



Report of the MIEMSS Ambulance Safety Task Force

Executive Summary

The MIEMSS Ambulance Safety Task Force was formed to consider ways to increase ambulance safety. Ambulance crashes are a significant risk for EMS personnel and for the patients they transport, and while many of these crashes are minor, many are not. National statistics indicate that, on average, 10 ambulance crashes occur every day and two ambulance occupants die in an ambulance crash each month. During a two-year period, Maryland averaged 390 ambulance crashes each year – more than one per day. Key factors that lead to such crashes include insufficient driver training, driver error, failure to use restraints, and excessive use of “lights and sirens.”

In collaboration with the MSFA, MFRI, jurisdictions, commercial ambulance companies, and other interested parties, the MIEMSS Ambulance Safety Task Force considered factors associated with ambulance crashes and developed recommendations to increase ambulance safety. Task Force recommendations include the following:

1. Screen ambulance drivers -- Jurisdictions and companies should implement initial and periodic driver screening to identify ambulance drivers whose driving records, excessive risk-taking, or medical conditions may make them poor candidates for the responsibility of driving an ambulance.
2. Ensure effective initial ambulance driver training and periodic refresher training - Ambulance-specific driving training should be uniformly required by jurisdictions and available for ambulance drivers in Maryland. Maryland’s EVOC training sites should consider modifying EVOC courses to include ambulance-specific didactic instruction modules, practical skill training that includes driving training and testing on different road types, and refresher training (including the use of driving simulators) to allow ambulance drivers to update skills and knowledge. Jurisdictions should implement graduated driving responsibilities for newly-trained ambulance driver as a critical and necessary adjunct to ambulance driver education courses.
3. Increase use of restraints and safety improvements during ambulance operations - Jurisdictions and companies should set, monitor and enforce policies that require the use of seat belts / restraints for the driver, other EMS personnel in the ambulance and the patient being transported. Future ambulances purchases should ensure patient compartments that are ergonomically structured to increase safety.

4. Reduce the incidence of excessive ambulance speeds and routine use of “lights and sirens” - Jurisdictions and companies should ensure that response and transport policies reinforce the need for safety as the first priority and should tailor practices to the degree of urgency as determined by patient need. “Lights and sirens” should be used with Priority 2 patients only in exceptional circumstances (e.g., the need for time critical hospital care) and should be prohibited for Priority 3 and 4 patients. Routine use of “lights and sirens” should be eliminated in both responses and transports.
5. Improve monitoring of ambulance safety issues and enforcement of safety practices - Jurisdictions and companies should develop written policies that foster increased ambulance safety, ensure the availability of accurate data needed for effective monitoring of ambulance safety issues, and include formal review of ambulance crashes and near-misses.
6. Create an ongoing statewide forum for ambulance safety issues - The Ambulance Safety Task Force should continue to promote the advancement of ambulance safety throughout Maryland, monitor trends in ambulance crashes, and provide a forum for addressing future ambulance safety issues common to all jurisdictions and counties, including a review of the updated NFPA 1917.



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Background

Ambulance crashes – and the serious injuries and deaths that result from such crashes – are far too common in the United States. Nationally, the number of ambulance crashes has been estimated at 6,500 each year. One study conducted over a nine-year period in the U.S. counted over 350 fatalities and almost 23,000 injuries to individuals from ground ambulance crashes. EMS personnel in the U.S. have a higher estimated fatality rate than for other public safety workers, including police.

Ambulance crashes in Maryland mirror the national experience. From 2006 -2008, Maryland averaged 390 crashes per year – more than one per day. Most of these crashes (76%) involved multiple vehicles, as opposed to just the ambulance vehicle alone (24%). These crashes resulted in an average of one to two fatalities and 27 injuries in each of the years studied, ten of which were incapacitating injuries. Many of the incapacitating injuries were found to have occurred in the rear compartment of the ambulance. The ambulance driver was found to be “at fault” in over half of the crashes.

