**ASTNA's President's Acknowledgement**

The Air & Surface Transport Nurses Association is pleased to offer an updated edition of this important document. With the passage of time, the tools, technology, and knowledge base that create effective safety systems change, but the need for every person involved in transport to maintain an unwavering commitment to the large concepts and small details that allow us to complete each transport safely does not. This Position Paper is an important resource for administrators, managers and line staff in transport programs of all types—those with ground, fixed wing, or rotor vehicles, operating in any area and any model. Operational safety and patient care quality are the common goals of every transport program and provider, and ASTNA is happy to provide this resource as part of our mission to advance the practice of transport nursing and enhance the quality of patient care.

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**The Air & Surface Association Board of Directors would like to thank the former North Central Chapter of ASTNA for providing the funds to reprint this revision of the Transport Nurse Safety in the Transport Environment Position Paper**

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## STATEMENT OF PROBLEM

Maximizing safety of crew members in the transport medical environment is a primary focus of the Air & Surface Transport Nurses Association (ASTNA), formerly known as the National Flight Nurses Association (NFNA) * . In 2006, ASTNA published Flight and Ground Transport Nursing Core Curriculum.[1] Within that document, in the crew safety chapter it states that, "Responsibility for safety comes from every team member". Individual crew members may assist in maintaining their own safety or that of the aircraft and crew. Unfortunately, years after this recommendation, a survey of transport nurses conducted in 2007 revealed that safety practices were widely varied from program to program.[2] The transport nurse shares the responsibility of ensuring the safety of aircraft and crew."[2] By creating this standard, ASTNA was at the forefront of changing a long-standing myth that the safety of the aircraft and its occupants was the sole responsibility of the pilot(s).

The air medical transport industry has begun to recognize and address the importance of the nurse's role in taking an active part along with other members of the team to ensure a safe aviation environment. More recently, the importance of a safe ground transport environment has become a transport industry focus.

Team safety is the primary focus of the critical care transport community, yet low compliance with available guidelines for safety technology, practices, and behaviors are reported. Since 1998, air medical programs have continued to experience a fatal accident rate which exceeds that of all other types of aviation in the US. [4] In 2008, the fatality rate from air medical helicopter crashes was the highest ever recorded in the history of the industry. [4] This unfortunate statistic is indicative of an area of practice that should be looked at closely. The number of patients flown, as well as the number of HEMS aircraft in operation, has increased significantly since 1980. Some researchers hypothesize that with more flight programs and more missions being conducted, the accident rate appears higher than actuality reveals. Many of the deaths were nurses involved in transporting ill or injured patients – a tragic loss of unacceptable proportions to the nursing profession. The fatality and injury rate for transport nurses performing ground transport is unknown. However, best estimates for all ambulance fatalities are one fatality per week and approximately 10 serious injuries each day.[7,8] Safety hazards of ground transport are numerous. When hazards of transport are discussed, the hazards associated with surface transport are often overshadowed by those of air transport. Components such as required reporting, a national database, ambulance construction requirements and an investigative arm are not even in place. Critical care ground transport nurses are at greater risk due to their functioning in larger ambulances to accommodate critically ill patients and their equipment. ASTNA believes there is a great need to investigate, promote and implement methods to decrease the safety risks for each transport nurse, whether the transport occurs on the ground or in the air. To ensure the safest transport medical transport environment, it is imperative that risks are minimized and consistent application of available knowledge and technology is utilized in the transport community.
In 2007, ASTNA surveyed its membership regarding safety. Varying degrees of compliance were noted, ranging from highly compliant safety practices to practices that were suboptimal.

These survey results we published in the *Air Medical Journal*, in 2008. These results indicated that despite the Transport Community having made great strides in safety, we, as an industry, still have a great deal of room for growth. Policies that promote safety through recognition and reward, as well as the implementation of policies that foster openness and honesty without fear of repercussion should be adopted across the spectrum of critical care transport

Every patient and transport team member is entitled to the highest level of protection and most effective transport safety systems available. Unity as a transport nurses' association and sharing – honestly and openly – positions regarding issues of safety can be a powerful influence in positively affecting a future of significantly reduced incidents and accidents in the transport medical community.

It has been established that the majority of the air medical helicopter crashes that have occurred in the last five years were not survivable – the only thing that would have preserved the lives of those victims would have been prevention of the crash itself. Many of the crashes have been determined by investigators to be caused by "Pilot Error" or "Controlled Flight into Terrain" (CFIT). [9] Therefore, the ASTNA Position Paper on Transport Nurse Safety in the Transport Environment includes all of the aspects of safety addressed in earlier versions, i.e. helicopter design, ground transport, survival training, personal protective equipment, etc. as well as highlighting the human factors that must be considered.

Twelve topics are addressed with background information presented first and the Association's position following. Each section contains adequate information to serve as a resource regarding the particular topic without necessitating review of the entire paper. This document reinforces ASTNA's commitment to ensuring that safe medical transport continues as an important and integral resource in the health care industry.

* The name National Flight Nurses Association (NFNA) was changed to Air & Surface Transport Nurses Association (ASTNA). All references in this document to ASTNA and/or NFNA refer to the same organization.

NOTE: The Federal Aviation Administration defines 'CREWMEMBER' as 'a person assigned to perform duty in an aircraft during flight time.' [10] For the purpose of this document, the term "team member" identifies any member of the team (exclusive of the pilot) who provides medical care to the patient. The use of the term "team member" herein does NOT identify a person who meets the definition provided in the Federal Aviation Regulations.

