Use of Warning Lights and Siren in Emergency Medical Vehicle Response and Patient Transport

National Association of Emergency Medical Services Physicians (NAEMSP) and

the National Association of State EMS Directors (NASEMSD)

This paper was developed for NAEMSP by the Emergency Medical Response Task Force: Jeff J. Clawson, MD, Chair; Robert Forbuss; Scott A. Hauert; Fred Hurtado; Alexander E. Kuehl, MD; W.H. ABill@ Leonard; Peter A. Maningas, MD; Joseph L. Ryan, MD; and Donald R. Sharpe. It was reviewed and adopted to the position paper format by the NAEMSP Standards and Clinical Practice Committee, Herbert G. Garrison, MD, MPH, Chair.

Correspondence: Executive Director, National Association of EMS Physicians, P.O. Box 15945-281, Lenexa, KS 66285-5945.

The position paper was approved by the NAEMSP Executive Committee on 18 November 1993, and by the Executive Committee of the National Association of State EMS Directors on 6 January 1994.

Published in *Prehospital and Disaster Medicine*, April-June 1994.

Abbreviations: EMS = emergency medical services; EMV = emergency medical vehicle; L&S = lights and siren

Introduction

The use of warning lights and siren (L&S) by prehospital emergency medical services (EMS) vehicles is a basic component of emergency response and patient transport. This public-safety practice predates modern EMS by 50

years[1]. Despite the long-term reliance on L&S, it is not a risk-free practice. There are many reports of emergency medical vehicle (EMV) collisions during L&S responses and transports[2-4]. These collisions often result in tragic consequences for the EMV occupants and those in other vehicles, and may cause significant delays to medical care for the patient the EMV was responding to or transporting[5]. While there is no systematic collection of EMV collision data, some authors have suggested that the available information underestimates the extent of the problem[6,7]. In addition, to date there have been few published analyses regarding the effectiveness of L&S as a modality that improves response times or, more important, patient outcome.

Despite the lack of data, it generally is accepted that the use of L&S is a privilege granted to emergency medical responders that should be reserved for those situations in which patient welfare is at stake. To provide guidance to the states' EMS medical directors and system managers, the National Association of EMS Physicians (NAEMSP) and the National Association of State EMS Directors (NASEMSD) endorse the following positions regarding the use of warning L&S in EMV response and patient transport.

Position Statements

1. *Emergency medical services (EMS) medical directors should participate directly in the development of policies governing EMV response, patient transport, and the use of warning lights and siren.*

Emergency medical vehicle response policy decisions involve many medical care and medical direction issues including patient outcome, quality improvement, patient and emergency medical provider safety, and risk management. Therefore, EMV response and patient transport decisions should be guided, reviewed, and approved by the EMS medical director.

2. *The use of warning lights and siren during an emergency response to the scene and during patient transport should be based on standardized protocols that take into account situational and patient problem assessments*.

Written protocols and guidelines should delineate when to use L&S during scene response and patient transport. These protocols should be based on a reasonable identification of situations for which a reduction in response and transport times might improve patient outcome. The protocols should be developed in conjunction with local emergency response practices and statutes and should receive approval from the EMS medical director. Final protocols should be distributed to all dispatch and EMS entities. Warning

lights and siren protocols should be enforced, and inappropriate use of L&S by EMS personnel will be limited.

3. *EMS dispatch agencies should utilize an emergency medical dispatch priority reference system that has been developed in conjunction with and approved by the EMS medical director to determine which requests for prehospital medical care require the use of warning lights and siren.*

Sound dispatch prioritization systems establish a patient's level of severity, which then allows the determination of the type of vehicle(s) that should respond and the urgency of that response. Emergency medical dispatch centers should institute the protocols and monitor adherence to them.

4. *Except for suspected life-threatening, time-critical cases or cases involving multiple patients, L&S response by more than one EMV usually is unnecessary.*

Guidelines for the multi-EMV L&S response should be outlined in emergency medical response policies and dispatch procedures.

5. *The utilization of emergency warning L&S should be limited to emergency response and emergency transport situations only.*

Alternative practices, such as returning to a station or quarters using warning L&S or using L&S for Astaging@ or moving to designated areas to stand-by for a response, should be discontinued. Exceptions to such a policy would include extraordinary circumstances such as a disaster, or situations in which patient outcome could be affected.

6. *All agencies that operate EMVs or are responsible for emergency medical responders should institute and maintain emergency vehicle operation education programs for the EMV operators.*

Initial and continuing education of EMS personnel should include instruction in safe and appropriate EMV driving techniques and should take place prior to initial EMV operation. Knowledge and demonstrated skill in EMV operation are prerequisites for all public-safety vehicle operators.