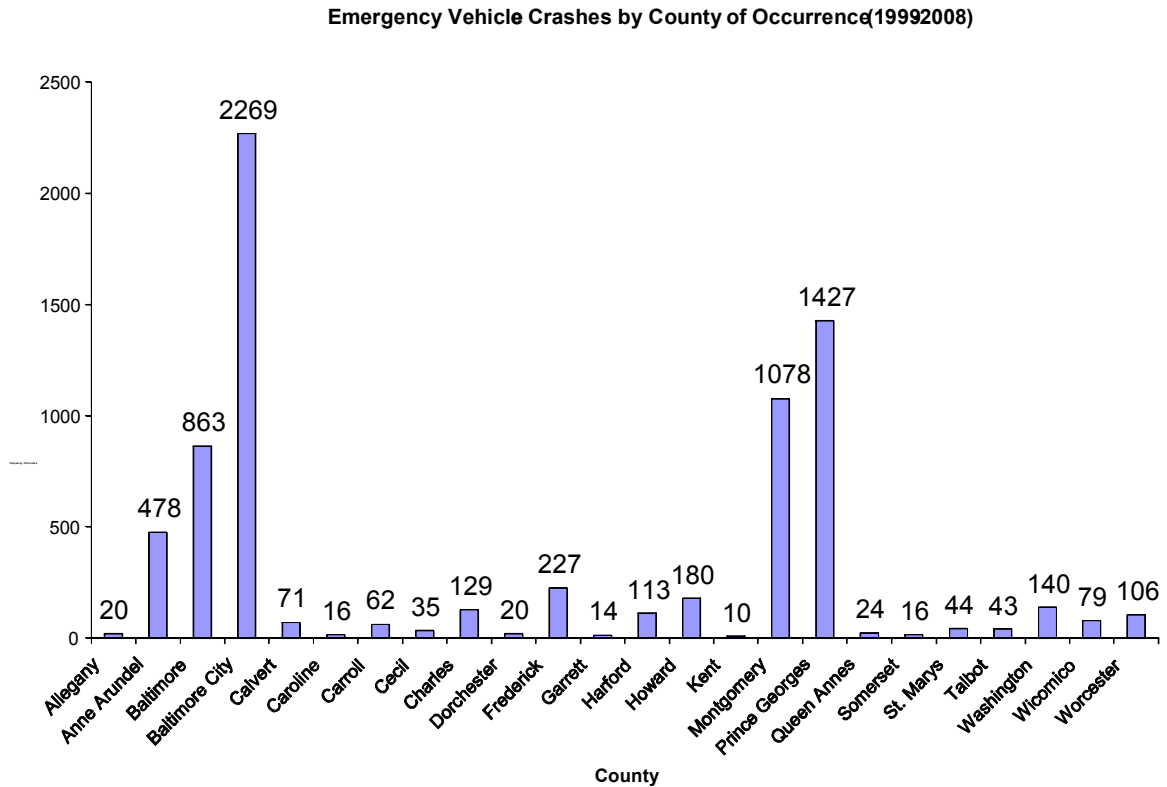
The MIEMSS Task Force on Ambulance Safety was convened in 2010 to develop a consensus approach, including key recommendations, for improving ambulance safety in Maryland. In collaboration with the Maryland State Firemen’s Association, the Maryland Fire & Rescue Institute, EMS Operational Jurisdictions, commercial ambulance companies, and subject matter experts, the Ambulance Safety Task Force worked to develop consensus guidelines on ways to increase ambulance safety and reduce ambulance crashes across the state. Task Force members met periodically throughout FY11. The membership of the Task Force is shown in Appendix A.

The Task Force created several subgroups to focus on specific issues: training and education; data; dispatch; and vehicle and traffic standards. Consideration of training and education issues involved review of the current emergency vehicle driver training course offered by MFRI, training standards developed by the National Fire Protection Association, available on-line training, as well as simulator training and discussion of the concept and practice of graduated driver responsibilities. Data issues included a review of national statistics and data available on ambulance crashes in Maryland. Dispatch and vehicle / traffic standards issues included consideration of dispatch practices, including use of lights and sirens.