References:


1 Air & Surface Transport Nurses Association (2006).Flight and Ground Transport Nursing Core Curriculum. Section III (Safety) Denver, Colorado

2 Air & Surface Transport Nurses Association (2007). Safety Survey: Nurse Safety Practices, Perceptions, and Experiences
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5 Harris, Joel S. (Sept – Oct, 1999). Reports Show Pilot Error as the Major Cause of Helicopter Accidents in US On-demand Operations. Safety Foundation Helicopter Safety, 25(5).

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7 Levick, N., A Crisis in Ambulance Safety, Emergency Response Disaster Management, 2002; 4:20-2.

8 Levick, N., New Frontiers in Optimizing Ambulance Transport Safety and Crashworthiness, Paramedic, 2002; 36-9.

9 Association of Air Medical Services Core Safety Committee (Oct, 2000). A presentation conducted at the Air Medical Transport Conference in Salt Lake City, UT.

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**IMPROVED PERFORMANCE THROUGH APPROPRIATE SCHEDULING AND PROVISION FOR ADEQUATE REST**

## BACKGROUND

The provision of 24-hour availability of medical transport services may result in the scheduling of nursing staff for extended or rotating shifts. The negative impact of shift work on quality of life relationships with family and friends and job performance, has been documented. [1] Study of the effects of time on living organisms is an area of science known as chronobiology.

Managers have traditionally rotated day, evening, and night shifts on the exclusive basis of providing fair distribution of various shifts among employees. Chronobiologists have reported that fatigue resulting from shift work is an insidious cause of decreases in every aspect of physical and mental performance. [2] Although there are no perfect solutions to the problems inherent with shift work, chronobiologists have provided suggestions to minimize the negative effects and maximize performance. Shifts should be changed infrequently, with as few combinations of different shifts in any given week as possible. Shift changes should also occur in a forward rotation direction (i.e. day to evening to night for 8-hour shift workers, or day to night for 12-hour shift workers), with days off scheduled in between allowing maximum shift transition. [5]

A safety study published by the National Aeronautical Space Administration (NASA) clearly documents the relationship between performance levels and adequate rest. Alertness, fine motor skills, and judgment deteriorate significantly when adequate rest is not obtained. [3] Currently nurses and other air medical crew members are not included in Federal Aviation Regulation (FAR) requirements under Part 135. These requirements were changed in October 1999 to include a stringent limitation on the maximum time a pilot can be on duty before a mandated, uninterrupted rest period. Regulations dictate that a pilot must have a minimum of 10 hours of uninterrupted rest within every 24-hour period ("on call" time, when the pilot is required to carry and respond to a pager, is counted as "duty time", and cannot be included in the minimum 10 hours of required rest). [4] Imposing this same stricter limit of duty time on all crew members may create difficulties for some programs. However, it has been well established that the pilot is not the only person responsible for maintaining a safe aviation environment.

Nurses who work 24-hour shifts may encounter difficulties in obtaining adequate rest. Lengthy duty time associated with 24-hour shifts may create an environment that promotes conditions of fatigue and compromised judgment abilities unless the necessary 10-hour rest period can be ensured. Scheduling shorter shift duration does not guarantee crew members will receive sufficient rest or be free from fatigue and compromised performance. According to the National EMS Pilots Association Safety Guidelines, "…fatigue cannot always be self-determined, and in most cases…may not be apparent until serious errors are made". [5,6]

Insufficient rest is not the only cause of deteriorated transport nurse performance. The unpredictability of requests for service as well as the potential for frequent, "back-to-back", and/or lengthy transports often precludes transport nurses from eating and drinking at regularly scheduled intervals. A definite relationship between adequate fluid and nutrition and an individual's performance level has also been documented. [7]

In the 8th edition CAMTS [8] standards, it is recommended that all medical crew members work no more than 24 hours in a row and that medical crewmembers be allowed to "time out" should they become fatigued during their shift. In addition to the formal recommendations by CAMTS, individual preparation and governance is imperative. Proper hydration, diet, and the minimal use of alcohol and tobacco will result in team members being more fit for duty. Additionally, drug use, both prescription and over the counter should be minimized and closely monitored in an effort to reduce the impact on mission readiness and health.

## ASSOCIATION POSITION

Based on the results of published research and the recent imposition of stricter minimum rest requirements on pilots by the FAA in response to a significant rise in EMS helicopter accident/fatality rates, the Air & Surface Transport Nurses Association recommends and supports that improved performance, alertness and decision-making be promoted by:

1 Structured scheduling that assures each transport nurse receives a minimum of 10 hours uninterrupted rest in any 24-hour period. A written policy should be established acknowledging the nurse's responsibility to request relief from duty when feeling excessively fatigued or inadequately rested. The policy should include a process for identification and activation of back-up personnel to relieve excessively fatigued crew members.

2 Structured scheduling of transport nurses to provide for infrequent changes between night, evening, and day shifts, and with shift changes made in a forward rotation. Scheduling of days off should allow for maximum quality rest and transition between shifts.

3 Provision of adequate fluids and nutrition for transport nurses, especially during the busiest service periods.

4. Recommend utilization of a fatigue risk assessment tool.

References:

1 Dodd, R. F. (June, 1988). Safety Study, Commercial Emergency Medical Services Helicopter Operations. (Report Number NTSB/SS-88/0). Washington, DC. U. S. Department of Commerce National Technical Information Service.

2 Tepas, D. I., Monk, T. M. (1987). Work Schedules. In Handbook of Human Factors. New York, NY. John Wiley & Sons.

3 Dodd, R. F. (June, 1988). Safety Study, Commercial Emergency Medical Services Helicopter Operations. (Report Number NTSB/SS-88/0). Washington, DC. U. S. Department of Commerce National Technical Information Service.