7. *Emergency medical vehicle-related collisions occurring during an emergency response or transport should be evaluated by EMS system managers and medical directors.*

Such evaluations should include an assessment of the dispatch process, as well as initial (at the beginning of the transport) and final patient conditions.

8. *A national reporting system for EMV collisions should be established*.

Data are needed regarding the prevalence, circumstances, and causes of EMV collisions, including related injuries and deaths, and "wake effect" collisions. Collection of the information should start at the state and local levels; the information collected should include uniform data elements for tabulation and nationwide comparison.

9. *Scientific studies evaluating the effectiveness of warning L&S under specific situations should be conducted and validated.*

These important research efforts should be supported by both public and private resources.

10. *Laws and statutes should take into account prudent safety practices by both EMS providers and the monitoring public.*

The major emphasis and focus should remain on the exercise of prudent judgment and due regard by EMV operators. Laws and statutes also should emphasize the motoring public's responsibility to clear a lane or access way for EMVs.

11. *National standards for safe EMV operation should be developed*.

Such standards should mandate that EMV operators should approach intersections safely and have a clear view of all lanes of traffic before proceeding through. Standards also should set appropriate speed limits for emergency responses and transports in urban and rural settings, and for responses that occur under adverse road, traffic, and weather conditions.

Discussion

The Risk of the Emergency Response

Response to and transport of emergency patients are integral components of the EMS chain of care. Since the beginning of modern EMS, the usual vehicle response mode has involved the use of L&S. Since this type of response was consistent with the practices of other public-safety agencies that use emergency vehicles (i.e., law enforcement and the fire service), the practice was implemented initially without question. As an understanding of EMS call histories and patient outcomes has evolved, it has become evident that the use of L&S by EMS vehicles is not necessary for every response or patient transport[4].

There is risk associated with the use of warning L&S: emergency medical vehicles running "hot" (with L&S) have been involved in many collisions that have resulted in injuries and death in a high number of cases[2,4,6]. The monetary loss derived from EMV collisions, including property damage, increased insurance premiums, and liability payments in some venues, have eclipsed that of any other negligence-related EMS problem[7,8]. This situation exists at a time when published data demonstrating the use of L&S in response or patient transport is effective in improving patient outcome are lacking. In fact, the U.S. Department of Transportation has reported that sirens may never become an effective warning device[9]. Even if warning L&S eventually are shown to be useful in certain time-critical situations (e.g., cardiac arrest or penetrating chest injuries), it is unlikely that L&S will be proven beneficial for each and every EMS response and transport.

Concern about patient welfare, combined with inadequate information on a patient's actual condition, often pressures emergency medical technicians and paramedics to rush to and from scenes in order to "save lives." As Auerbach[5] states, "...loose interpretation of what constitutes an emergency has essentially given [EMV operators permission] to operate their vehicles as they see fit while carrying victims who are essentially stable by anyone's definition."

Medical Director Involvement

Since EMS response and patient transport are prehospital medical "tools," accountable EMS medical directors should be involved in the development of emergency response and transport policies[10]. Additionally, EMS medical directors should evaluate EMV collisions for the medical correctness of the dispatch process, the patient's condition on arrival at the scene and when the transport began, and the patient's eventual outcome. For those medical directors who may need assistance with this aspect of prehospital care, advice is available from colleagues in NAEMSP, NASEMSD, and other EMS organizations.

Standardized Dispatch, Response, and Transport

Sound emergency medical dispatch protocols should be established and used as the basis for determining those situations that would benefit from the appropriate use of warning L&S. Research is emerging that supports the concept that medically sound protocols safely delineate which patients do and do not require emergency advanced life support[11, 12]. Such protocols, as well as proper emergency medical dispatcher and EMV operator training, should be integral parts of a local dispatch agency's emergency medical dispatch system. The American Society for Testing Materials state in their

Standard Practice for Emergency Medical Dispatch document [13] that "this practice may assist in overcoming some of the misconceptions…that red lights, siren, and maximal response are always necessary." Ideally, the use of L&S 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 or quality of life. Examples of such situations include cardiac or respiratory arrest, airway obstruction, extreme dyspnea, critical trauma, childbirth and problems with pregnancy, drowning, and electrocution. In some of these cases, a rapid response is important (e.g., cardiac arrest), whereas in others rapid transport is necessary (e.g., breech birth).

Nevertheless, a large number of calls to 9-1-1 are for non-emergency problems that require neither rapid response nor rapid patient transport[14, 15]. Systems utilizing non-L&S response modes for such low-priority calls have experienced few problems[16]. This issue, however, requires more in-depth study in order to determine the specific positive and negative effects of L&S utilization on patient outcome in the various types of high- and low-priority cases.