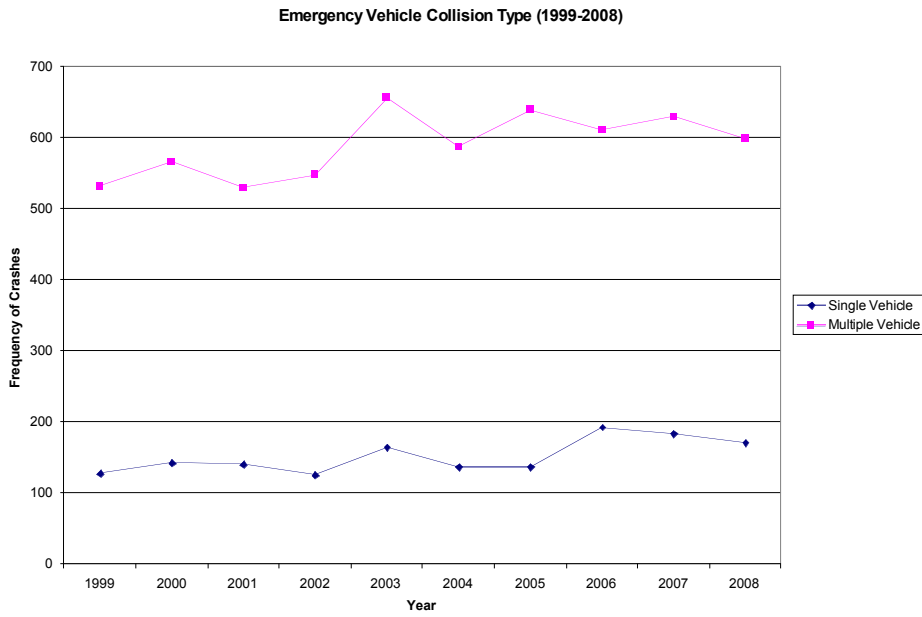
Ambulance Safety / Crashes in Maryland

Maryland's public safety jurisdictions have nearly 600 ground ambulances (BLS and ALS) available for responding to emergencies throughout the state that are equipped to carry and treat patients per Maryland protocols. In addition, Maryland's licensed commercial services are licensed to operate 370 vehicles, including neonatal and specialty care transport vehicles.

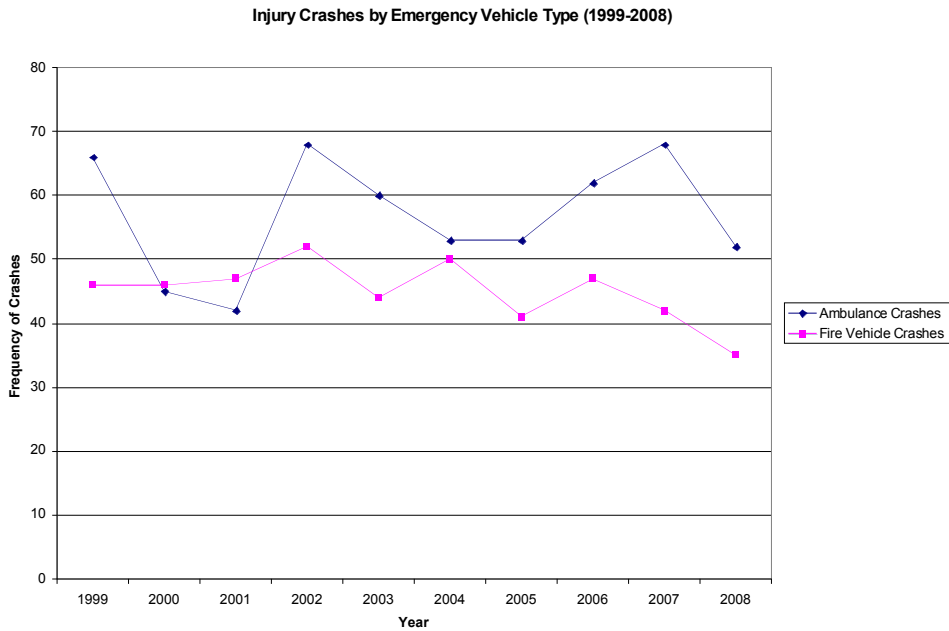
Maryland emergency vehicle crash data was reviewed for the period of 1999-2008. Emergency vehicle crashes by county of occurrence are shown in Figure 1:



Many of these crashes involved more than one vehicle. See Figure 2:

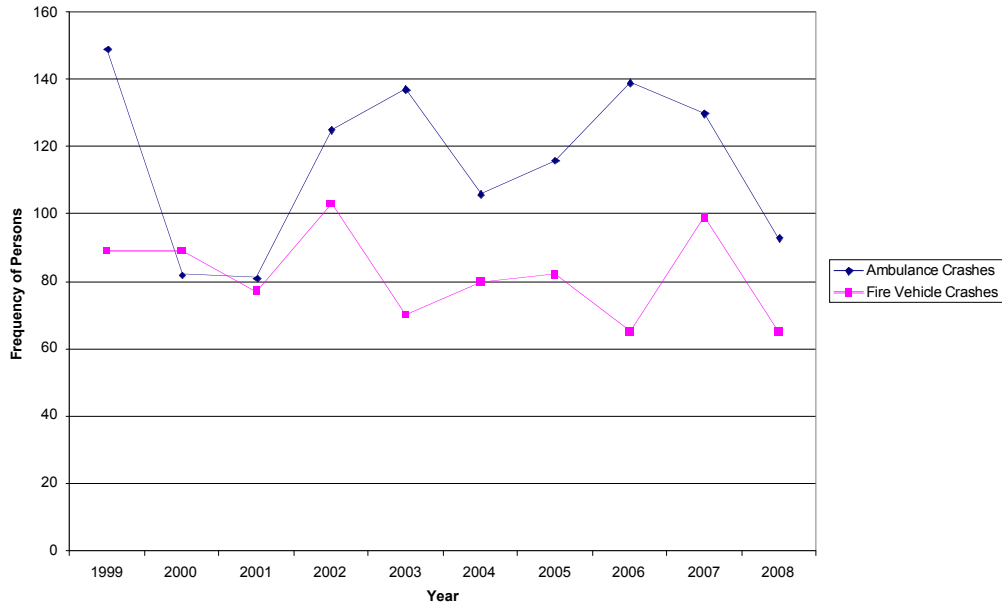


Ambulances were involved in vehicle crashes during the 1999-2008 more frequently than fire apparatus. See Figure 3 showing the type of emergency vehicle involved in the collision:



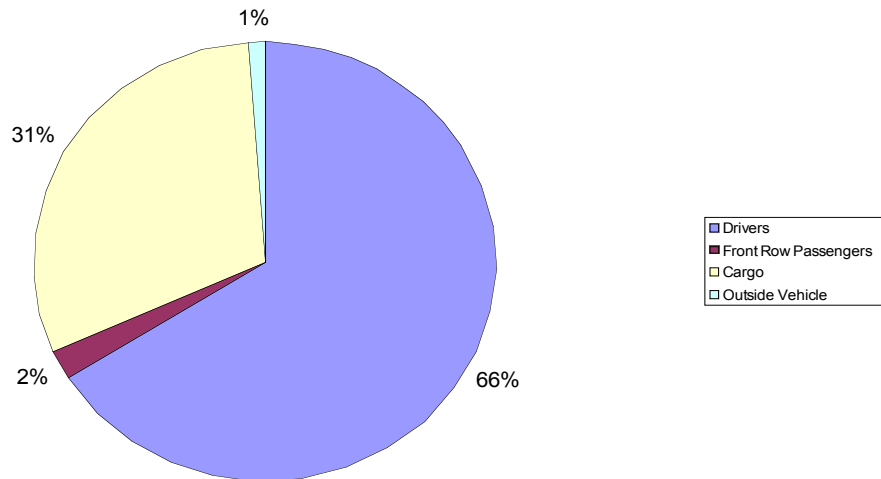
Injuries to persons occurred more frequently in ambulance crashes than in crashes of fire apparatus. See Figure 4:

Injured Persons in Crashes by Emergency Vehicle Type (1999-2008)



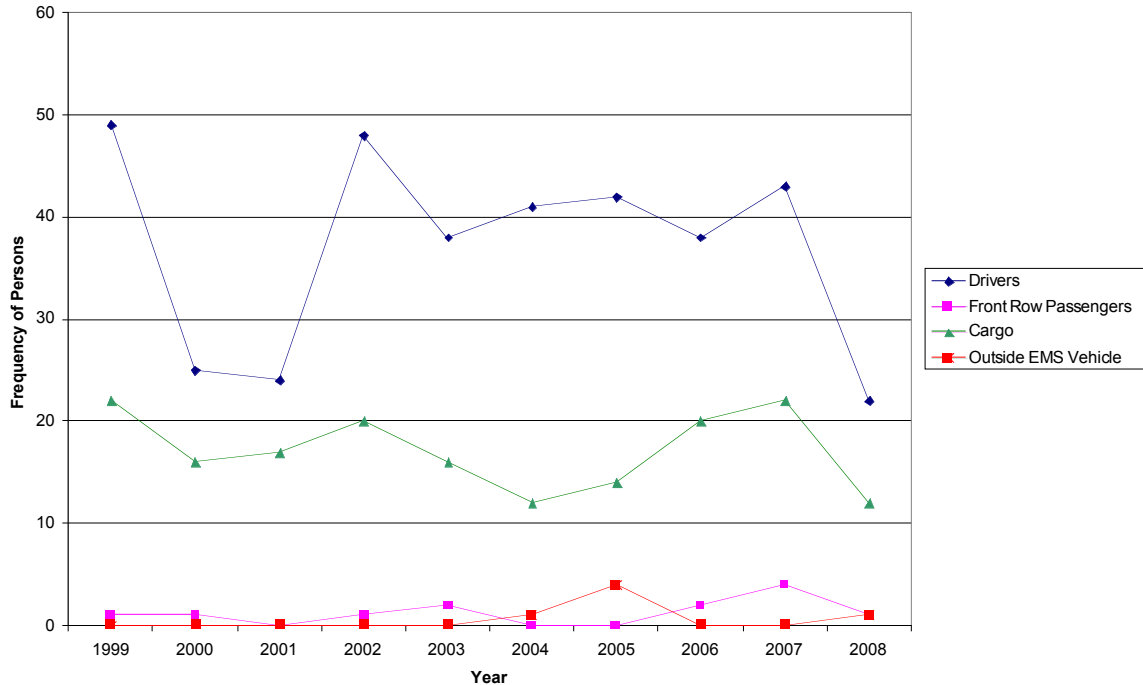
Most injuries resulting from the crash occurred to the ambulance driver, followed by those in the passenger compartment. See Figure 5:

Injured Persons in Ambulance Crashes by Seating Position (1999-2008)



Fewer injuries occurred to drivers and those in the patient compartment during the 2007-2008 period. See Figure 6:

Injured Persons in Ambulance Crashes by Seating Location (1999-2008)



Key Factors Associated with Ambulance Crashes

Four key factors that are generally associated with ambulance crashes: human; operational; environment; and vehicular. The first three factors were considered by the Task Force. The fourth factor – vehicular – involves consideration of ambulance design and construction and was determined to be outside of the Task Force purview. That factor is being considered and addressed through a national initiative to update ground ambulance standards, i.e., NFPA-1917 *Standard for Automotive Ambulances*. The proposed standards were released for public comment (due by August 30, 2011), but will not be considered by the National Fire Protection Association for formal adoption until June 2012. Even if adopted, however, the new standards would have only a prospective effect, i.e., they would apply only to new ground ambulances, i.e., those manufactured after the adoption date. Thus, as a practical matter, any safety enhancements afforded by the new standards will not have an impact for many years to come.

Human Factors

EMS personnel responding to care for a critically ill and injured patient are responsible for the treatment and often the survival of the patient. The ambulance driver's responsibilities are just as significant: the ambulance driver must ensure that the ambulance and its crew are transported to the scene to treat the patient; and after scene treatment, the ambulance driver is responsible for the safe and expeditious transport of the patient, the ambulance crew, and the ambulance to the hospital or other receiving facility. In this role, the ambulance driver must be proficient in the safe operation of an ambulance, mindful of traffic laws, and able to deal with changing road conditions, pedestrians, other vehicles on the road, and unexpected (and sometimes unsafe or even dangerous) driving

practices of civilians driving those vehicles. The ambulance driver must be able to stay in control of the ambulance and avoid putting the life or property of others in danger. The ambulance's shape, style, power and weight distributions require special driving abilities, and safely operating such a vehicle during stress-filled operations is extremely challenging.

“Driver error” occurs when the ambulance driver makes a mistake while driving the ambulance that can cause a crash or contribute to making it worse. Ambulance crashes can be prevented. Drivers who have questionable or poor driving records, who are excessive risk takers, or who have medical conditions that could preclude the safe operation of an ambulance are not suitable candidates for the significant responsibility of driving an ambulance.

Fatigue can be significant contributor to driver error. EMS personnel tend to work long hours under stressful conditions. Fatigue can result in decreased mental capacity that impairs the ambulance driver's judgment and ability to safely operate the ambulance and to recognize and respond to road traffic dangers.

Driver distraction is also a key contributor to crashes. An ambulance driver needs to focus his/her full attention on the driving the ambulance: distractions – whether as a result of the emergency itself, e.g., a critically ill patient in the back of the ambulance; or an outside factor, e.g., using a radio, a mobile data terminal, or cell phone – can create a potentially lethal situation as the ambulance navigates the highways.

Insufficient driver training is another factor in ambulance crashes. The ambulance driver must be appropriately trained in the operation of the ambulance, safe driving practices, collision avoidance, physical forces that affect driving an ambulance, appropriate use of lights and sirens, dealing with adverse conditions, negotiating intersections, emergency parking, and motor vehicle laws and regulations affecting the operation of the ambulance. Practical training and skills performance assessments is often not possible, or at the very least, not practical for ambulance model-specific training. Further, even when initial training occurs, typically no periodic refresher training is conducted that ensures that driver competence and skill levels do not deteriorate.