4 U. S. Department of Transportation. Federal Aviation Regulations. Washington, DC. Federal Aviation Administration. Part 135.

5 Wright, D. (1984). An analysis of shift work and Emergency Medical Service Helicopter Pilot Performance. Unpublished Manuscript.

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7 Rosekind, M. R. (1996). Managing Fatigue in Operations Settings, pp 2.

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**IMPROVED SAFETY THROUGH
NURSE INTERACTION WITH
THE PILOT OR DRIVER IN COMMAND TO ENSURE A SAFE
TRANSPORT ENVIRONMENT – Air Medical Resource Management
(AMRM)***

## BACKGROUND

The Air & Surface Transport Nurses Association recognizes the importance of the nurse playing an active role in safety. [1]Along with ASTNA, many in the transport community have also recognized and addressed the absolute necessity of active participation of the nurse, along with other members of the team, in ensuring a safe aviation environment. In response to a Federal Aviation Administration mandated industry-wide effort to reduce the number of air medical helicopter crashes, a Safety Summit was held in Dallas on April 7, 2000. Since then, countless meetings and conferences have been held, including hearing before Congress, as well as other safety related meetings. In 2010, the FAA issued recommendations for air medical transport agencies to follow as a possible "path to safety" One of the recommendations is Air Medical Resource Management "AMRM". This dovetailed off the 2005 guideline that the FAA issued. On September 22, 2005, the FAA issued guidance to HEMS operators establishing minimum guidelines for Air Medical Resource Management (AMRM) training. The training focuses on pilots, maintenance technicians, flight nurses, flight paramedics, flight physicians, medical directors, specialty team members (such as neonatal teams), communications specialists (dispatchers), program managers, maintenance staff, operational managers, support staff, and any other air medical team members identified by specific needs. AMRM is a system in which everyone owns safety. The fundamental of AMRM is open communication. This allows the entire system to collaborate and have a voice that is heard in the consistent use of shift briefings, pre-mission briefings, post-mission debriefings, pre-mission inspections of the aircraft or vehicle, and pre-mission checklists involving every crew member. [6] The degree of involvement by each crew member may vary between programs; however, all members of the team should play an active role.

Shift briefings provide an opportunity to disseminate information about particular concerns or circumstances expected during that shift such as weather, scheduled maintenance, NOTAMS, road work or closures, etc. Pre-mission briefings allow for pertinent information to be communicated to crew members including special needs of the patient, ground contacts, customs paperwork, potential safety hazards in the area, expected time en route, anticipated weather, anticipated landing zone, airport, or road concerns, specific crew task assignments, etc.

Pre-mission checklists and inspections of the aircraft or vehicle are the responsibility of the pilot or driver. [7] Nonetheless, all crew members should be alert for unplugged cords, liquid spills beneath the aircraft or vehicle, unsecured objects in and around the aircraft or vehicle, loose objects in the vicinity, unsecured latches, etc. Any potential hazards should be brought to the pilot's or driver's attention as soon as identified.

Post-mission debriefings involve a formalized process documented in writing. These debriefings allow for the identification and trending of safety issues and/or concerns (including safety near-misses) so the information can be brought to the attention of the appropriate safety personnel. Information gathered from post-mission debriefings is invaluable for quality improvement purposes, such as tracking potential problems and monitoring trends. Safety issues identified should be called to the attention of the appropriate safety and/or administrative personnel in a timely manner. The acceptable timeframe and method of communication will be dependent upon the severity of the incident. Information regarding safety issues should also be formally communicated to other team members to improve awareness and incident prevention. Corrective action(s) taken should be documented in writing with a timely, follow-up evaluation of the effectiveness of the action(s). The data resulting from this process should be integrated into the transport service's comprehensive, ongoing safety program.

The nurse also has an obligation to assist the pilot/driver in maintaining a safe environment inside the aircraft or vehicle cabin. Responsibility includes ensuring that:

- All equipment is fully secured
- All crew members and/or passengers have seatbelts/shoulder harnesses fastened
- Patients are properly secured within the aircraft or vehicle
- The pilot or driver and controls are isolated from potential patient movement
- Night lighting is used judiciously
- Sterile cockpit is maintained during critical phases of flight
- Patients and passengers have received proper briefing regarding safety procedures in and around the aircraft [14]

## ASSOCIATION POSITION

The Air & Surface Transport Nurses Association believes that safety will be enhanced through nurse interaction with the pilot or driver in command if:

1 Nurses actively participate in ensuring a safe environment inside the aircraft or vehicle at all times.

2 Nurses work closely with the pilot(s)/driver(s) in developing procedures for shift briefings, pre-mission briefings, pre-mission checklists, pre-mission inspections, and post-mission debriefings as appropriate for that program's specific circumstances.

3 Nurses are trained in and routinely practice safety procedures utilized routinely during day-to-day operations (i.e. sterile cockpit, watching for other aircraft/vehicles, identifying potential hazards, assessing anticipated landing zones, etc.).

4. ASTNA believes the principles of AMRM apply to and should be practiced in the Transport environment, regardless of type of vehicle being utilized. Thus, even though

the current accepted industry term is “Air Medical Resource Management”, ASTNA believes the principles are applicable within all modes of transport, both ground and air.

References:


1. Air & Surface Transport Nurses Association (2006). Flight and Ground Transport Nursing Core Curriculum. Section III (Safety) Denver, Colorado

2. Safety Summit for Air Medical Services. Dallas, TX. April 7, 2000.

3. French, A., Hart, S., Heffernan, J., Lystrup, A., Savidge, K. (Sept, 2001). General Session: CRM/AMRM – Enhancing Patient Safety. A presentation conducted at the Air Medical Transport Conference in Orlando, FL.

