bite	same	2	4
Animal bite	same	3	4
Animal bite	same	3	4
Arm pain	same	3	4
Arm pain	same	2	5
Assault	same	3	5
Assault	same	3	5
Assault	same	2	6
Assault	same	3	6
Assault	same	2	4
Assault	same	3	4
Assault	same	3	4
Assault	same	3	5
Back pain	Fall	3	4
Back pain	same	3	4
Back pain	same	3	4
Back pain	same	3	4
Burn	same	3	5

Cardiac	Ill person	3	3
Cardiac	Ill person	3	3
Cardiac	Psych problem	3	4
Cardiac	same	3	3
Cardiac	same	3	3
Cardiac	same	3	3
Cardiac	same	3	3
Cardiac	same	3	1
Cardiac	Weakness	3	3
Car-Pedestrian	same	3	6
Car-Pedestrian	same	3	6
Car-Pedestrian	same	3	4
Car-Pedestrian	same	3	2
Check welfare	Ill person	2	3
Check welfare	Injured person	2	4
Check welfare	Injured person	2	4
Check welfare	same	2	5
Check welfare	same	2	6
Check welfare	Suicide attempt	2	4
Childbirth	same	3	3
Childbirth	same	3	3
Choking	No medical emergency	3	6
Code	ALOC	3	3
Code	Code	3	1
Code	same	3	1
Code	same	3	1
Code	same	3	6
Code	same	3	1
Code	same	3	1
Code	SOB	3	2
Code	Unconscious person	3	2
CP	General transport	3	3
CP	Ill person	3	3
CP	Ill person	3	3
CP	same	3	1

CVA	same	3	3
CVA	same	3	3
CVA	same	3	3
CVA	same	3	3
CVA	same	3	3
CVA	same	3	3
CVA	same	3	3
CVA	same	3	2
CVA	same	3	2
CVA	same	3	2
Diab	same	3	1
Diab	same	3	3
Diab	same	3	6
Diab	same	3	3
Diab	same	3	3
Diab	same	3	3
Diab	same	3	3
Diab	same	3	3
Diab	same	3	3
Dizziness	same	3	3
Dizziness	same	3	3
Dizziness	same	3	3
ETOH	same	3	3
ETOH	same	3	4
Fall	ALOC	3	6
Fall	ALOC	3	3
Fall	Back pain	3	5
Fall	ETOH	3	3
Fall	same	3	4
Fall	same	3	5
Fall	same	3	5
Fall	same	3	5
Fall	same	3	6
Fall	same	3	2
Fall	same	3	3

Fall	same	3	4
Fall	same	3	4
Fall	same	3	4
Fall	same	3	4
Fall	same	3	5
Fall	same	3	3
Fall	same	3	4
Fall	same	3	4
Fall	same	3	5
Fall	Syncope	3	3
Fall	Syncope	3	3
Foot pain	same	2	4
Gunshot	PD assist	3	6
Hanging	same	3	1
Hip pain	same	3	4
Hypertension	same	3	3
Ill person	Back pain	3	3
Ill person	Cardiac	2	3
Ill person	Cardiac	3	3
Ill person	CP	3	3
Ill person	CP	3	2
Ill person	ETOH	3	4
Ill person	Ill person	3	3
Ill person	Leg pain	3	4
Ill person	Nose bleed	3	4
Ill person	OD	3	3
Ill person	Psych problem	3	3
Ill person	same	3	4
Ill person	same	3	4
Ill person	same	2	5
Ill person	same	3	5
Ill person	same	3	6
Ill person	same	3	3
Ill person	same	3	3
Ill person	same	3	3