In the typical EMS model, once a patient is evaluated and provided appropriate emergency treatment, transport by an EMV is initiated to move the patient to a definitive care facility. Many patients to whom EMS respond do not require L&S for patient transport. However, many EMS systems do not have protocols governing L&S use during patient transport, and few endorse contact with an on-line medical control base-station for advice or consent on the use of L&S transport.

Response of Multiple Emergency Medical Vehicles

The use of warning L&S by all EMVs responding to a single incident has been scrutinized in many systems and many of those systems have adopted a modified approach[12, 17]. From a medical point of view, the response of more than one unit utilizing L&S is necessary only in those situations involving suspected life-threatening, time-critical cases, or multiple patients. Likewise, the practice of returning to a station or quarters using L&S so as to "be in position" for the next call has no support in most responsible public-safety communities.

The Emergency Medical Vehicle Operator

While prevention of EMV collisions will depend on the application of sound dispatch protocols, dispatcher training, and direct involvement of the EMS medical director in developing dispatch and transport policies, attention also

should be directed at the EMV operator. Before a driver of an emergency vehicle takes the wheel, their driving records should be carefully screened, and each should be trained in the proper use of EMVs. Rigorous education and control of EMV drivers should reduce EMV collisions, create a more standard approach and practice to EMV operation, and improve EMV longevity. Fortunately, there are detailed instruction guides for proper EMV operation[18, 19]. Emergency medical services provider education should include instruction in "low force" driving techniques. In addition, all personnel operating EMS vehicles should be involved in agency quality improvement programs including continuing education courses on EMV operation.

Some state laws require that EMV operators exercise what is called "due regard." New Jersey law (N.J.S.A. 39:4-91) states it "...shall not relieve the driver of any authorized emergency vehicle from the duty to drive with due regard for the safety of all persons, nor shall it protect the driver from the consequences of his reckless disregard for the safety of others." Using laws of this nature, a number of prosecutors recently have charged and convicted ambulance operators of involuntary manslaughter[14]. Most state laws, however, fail to place clear responsibility for the use of L&S on the EMS operators themselves[20]. While much talk has ensued regarding the public's responsibility to "watch out" or "get out of the way," EMS should not blame the public for the problem of EMV collisions.

The EMS Profession

Responsibility rests with the EMS profession and local governments to establish minimum standards for the safe operations of EMS vehicles and to monitor the use of such standards. An example of such a standard would be a formal policy stating that EMVs should not exceed the locally posted speed limit in urban settings, should not exceed the speed limit by more than 10 miles per hour in rural areas, and that EMVs should not travel at any speed that is unsafe for current road, traffic, or weather conditions.

Nationally, EMS-related organizations should work together in helping to create standards that detail the positions in this document. Organizations that should be involved in a effort to set standards for emergency medical response and transport include the American Ambulance Association, the American College of Emergency Physicians, the Association of Public Safety Officers, the International Association of Fire Chiefs, the International Association of Fire Fighters, the National Association of Emergency Medical Technicians, the National Association of EMS Physicians, the National Association of State EMS Directors, the National Association of State EMS Training Coordinators, the National EMS Alliance, and the National Fire Protection Agency.

Reimbursement

The reimbursement profiles of many EMS agencies contain an extra charge for the use of warning L&S. This occurs because the federal Health Care Financing Administration reimbursement policies recognize L&S use as a special circumstance. Insurance reimbursement for "emergencies" also may be predicated on L&S use, further perpetuating this problem. Unless these types of policies and profiles are modified by the government, insurance companies, and the EMS profession itself, adjustments in L&S use (as recommended in this document) may be viewed as adversely affecting EMS reimbursement. Therefore, without reimbursement policy modifications, the L&S reform process may be slowed.

Emergency Medical Vehicle Collision Reporting

The amount of data available on EMV collisions in general is fragmented and has not been obtained using any systematized or scientific format[4, 5]. The Fatal Accident Reporting System (FARS) may underestimate EMV collision occurrence and outcome. In 1990-1991, a national press clipping service documented 303 EMV collisions in one year resulting in 711 injuries and 78 deaths. (Clawson, unpublished data). The number of fatalities discovered in this newspaper review eclipses those reported by FARS involving EMVs for the same time period.

An acknowledged, but little-studied result of L&S use is the "wake effect," in which use of L&S results in collisions that involve only civilian vehicles and not the EMV itself. The ratio of wake effect collisions to those actually involving an EMV may be as high as five to one[6]. However, this only can be adequately assessed with a comprehensive EMV collision reporting system.