Lack of effective and consistent oversight of ambulance-driver related issues can increase the risks associated with driving an ambulance. Although EMS typically uses Standard Operating Procedures (SOPs) to specify standard practices for the EMS response, few SOPs set driver performance standards or ensure ongoing or refresher driver training. Further, without a requirement for retrospective analysis of crashes (or near-crashes), their review is not assured and any “lessons” are lost that might have been learned from the crash. Also, effective crash analysis is made more difficult when crash-related data and required recordkeeping is incomplete or essentially limited to information required for insurance claims.

Operational Factors

Operational factors focus on various aspects involved in the routine functioning and activity associated with the operation of the ambulance and the transport of the patient.

Failing to use restraints is a major operational factor that increases the risk of injury to all three types of ambulance occupants – ambulance driver, EMS provider and patient. Of the three types of occupants, use of restraints is lowest among EMS personnel who provide care in the patient compartment of the ambulance. While EMS providers justify lack of restraint usage because of a need to reach the patient or equipment, or to stand up or change positions, failure to use restraints means

that these personnel are at higher risk of striking cabinets, shelves, other providers or even the patient during a crash. While seat belt usage is higher among ambulance drivers, it is not consistently or universally practiced. Requirements for use of restraints for all ambulance occupants and monitoring of compliance are not always included as standard SOP components.

Excessive ambulance speed that can accompany the use of lights and sirens increases not only the likelihood of a crash, but also the risk of injury or death to ambulance occupants and others on the road. The vast majority of EMS calls does not involve life-threatening conditions, and the few seconds saved from the use of speed (“lights and sirens”) has a negligible impact on the patient and is insufficient to justify its frequent use. Routine use of lights and sirens is unwarranted when highly skilled EMS personnel now provide many advanced treatments at the scene which were previously available only at a hospital. Sophisticated dispatching algorithms that can help tailor EMS response to patient need are often not used to their full potential. Over-emphasize on the importance of EMS response times can inadvertently pressure EMS crews to respond as fast as possible, without sufficient consideration of the risks involved.

Environmental Factors

Environmental factors are elements outside the control of the ambulance driver that can detrimentally affect the safe operation of the ambulance. The different types of roadway that the ambulance has to travel, e.g., interstate; suburban street; rural road, each have unique characteristics and potential risks. For example, crashes in rural areas tend to be more severe in terms of occupant injury or death because of narrower roads, limited lighting, few dividers, and inadequate shoulders. Intersections, red lights or stop signs can be exceptionally hazardous, particularly when other drivers fail to hear or see the ambulance or ambulances fail to slow-down or stop to account for traffic signals. Road surface conditions, resulting from ice, snow, or even rain, require the ambulance driver to use extra caution and can further compromise the maneuverability of the ambulance.

Recommendations

Based on consideration of these factors, the MIEMSS Ambulance Safety Task Force makes the following recommendations. The recommendations should be considered by jurisdictions and companies that bear the day-to-day responsibility of ensuring the provision of emergency medical services care throughout the state. Adoption of new company / jurisdictional policies, or modification of existing ones, may provide the mechanism for implementation of various recommendations (see #5 below). Reinforcement of safe ambulance operations and safety-conscious management programs is essential.

1. Screen ambulance drivers

Jurisdictions and companies should implement driver screening to identify ambulance drivers whose driving records, excessive risk-taking, or medical conditions may make them poor candidates for the responsibility of driving an ambulance. Subsequent to initial approval, periodic screening and monitoring of driving records and driving performance should occur to identify drivers who have since developed problem behaviors or conditions that have the potential to detrimentally impact driving abilities.

Determination of what constitutes a “poor” driving record should be made by each jurisdiction, although uniform standards that would be applicable statewide should be encouraged. As an example,

the State of Maryland precludes any state employee who has five (5) or more points on their driver's license from driving a state vehicle. Such existing standards can provide guidance to jurisdictions as they develop their own standards.

Identification of excessive risk-taking involves consideration of actions or behaviors that could put at risk the driver, those in the ambulance, or others on the road. Risk-taking behaviors include those that occur not only behind the wheel, but also those that occur in other environments. Jurisdictions and companies should determine on a case-by-case basis what behaviors constitute excessive risk-taking.