4. Air & Surface Transport Nurses Association (2006). Flight and Ground Transport Nursing Core Curriculum. Section III (Safety) Denver, Colorado

5. French, A., Hart, S., Heffernan, J., Lystrup, A., Savidge, K. (Sept, 2001). General Session: CRM/AMRM – Enhancing Patient Safety. A presentation conducted at the Air Medical Transport Conference in Orlando, FL.

6. French, A., Hart, S., Heffernan, J., Lystrup, A., Savidge, K. (Sept, 2001). General Session: CRM/AMRM – Enhancing Patient Safety. A presentation conducted at the Air Medical Transport Conference in Orlando, FL.

7. U. S. Department of Transportation. Rules and Regulations. In Federal Aviation Regulations. Washington, DC. Federal Aviation Administration. Part 135.

8. Air & Surface Transport Nurses Association (2006). Flight and Ground Transport Nursing Core Curriculum. Section III (Safety) Denver, Colorado

9. Advisory Circular AC No**:** 00-64 Air Medical Resource Management (AMRM) Date: 9/22/2005 Initiated by: AFS-300

## LOADING/UNLOADING AN AIRCRAFT WHILE THE ROTORS ARE TURNING ("HOT" LOADING/UNLOADING)

## BACKGROUND

"Hot" loading and unloading refers to loading or unloading the patient and crew without taking the necessary time to shut down the aircraft engines and/or rotors. The majority of helicopter EMS programs conduct "hot" loading and unloading of patients in a variety of circumstances. An increased risk is present to all who participate in loading and/or unloading procedures while the rotors are turning. The significantly increased noise levels associated with turning rotor blades may prevent essential communication between team members and others who are assisting, as well as creating additional risks for hearing loss in the patient and EMS personnel. The patient specifically may suffer further negative consequences as a result of the cold air associated with "rotor wash". [1]

No evidence is available to support a cause and effect relationship between the delay required for the aircraft shutdown and a negative impact on the patient's condition or progress. In most circumstances, the time associated with shutdown is minimal – 30 seconds to over two minutes, depending upon aircraft type. However, the inherent risks of loading and/or unloading an aircraft with the rotor blades turning are well known. Any contact between personnel and either the main rotor system or the tail rotor may result in fatal injuries. [2] Therefore, prudent crew members must consider the benefits and risks of this practice in determining when "hot" loading and/or unloading would be deemed appropriate.

## ASSOCIATION POSITION

The Air & Surface Transport Nurses Association believes that safety during helicopter transport would be enhanced if:

1 Each helicopter EMS program considers the value vs. risk of "hot" loading/unloading the aircraft. If a program chooses to utilize "hot" loading/unloading, written policies and procedures detailing these operations must be established.

2 "Hot" loading/unloading is not used routinely, but rather in cases when the benefits outweigh the additional risks involved. All personnel involved in "hot" loading/unloading procedures should receive initial and recurrent training to assure safe performance of these procedures. Since it is often difficult to ensure that personnel from agencies other than the hospital(s) where the helicopter is based are trained consistently and continually

in “hot” loading/unloading, special consideration should be given to limiting such procedures to only those hospitals and/or locations where it is done more frequently.

References:


1. National Flight Nurses Association (1997). Safety and Personal Safety. In Flight Nursing Practices and Principles. 2nd Edition. Edited by R. Semonin Holleran. Mosby, Inc. St. Louis, MO. p 81-82.

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## PERSONAL PROTECTIVE GEAR
## FOR FLIGHT NURSES

### BACKGROUND

In 1986, the National Transportation Safety Board (NTSB) began investigating the growing number of EMS helicopter incidents/crashes. By 1988, a comprehensive study that included safety improvement recommendations had been completed. These recommendations were presented to the FAA and the American Society for Hospital-based Emergency Air Medical Systems (ASHBEAMS), now known as the Association of Air Medical Services (AAMS). The NTSB recommendations included the following priority action: "Encourage members who operate emergency medical services (EMS) programs to provide medical personnel, who routinely fly EMS helicopter missions, with mission appropriate protective clothing and equipment to reduce the chance of injury and death in survivable accidents. This clothing and equipment should include protective *helmet*s, flame and heat resistant suits, and protective footwear." [1]

In 1992, the AAMS Safety Congress recommended that "hospital programs doing scene work should have helmets, Nomex uniforms, and boots with steel toes and shanks" and that "all EMS helicopter personnel should wear helmets". [2] Both the NTSB and AAMS Safety Congress have defined personal protective equipment to include helmets, fire resistant (Nomex) uniforms, and high-top leather boots.

### HELMETS

The U.S. Army Aeromedical Research Laboratory at Fort Rucker, Alabama, has performed extensive testing, research and analysis of helicopters accident kinematics and the efficacy of utilizing personal protective gear. A study completed by Shanahan reviewed crash analysis data of 297 military helicopters and concluded that "the most common cause of injury was secondary impact caused by collapse of the helicopter structure into occupied areas, by inadequate restraint of the occupants that allowed them to flail into structures, or by a combination of both mechanisms. Injury solely related to acceleration occurred infrequently." Shanahan states that the most frequently reported injury of the crashes reviewed (both survivable and non-survivable) were head injuries. When Shanahan reviewed the cause of death in fatal crashes that were classified as "survivable", 56% of those occupants died as a result of head injuries. Further research into accidents that occurred in U.S. Army helicopters showed 24% of all injuries were to the head and face and nearly 25% of those were fatal injuries. [3]