There are models for EMV collision reporting systems. The National Fire Protection Agency has had in place a uniform process for reporting and quantifying fire fighting-related collisions and injuries for many years. Utah and Tennessee have "ambulance accident" reporting systems. As Auerbach[5] has reported about Tennessee's system: "Before the requirement for accident reporting was imposed, [EMV collisions] analysis would have been impossible. Prehospital [EMV collision] data collection is essential if emergency medical services physicians are to exert reasonable control and make knowledgeable recommendations involving clinical care and professional regulations." Ideally, the federal government will initiate a national reporting system for EMV collisions. Any reporting system should be uniformly structured, track the multiple different types of responding agencies and vehicles including both volunteer and fire-based first responders

(not just "ambulances"), and also provide a mechanism for the identification and reporting of wake effect collisions.

Research

Regrettably, there currently are few published investigations of dispatch protocols for L&S use. Also, there are no published studies attempting to evaluate the effectiveness of L&S use in terms of patient outcome. Worse still, there are no studies in either refereed or public safety trade journals that demonstrate that the use of L&S saves significant time over routine driving methods. In 1987, Auerbach[5] demonstrated that the mean delay to hospital care after an EMV collision in Tennessee approached 10 minutes.

The use of warning L&S in EMS rests primarily on the unsupported tradition that has evolved from police- and fire-response practices. In some cases, these practices may adversely affect EMS patients and providers. Therefore, a series of objective, well-structured, scientific studies aimed at identifying both the positive and negative effects of L&S use should be pursued.

Conclusion

In order to ensure that we "first do no harm," 20 sound rationale and corresponding protocols and policies for the use of warning L&S in EMV response and patient transport should be developed and instituted in all EMS systems. All EMV operators should be trained adequately and regulated. The judicious use of warning L&S in the initial response and subsequent transport of patients likely will result in a more balanced system of appropriate care with minimization of iatrogenic injury and death.

References

1. DeLorenzo RA, Eilers MA: Lights and siren: A review of emergency vehicle warning systems. Ann Emerg Med 1991;20:1331Ð1334.

2. Elling R: Dispelling myths on ambulance accidents. JEMS 1989;14:60Ð64.

3. Caldwell LH: Hard Lessons. Fire Command 1990;57:20Ð21.

4. Sharpe D: Ambulance Fatality Accidents for 1988. Presented at the 1990 Canada InterPhase Conference; Edmonton, Alberta, Canada.

5. Auerbach PS, Morris JA, Phillips JB Jr, et al: An analysis of ambulance accidents in Tennessee. JAMA 1987;258:1487Ð1490.

6. Clawson JJ: Ambulance accidents. JEMS 1989;13:23.

7. Clawson JJ: Hit or myth. JEMS 1989;14:8.

8. Page JO: EMS Legal Primer. Jems Publishing Co. 1985;2.

9. Skeiber SC, Mason RL, Potter RC: Effectiveness of Audible Devices on Emergency Vehicles. Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration, Publication No. DOT-TSC-OST-77-38, 1977.

10.National Association of EMS Physicians position paper: Emergency medical dispatching. Prehospital and Disaster Medicine 1989;4:163Ð 166.

11.Kallsen G, Nabors MD: The use of priority medical dispatch to distinguish between high- and low-risk patients. Ann Emerg Med 1990;19:458Ð459.

12.Curka PA, Pepe PE, Ginger VF: Computer-aided EMS priority dispatch: Ability of a computerized triage system to safely spare paramedics from responses not requiring advanced life support. Ann Emerg Med 1991;20:446.

13.Standard Practice for Emergency Medical Dispatch. American Society for Testing and Materials Publication No. F1258Ð90. Philadelphia, Pa., 1990.

14.Leonard WH: What a waste when a system fails. Ambulance Industry News 1991;1:6Ð7,22,44.

15.St. John DR, Shephard RD Jr: EMS dispatch and response. Fire Chief 1983;26:142Ð144.

16.Clawson JJ: Medical priority dispatchÑIt works! JEMS 1983;8:29Ð

17.Clawson JJ: The maximal response disease: Red lights and siren syndrome in priority dispatching. JEMS 1987;12:28Ð31.

18.Childs BJ, Ptacnik DJ: Emergency Ambulance Driving. Englewood Cliffs, NJ: Prentice-Hall, 1986.

19.Solomon SS: Ambulance accident avoidance. Emergency 1985;17:34Ð 35,44.

20.George JE, Quattrone MS: Above allÑDo no harm. Emerg Med Tech Legal Bull 1991;15:4.