Jurisdictions and companies should require initial medical screening and periodic screening updates for ambulance drivers. Screening results should be used to identify the presence of medical conditions that could impact the driver's ability to safely operate an ambulance. Drivers with potentially problematic medical conditions should be referred for further medical review and consideration to determine whether they are able to safely operate the ambulance. The Maryland Motor Vehicle Administration's Medical Advisory Board (MAB), comprised of physicians from multiple specialties, assesses the medical fitness of individuals who have been referred to them because of medical conditions that can impact the individual's ability to safely operate a motor vehicle. The MAB has developed a list of 20 medical conditions that, when present, can lead to an in-depth review of the individual's medical condition and a final MAB recommendation to the Motor Vehicle Administration as to the individual's fitness to drive. Jurisdictions may wish to consider the MAB's list of medical conditions for guidance as to which conditions may be appropriate for medical screening. See Appendix B.

2. Ensure effective initial ambulance driver training and periodic refresher training

Initial driver training is essential for a strong foundation to help ensure safe operation of the ambulance. Ongoing training keeps driving skills sharp and knowledge of safety laws and policies up-to-date. Training also provides the opportunity to set expectations for a "culture of safety" for ambulance operations. Graduated driving responsibilities help newly trained ambulance drivers begin on-road driving in low-risk circumstances and permits increased responsibilities after certain standards (e.g., number of hours; level of performance) have been achieved.

In Maryland, there is no state-issued driver's license specifically for ambulance drivers. There is significant variation among jurisdictions regarding initial training for ambulance drivers. While some jurisdictions require EVOC training, the requirement is not uniform applied among jurisdictions and can even vary within a jurisdiction. For those that require EVOC training, emergency vehicle operators must successfully complete an approved emergency vehicle operator's course approved by the Maryland Fire-Rescue Education and Training Commission. Emergency Vehicle Operations Courses (EVOCs) are currently offered by various jurisdictions, as well as by the Maryland Fire & Rescue Institute. EVOC involves classroom lectures, as well as practical skill sessions, and courses can typically include a variety of emergency vehicles, including fire apparatus.

Ambulance-specific driving training should be uniformly required by jurisdictions and available for ambulance drivers in Maryland. Maryland's EVOC training sites should consider modifying EVOC courses to include ambulance-specific didactic instruction modules. Further, practical skill training that should include requirements for driving practice and testing on different road types to help students experience the dynamics and physical forces associated with driving the ambulance(s) that will be used in their local operations.

Training sites should also provide periodic refresher training to allow ambulance drivers to update their knowledge and practice skills. Such updates can use traditional classroom or distributive learning techniques that include online training. Use of driving simulators should be considered for the practical component of refresher training, which can be especially helpful in training drivers to deal with high-risk situations. Simulators are currently being used by several jurisdictions in Maryland. Given the costs of purchasing such simulators, opportunities for sharing simulator resources across jurisdictional boundaries, among regions, or statewide should be explored and encouraged.

Training sites should also consider offering training credits (e.g., CMEs) for completion of periodic refresher training. Training credits could help encourage and reward providers for their efforts in completing periodic refresher courses.

Jurisdictions should implement graduated driving responsibilities for newly-trained ambulance drivers as a critical and necessary adjunct to driver education courses. Graduated driving responsibilities help ambulance drivers increase their skills and become proficient drivers in different environments (e.g., rural, urban), on various road surfaces and types (interstate; city), and in all types of weather conditions (wet surfaces; fog).

3. Increase use of restraints and safety improvements during ambulance operations.

Jurisdictions and companies should set, monitor and enforce policies that require the use of seat belts / restraints for the driver, other EMS personnel in the ambulance and the patient being transported.

Maryland's seat belt laws for passenger cars require that the driver and front seat occupant wear seatbelts. Policies that similarly require ambulance drivers and front seat occupants to use seatbelts should be in place throughout the state. Ensuring use of restraints for EMS personnel in the ambulance will require thoughtful consideration and discussion within companies and jurisdictions to identify methods to use such restraints in existing ambulance models without compromising patient care. Approaches will likely vary based on the type of ambulance used.

Moving forward, jurisdictions and companies should take steps to ensure that ambulances purchased in the future have patient compartments that are ergonomically structured to increase safety and facilitate use of restraints by all passengers. This is particularly important since, at the present time in many ambulances, EMS providers are unable to render care while staying in seatbelts / restraints. Compartment improvements, such as improved seat placement and restraint systems, safety netting for cargo storage instead of hard cabinets, and turn / brake signals in the patient compartment to warn occupants of impending stops or turns, can reduce the risk of injury during transport or in the event of a crash.