Impact tolerances to the face and temporal area of the skull are relatively low. Lateral impact injury to the temporoparietal area requires a relatively small amount of force to produce a potentially lethal injury. Given sufficient energy, blunt trauma to most areas of the skull can result in linear skull fractures that extend to the base of the skull. Helmets provide adequate spreading or attenuation of the impact load, which results in a decreased incidence of skull fractures. [4] A study published in 1991 by Dr. Crowley, a US Army physician, compared

helmeted vs. non-helmeted occupants of 595 military helicopter crashes that were classified as "survivable". This study indicated that the occupants who did not have head protection were at a six times greater risk of fatal head injuries than those who were helmeted. The risk was even higher for those occupants that were positioned behind the cockpit. [5] In studies of the original SPH-4 helmet utilized by the military, it was shown that the average abbreviated injury scale (AIS) score for those crew members who lost their helmets during impact was 4.3, versus an average AIS score of 2.7 for those who retained their helmets in survivable or potentially survivable accidents. This represents a 37% reduction in average AIS scores for injuries sustained to the head(s) of individuals wearing helmets. [6]

Helmets with attached facial visors additionally provide the wearer with eye and sight protection, not only in the event of a crash, but also in cases when birds or other objects come through the windshield/windscreen or windows of the helicopter and into the cockpit or cabin. In multiple documented incidents occurring over the last few years, feathers, blood and bird parts caused significant potential for injury to crew members' eyes and sight, as well as to their entire faces. The loss of vision, even for a short period of time, can be catastrophic, especially when the pilot is unable to navigate the aircraft to a safe landing. Coupled with the use of helmets, properly utilized facial visors significantly decreases the percentage of fatalities and increases survivability for the helmeted individual during all accidents, whether or not facial injuries are involved. [7]

CAMTS mandates that all personnel at accredited rotor wing programs wear helmets.[1] Helmets that are especially designed for use in helicopter EMS operations provide specific protection to the air medical helicopter crew member, greater sound and crash attenuation, increased ease of movement within the limited space of the cabin and cockpit, broader fields of vision, and increased comfort features. Although more commonly associated with helicopter EMS operations, the hypotheses that helmets use in ground and fixed wing transport operations may prove beneficial. More investigation of the possible benefits of helmets in these types of environments is warranted. For use in helicopter EMS operations, lighter weight Kevlar helmets (i.e. Gentex SPH-5) or Kevlar and carbon fiber helmets (i.e. Gallet CGF LH 250) are available. For maximum comfort and safety, helmets must fit properly and facial visors must be utilized at all times. The chinstraps must also be used whenever the helicopter is airborne and must be properly tightened to ensure the helmet cannot become dislodged from the force of impact in hard landings and/or crashes. Because a helmet alters vision, movement, and hearing, each air medical crew member must become accustomed to differences by simulating normal activities in and around the aircraft prior to utilizing the helmet on an actual mission. [8,9]

## FLAME RESISTANT UNIFORMS AND GLOVES

The crash of an aircraft creates the potential for fuel spillage from ruptured fuel tanks and lines, with further potential for a major fire if the fuel is ignited by an electrical spark or heated surface. If the pilot and/or air medical crew members involved in such a crash are not immobilized or incapacitated, the only escape route may be through flames. U.S. Army research has demonstrated that the degree and extent of burns received in those circumstances depends

upon the thermal protection provided by the crew member's clothing. A helicopter post-crash JP-4 (jet A) fuel fire reaches a maximum intensity and "a steady state" of thermal dynamics approximately 20 seconds after single point ignition. [10] A crew member that is wearing a standard summer-weight cotton uniform would therefore have to escape such a fireball within ten seconds of ignition if there is to be any reasonable chance of survival. After 20 seconds, the thermal environment would consist of temperatures ranging from 927 to 1260 degrees Celsius, with the crew member's uniform acting as the only barrier between the excessive thermal temperature and his/her skin. [11] Most non-flame/heat-resistant clothing will ignite within seconds in such an intensely heated environment, and when clothing does ignite, morbidity and mortality increase fourfold. [12]

Although no protective clothing will completely prevent burns to the skin, the goal is to minimize the skin's exposure to the intense thermal environment during an aviation fire. Nomex is a flame and heat-resistant material made from aramid fiber, which is similar to nylon, but does not melt or drip when exposed to higher temperatures. Nomex aramid fiber is designed to withstand a brief intense heat environment by remaining intact and forming a char, which provides a barrier between the individual and the heat source. Nomex will not prevent thermal injury to the skin, but may reduce the risk or severity of tissue damage. [13] The use of Nomex gloves is also considered as part of a flame/heat resistant uniform since severe and debilitating injuries to the hands can result from brief exposure to flame or intense heat. [14]

When selecting a flame-resistant (Nomex) uniform, helicopter EMS programs should review the specific flammability and heat transfer characteristics of available fabrics. This information can typically be requested from the manufacturer of either the fabric or the uniform. Because multiple choices and manufacturers are available, other considerations when selecting a uniform are: comfort, cleaning/laundering ease, resistance to abrasion, fabric strength and durability, colorfastness, and predicted useful service life. The weight (ounces/yard squared) of the fabric in the uniform should also be considered, especially in areas of extreme climates and conditions. Fabric weights generally range from 4.5-to 6.0 oz/yd squared. [15] Programs that operate in warm climates should consider using a lightweight (summer-weight) fabric, while those in areas where winter temperatures are extremely cold should consider fabric that is heavy enough to provide protection from the cold environment. Multiple-layered Nomex uniforms with insulating fabric are also available for use in cold climates. [16,17]