Ill person	same	3	4
Ill person	same	3	4
Ill person	same	3	4
Ill person	same	3	4
Ill person	same	3	4
Ill person	same	3	4
Ill person	same	3	4
Ill person	same	3	5
Ill person	same	3	6
Ill person	Syncope	3	3
Injured person	No medical emergency	3	4
Injured person	Psych problem	3	4
Injured person	same	3	5
Injured person	same	3	5
Injured person	same	3	5
Injured person	same	3	6
Injured person	same	3	6
Injured person	same	3	6
Injured person	same	3	3
Injured person	same	3	3
Injured person	same	3	3
Injured person	same	3	3
Injured person	same	3	3
Injured person	same	3	3
Injured person	same	2	4
Injured person	same	3	4
Injured person	same	3	4
Injured person	same	3	4
Injured person	same	3	4
Injured person	same	3	4
Injured person	same	3	4
Injured person	same	3	4
Injured person	same	3	5
Injured person	Suicide attempt	3	3
Injured person	Suicide attempt	2	4
Internal bleeding	same	3	5
Internal bleeding	same	3	3

Internal bleeding	same	3	3
Internal bleeding	same	3	4
Internal bleeding	SOB	3	3
Internal bleeding	SOB	3	3
Invalid assist	Fall	2	3
Invalid assist	same	2	5
Invalid assist	same	2	6
Invalid assist	same	2	6
Leg pain	same	2	4
Leg pain	same	3	4
Leg pain	same	3	4
Leg pain	same	3	4
Leg pain	same	3	4
Medical alarm	No medical emergency	3	6
MVA	No medical emergency	3	5
MVA	No medical emergency	3	6
MVA	No medical emergency	3	6
MVA	same	3	4
MVA	same	3	5
MVA	same	3	5
MVA	same	3	5
MVA	same	3	6
MVA	same	3	6
MVA	same	3	6
MVA	same	3	6
MVA	same	3	6
MVA	same	3	6
MVA	same	3	6
MVA	same	3	6
MVA	same	3	6
MVA	same	3	6
MVA	same	3	4
MVA	same	3	2
MVA	same	3	3
MVA	same	3	3
MVA	same	3	3
MVA	same	3	4

OD	ETOH	3	4
OD	No medical emergency	3	6
OD	same	3	2
OD	same	3	2
OD	same	3	3
OD	same	3	3
OD	same	3	3
OD	same	3	3
OD	same	3	1
OD	Suicide attempt	3	2
PD assist	same	3	3
Pregnancy	same	3	3
Psych problem	same	3	5
Psych problem	same	3	4
Seizure	Diab	3	3
Seizure	same	3	5
Seizure	same	3	3
Seizure	same	3	3
Seizure	same	3	3
Seizure	same	3	3
Seizure	same	3	3
Seizure	same	3	3
SOB	Abdominal pain	3	3
SOB	ALOC	3	3
SOB	Code	3	1
SOB	CP	3	1
SOB	CP	3	2
SOB	CP	3	3
SOB	ETOH	3	4
SOB	Ill person	3	3
SOB	Ill person	3	3
SOB	same	3	5
SOB	same	3	6
SOB	same	3	6
SOB	same	3	1

Unconscious person	Abdominal pain	3	3
Unconscious person	ALOC	3	3
Unconscious person	ALOC	3	3
Unconscious person	Ill person	3	3
Unconscious person	Ill person	3	3
Unconscious person	Ill person	3	3
Unconscious person	Ill person	3	3
Unconscious person	No medical emergency	3	6
Unconscious person	OD	3	3
Unconscious person	same	3	3
Unconscious person	same	3	3
Unconscious person	same	3	3
Unconscious person	same	3	3
Unconscious person	same	3	3
Unconscious person	same	3	4
Unconscious person	same	3	4
Unconscious person	Seizure	3	3
Unconscious person	Seizure	3	3
Unconscious person	Syncope	3	3
Unknown problem	Cardiac	2	3
Unknown problem	ETOH	3	4
Unknown problem	Ill person	3	6
Unknown problem	No medical emergency	3	5
Unknown problem	Suicide attempt	3	4
Weakness	same	3	3
Weakness	same	3	3
Weakness	same	3	3
Weakness	same	3	3
Weakness	same	3	4
Weakness	same	3	4