4. Reduce the incidence of excessive ambulance speeds and the routine use of "lights and sirens".

Jurisdictions and companies should adopt EMS Response and Transport Guidelines for the use of lights and sirens based on the needs of the patient. Determinations of patient need for a response with lights and sirens should be based upon Emergency Dispatch Protocols approved by the EMS Board that identify the patient problem and urgency of the response needed. Determinations of a patient's need for transport with lights and sirens to the hospital should be grounded in the Maryland Medical Protocols that identify the level of patient need, e.g., life-threatening, urgent, etc. Jurisdictional Medical Directors should provide assistance in developing these guidelines.

“Lights and sirens” should be used with Priority 2 patients only in exceptional circumstances (e.g., the need for time critical hospital care) and should be prohibited for Priority 3 and 4 patients. Jurisdictions and companies should eliminate routine use of “lights and sirens” for both responses and transports.

5. Improve monitoring of ambulance safety issues and enforcement of safety practices.

Jurisdictions and companies should develop written policies that foster increased ambulance safety, improve ambulance driver performance, set standards to reduce variation in driving and ambulance response practices among different crews, facilitate training and retention of driving skills, and provide a common understanding and shared expectations to aid in evaluation of ambulance safety performance. For this to occur, jurisdictions and companies must ensure that the internal administrative structures, e.g., Driver Performance Review / Crash Review Committees, are in place to monitor and intervene when safety standards are not met. Jurisdictional / company monitoring of safety issues should also include formal review of ambulance crashes and near-misses. Such reviews can be invaluable in identifying “lessons learned” which should then be shared with other jurisdictions and companies.

Jurisdictions and companies should also ensure the availability of accurate data needed for effective monitoring of ambulance safety issues. Technology can assist in providing the necessary data. For example, “black boxes” provide real-time monitoring of vehicle parameters, including speed, acceleration, braking and cornering, and provide driver feedback and information for supervisory purposes.

6. Create an ongoing statewide forum for ambulance safety issues.

The Ambulance Safety Task Force should continue to promote the advancement of ambulance safety throughout Maryland, monitor trends in ambulance crashes, and should provide a forum for addressing future ambulance safety issues common to all jurisdictions and counties including a review of the update of NFPA 1917.

Appendix A

MIEMSS Ambulance Safety Task Force Members

Robert R. Bass, MD, FACEP (Chair)	MIEMSS Executive Director
Bill Adams, NREMT-P	MIEMSS Acting Director, SOCALR
Bobby Balta	Past President of the MSFA
Wendell Baxter, EMTB	Harford County/Bel Air Police Department
Chuck Boone	LifeStar Response
Jim Brown, MA	MIEMSS, Director of Educational Support Services
Doyle Cox	Past President of the MSFA
John Denver	First Vice President of the MSFA 2011-2012
Bill Dousa, CRT-I	Harford County Association/EMS Committee Chair MSFA 2011-2012
Linda Dousa, CRT-I	Harford County Association/EMS Committee Chair MSFA 2011-2012
Rene Fechter, NREMT-P	MIEMSS, SOCALR Director
Wade Gaasch, MD	Baltimore City Medical Director
Barbara Goff	MIEMSS, Executive Assistant
Jon Mark Hirshon, MD, MPH	National Study Center for Trauma & EMS
Phil Hurlock	MIEMSS, Ombudsman
Dave Lewis	President of the MSFA 2011-2012
Jackie Olson	Second Vice President of the MSFA 2011-2012
Danny Platt, NREMT-P	Commercial Ambulance Liaison
Carl Soderstrom, MD	Chief, MVA Advisory Board
Lolita Stewart	State Highway Administration
Allen Williams	MFRI, Manager, Logistical Support Section
Cyndy Wright Johnson, MSN, RN	MIEMSS, EMS for Children Director

Appendix B

Medical Conditions Listed for Review by the Motor Vehicle Administration's Medical Advisory Board

1. Cerebral Palsy;
2. Diabetes requiring insulin;
3. Epilepsy;
4. Multiple sclerosis;
5. Muscular dystrophy;
6. Irregular heart rhythm or heart condition;
7. Stroke, "mini-stroke", or transient ischemic attack (TIA);
8. Alcohol dependence or abuse;
9. Drug or substance dependence or abuse;
10. Loss of limb or limbs;
11. Traumatic brain injury;
12. Bipolar disorder;
13. Schizophrenic disorders;
14. Panic attack disorder;
15. Impaired or loss of consciousness, fainting, blackout, or seizure;
16. Disorder which prevents a corrected minimum visual acuity of 20/70 in at least one eye and a field of vision of at least 110 degrees;
17. Parkinson's disease;
18. Dementia, for example, Alzheimer's disease or multi-infarct dementia;
19. Sleep disorders, for example, narcolepsy or sleep apnea; or
20. Autism.