In a post-incident aviation fire, the fabric weight is only one factor that determines the amount of heat transfer that will occur. Of greater importance than fabric weight is uniform fit and what type of undergarments are worn underneath. The highest degree of thermal protection will be provided when a Nomex uniform is worn over a natural fabric undergarment (cotton, silk, or wool/cotton mix), including both briefs and T-shirt or long underwear. [16] The uniform should be fitted so that there is a minimum of ¼ inch between the undergarment(s) and the Nomex aramid fabric. [17] Because fabrics of synthetic undergarments (e.g. polyester, polypropylene, nylon) melt and become embedded in the skin when they are exposed to intense heat, undergarments made of these materials should be avoided.[18]

Although currently available data shows that the incidence of post-crash fires in survivable air

medical accidents is less than 25%, the effects of burn injuries are physically, emotionally, and financially devastating. [19] The average hospitalization for an industrial burn injury victim is 45 days in a specialized burn center at an approximate cost of $3000-$5000 per day. [20] After that initial treatment, extensive rehabilitation, occupational therapy, plastic surgery procedures, etc., are common, adding significantly to the total cost. While the wearing of Nomex uniforms will not provide complete protection from a post-crash fire, when worn appropriately, they lessen the severity of thermal injury by providing a barrier between the heat source and the crew member's skin. If burn depth is subsequently lessened by as little as several hundred microns, the outcome and prognosis of the burn victim greatly improves.

Nomex gloves can also be an excellent supplement to the flight crewmember's uniform, Hand protection during a fire can reduce the risk of disabling and disfiguring injuries caused by contact with fire as well as hot materials. It is recognized that Nomex gloves can most likely not be worn during patient care. However, they may be worn on outbound flights, as well as other situations where patient care is not being performed.

## PROTECTIVE FOOTWEAR

According to National Safety Council statistics, foot-related injuries represent approximately 20% of the total workplace injuries reported. Reported foot injuries include contusions, cuts, and lacerations, with the frequent incidence likely due to the fact that feet are highly exposed and largely unprotected. [21] Air medical crew members are at even greater risk for foot injuries because of their increased exposure to environments where multiple hazards exist – sharp metal objects, moving equipment, falling debris, wet/slippery surfaces, obstacles to climb over, etc. Injuries to the feet can be extremely disabling when the foot's supporting and balancing functions are comprised or lost. The use of protective boots may significantly reduce the risk of foot injuries when the boots are constructed of all natural leather material and they extend several inches above the uniform pant legs. Leather protects the underlying tissue from punctures, lacerations, and thermal injuries, and high-top boots have been shown to reduce the potential for ankle sprains and fractures, as well as providing additional ankle support and stabilization when working in a harsh environment. Boot soles should be constructed of lightweight material that is also slip-resistant on wet surfaces. Although zippered boots provide convenience in donning and removing the boots quickly, when exposed to fire or significant heat, underlying skin must be insulated from direct contact with metal zippers to reduce the potential for rapid heat transfer. Socks/stockings should be made of all natural fibers, such as cotton, wool, silk, etc., and should be heavy enough to keep the feet insulated and protected from friction injuries.

## ASSOCIATION POSITION

Based on available research, the Air & Surface Transport Nurses Association believes the potential for injury in survivable accidents/incidents would be reduced if:

1 Flight Nurses in helicopter operations wear helmets specifically designed for helicopter

operations. These helmets should meet or exceed U.S. military specifications for aviation head protection gear and should have full facial visors. Helmets should be properly fitted and facial visor utilized at all times.

2 Flight Nurses wear loose fitting, long sleeved uniforms constructed of flame/heat – resistant materials. Uniforms should be fitted to provide for at least ¼ inch between the undergarments and the uniform and undergarments should be made of all natural fibers. Nomex gloves provide additional protection and should be worn whenever possible.

3 Flight Nurses in operations that conduct scene flights or missions wear high-top, all natural leather boots, with cotton or cotton/wool blend socks. If zippers are employed in the boot design, a leather shield should be placed between the zipper and the inside of the boot.

4 Flight nurses working in any type of transport environment should be aware of the decibel level in their environment and the potential damage to hearing. Appropriate hearing protection should be worn. Recommend annual hearing tests.

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## REPORTING OF HAZARDOUS SITUATIONS AND SAFETY ISSUES

## BACKGROUND

The safety survey of ASTNA's membership conducted in 1988 revealed no mechanisms for reporting safety concerns and no resources to assist in resolution of those concerns were in place. As a result of this survey, the ASTNA Safety Committee issued a recommendation that "the NFNA Board of Directors should explore a mechanism for members to report and resolve safety issues." [1]

Despite the recognized importance of having such a reporting/resolution process available, more than a decade passed without any such system in place. Recognizing this, ASTNA added a page to the Association's website (www.astna.org) providing an arena for reporting safety concerns. [2]

The link on the ASTNA website worked well, yet the industry needed another venue for reporting. With the advent of other mechanisms, the ASTNA link, while useful and cutting edge at its inception, was removed. The Concern Network is now available to share information that is related to mishaps during ground or air transports. Concern participation is voluntary and has become increasingly more and more widely used to disseminate information ranging from mechanical failures to actual accidents and crashes. Updates are disseminated via email to those subscribed to the service, often sending out preliminary information followed by a more in depth description of the events surrounding the accident, mishap, or event. The Concern network has become the widely used venue for reporting.

In addition to these two reporting systems, Safety Management Systems "SMS" have been developed within our industry to mitigate the risks of transport by managing the potential hazards by identifying and reducing the risks associated with our industry. The SMS concept empowers and charges every member of the team to be safety conscious. This empowerment encourages all team members to "speak up" when a problem or potential problem exists. It can be reported early in hopes that an accident or mishap won't occur.

## ASSOCIATION POSITION

The Air & Surface Transport Nurses Association believes the establishment of a readily available method of reporting safety issues/hazards will enhance transport nurse safety. Such a system must include:

1 Anonymous process of reporting or notifying others that the hazard exists.

2 A forum allowing for questions, feedback, discussion, etc.

3 Clearly visible, written notification that information available and/or obtained through this reporting mechanism is NOT to be used for criticism, negative feedback or punitive

measures.

4. Utilization of safety management systems “SMS” that use multiple levels and personnel in all levels of levels of an organization to identify, report, and take action in regards to unsafe or potentially unsafe situations.

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# VEHICLE CONFIGURATION AND DESIGN TO MAXIMIZE SAFETY AND REDUCE THE POTENTIAL OF SERIOUS INJURY TO TRANSPORT CREWS IN THE EVENT OF A CRASH

## BACKGROUND

Much has been learned from the studies of helicopter crashes and their results during the past two decades. Researchers identified several areas of significant risk, some of which referred to problems with helicopter design and/or configuration. In a report prepared for the Federal Aviation Administration by consultants, an analysis of rotorcraft crash dynamics was completed and recommendations made for improved crashworthiness. That report entitled "Analysis of Rotorcraft Craft Dynamics for Development of Improved Crash-Worthiness Design Criteria" included recommendations for energy attenuating seats, single-point release shoulder harnesses, and crash-resistant fuel cells. [1] Data analysis demonstrated that with the implementation of these safety enhancements, fatalities and injuries in otherwise survivable crashes could be reduced as much as 85%.[2]

Velocity and angles of impact are factors that largely determine the type and extent of injury sustained in rotorcraft accidents. Statistics indicate that spinal injuries resulting from vertical direction of impact, and head injuries caused by unrestricted contact with the environment are the major causes of severe injury or morbidity in such crashes. [3] FAA recommendations identified significant potential for injury reduction as a result of using shoulder harnesses and crash attenuating seats. The expected reduction in injuries as a result of consistent use of these two safety measures is presented in the following tables:

***Table 1***

**Injury Reduction Due to Incorporation of Shoulder Harnesses**

(Based on analysis of 1351 accidents occurring during the five-year period from 1974 to 1978) **Simula,** Inc.[4]

| Injury Category | Total Number of Injuries in Survivable Accidents Due to All Hazards | Number of Injuries Reduced Due to Use Of Shoulder Harness Usage | Injury Reduction (%) | Expected Range of Injury Reduction (%) |
|---|---|---|---|---|
| Fatal | 115 | 35 | 30.4 | 25-60 |
| Serious | 285 | 70 | 24.6 | 20-36 |

| | | | | |
|---|---|---|---|---|
| Moderate | 475 | 238 | 30.1 | 35-60 |

***Table 2***

**Injury Reduction Due to Incorporation of Improved Seating Systems**

(Based on analysis of 1351 accidents occurring during the five-year period from 1974 to 1978) **Simula**, Inc. [5]

| Injury Category | Total Number of Injuries in Survivable Accidents Due to All Hazards | Number of Injuries Reduced Due to Use Of Improved Seating System | Injury Reduction (%) | Expected Range of Injury Reduction (%) |
|---|---|---|---|---|
| Fatal | 115 | 10 | 8.7 | 5-25 |
| Serious | 285 | 120 | 42.1 | 33-50 |
| Moderate | 475 | 130 | 27.4 | 23-3 |

Both the National Transportation Safety Board (NTSB) and the FAA Crash Dynamics Program completed further reviews of the FAA consultant's report prepared by Simula, Inc. [6] Based upon the findings of all three groups, the FAA Regulatory Analysis Branch recommended amendments to parts 27 and 29 of the Federal Aviation Regulations (FARs) such that "all newly certified normal and transport category rotorcraft" be required to have installed single-point release shoulder harnesses and energy-attenuating seats. [7] Certification requirements for fixed-wing operations also involves proper restraints and energy attenuating seats (FAR part 25.785). [8]

A crash resistant fuel system (CRFS) describes an aircraft fuel system, which has been specifically designed to prevent post-crash fire, allowing time for the pilot and crew to safely exit the aircraft. Even when the fuselage has been severely damaged and distorted, the CRFS is designed to contain the fuel spillage. The military has conducted numerous tests of crash resistant vs. non-crash resistant fuel systems. The results clearly indicate that helicopters equipped with a CRFS present minimal risk of thermal injury to occupants in the event of a survivable crash. [9]

Although the recommendations made by Simula, Inc. resulted in amendments to the FARs over ten years ago, only a small percentage of the helicopters used in the EMS transport industry today are required to have these safety modifications. Aircraft that were originally certified prior to the date that the above amendments were added to the FARs are not required to make these modifications. These aircraft need only meet the standards that were established as requirements at the time of the original aircraft certification process. [7,8]

Regarding ground transport, the first dynamic crash testing of an ambulance was not performed

until 2000. [10] Accordingly, the knowledge base for a crash-resistant ambulance is limited. Although the "standard" for ambulance construction follows the federal requirements for ambulances as defined by General Services Administration Standard KKK-A-1822: Federal Specifications for Ambulances, these are in fact only purchasing guidelines developed by the federal government's General Services Administration. Of the 110 pages of this document, only 2 lines address the safety of the patient compartment. With van type ambulances, the entire unit complies with Federal Motor Vehicle Safety Standards (FMVSS). Van type ambulances, however, are rarely found in use with critical care ground transport programs due to the space requirements for additional staff and equipment. In ambulance types where there is a cab/chassis and a patient compartment box, only the cab and chassis are required to meet FMVSS. One need only view post-crash photographs of ambulances to determine patient compartment/box design is woefully inadequate from a safety standpoint. The few efforts to develop and improve industry standards for safer ambulance construction have been unsuccessful.

The most serious and fatal EMS vehicle injuries occur in the patient compartment and to improperly restrained occupants. [11] An 11 year study of fatal ambulance crashes showed that 82% of fatally injured EMS rear occupants were unrestrained. [11] Of fatal occupant injuries, 65% are the result of head injury. [10,12] Smaller ambulances that enable the providers in the rear to remain seated and seat belted while rendering patient care, minimize risk. Although much more dynamic crash testing and research are needed, results suggest that improved outcomes of ambulance crashes may result from: locating crewmember seats so as to permit rendering of care from a seat belted position; head protection, as in helmets, for crewmembers that ride in the patient compartment; using automobile-grade padding on corners and edges, and lap belts positioned at the pelvic level versus waist level as found on some bench seats. [12]

Real time driver performance feedback and monitoring systems have been shown to make dramatic improvements in safety performance, for example, reducing the incidence of vehicle operators driving over the speed limit. Research shows decreases in crash rates, up to 90% and decreased injury rates. Results of the use of these devices are significant and sustainable. Other available technology and devices that may enhance safety are backing cameras that allow the driver to see behind the ambulance; power lift stretchers; event video cameras that record accidents; global positioning systems with weather reporting capability; and speed governors.

## ASSOCIATION POSITION

The Air & Surface Transport Nurses Association believes transport crew protection in survivable crashes would be maximized if:

1 All air medical programs or operators install or configure ALL aircraft that have this type of seating available with crash attenuating seats and single-point release safety restraints that meet current FAR standards. As transport programs reconfigure and refurbish interiors of existing aircraft; available data should be reviewed and requests

made of either the vendor or the manufacturer for installation of this equipment to meet FAR standards.

2 When possible, crash resistant fuel systems should be installed in all helicopters utilized in the air medical industry.

3 Programs require vehicle interiors be designed with a "clear" head-strike envelope for each occupant.

4 Programs choose the smallest ground critical care ambulance to accommodate the program's mission; locate crewmembers seats so as able to permit rendering of care from a seat belted position; use automobile-grade padding on corners and edges, and have lap belts positioned at the pelvic level.

5 All programs (ground or air) make use as much as possible of currently available monitoring, performance, feedback and crash analysis technology as well as other devices that promote safety.

6. Vehicles (both air and ground) should be configured using the recommendations of all resources, including but not limited to the FAA, NAEMSPA, Department of Transportation and other bodies that can offer input to design a vehicle that is as crashworthy and as safe as possible.

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## MAXIMIZING TRANSPORT NURSE FAMILIARITY WITH VEHICLE/AIRCRAFT SPECIFIC EMERGENCY PROCEDURES AND EQUIPMENT

## BACKGROUND

Safety training pertaining to emergency procedures and equipment that is provided to transport medical team members is often specific to a particular vehicle or aircraft. However, due to vehicle and aircraft availability, contractual agreements with vendors, and costs associated with maintaining backup vehicles and/or aircraft, the backup vehicles and/or aircraft are often not the same type and/or model that are utilized by the organization as their main mode of transport.

The introduction of an unfamiliar vehicle or aircraft, even if utilized only for a short period of time, may significantly diminish the performance of team members in the event of an emergency situation. Team members with exceptional performance of emergency procedures in the program's primary vehicle(s) or aircraft are likely to have more difficulty accomplishing those same procedures in an unfamiliar vehicle or aircraft. The Commission on Accreditation of Medical Transports Systems (CAMTS) standards for accreditation requires initial and annual education about safety measures and emergency procedures for each aircraft and ambulance used by a program, including "…specific training for backup or occasionally-used aircraft and ambulances". [1]

The ability to function appropriately in an emergency situation is often dependent on repetitive training and complete familiarity with equipment and procedures. Day-to-day safety practices are often a function of habit – continually doing certain things in a certain way until the response is automatic, rather than requiring analysis in the midst of an emergency. During periods when an unfamiliar backup vehicle or aircraft is used, consideration should be given to allowing team members adequate time to orient to the unfamiliar vehicle or aircraft. Differences in emergency equipment and procedures regarding either the backup vehicle or aircraft should be identified and practiced.

## ASSOCIATION POSITION

The Air & Surface Transport Association believes transport nurse safety would be enhanced if:

1 Transport programs attempt to develop contractual provisions that ensure the availability of backup vehicles and/or aircraft of the same type and model as the primary vehicles and/or aircraft. When this is not possible, reasonable measures should be taken to obtain a vehicle and/or aircraft as similar as possible to the primary vehicle and/or aircraft.

2 Emphasis is placed on providing time for adequate familiarization with the backup vehicles and/or aircraft. Training in safety and emergency procedures should be provided, and allowances made for practicing those procedures and working with the unfamiliar

equipment. In addition, programs establish written policies and procedures that address provisions for ensuring the safety of transport team members in emergency situations when the backup vehicles and/or aircraft is a different type or model than the primary vehicles and/or aircraft.

References:

1. Commission on Accreditation of Medical Transport Systems. (Jan, 2011). Accreditation Standards of the Commission on Accreditation of Medical Transport Systems 8th Ed., Anderson, SC., Commission on Accreditation of Medical Transport Systems.

## PATIENT RESTRAINT

### BACKGROUND

Combative and potentially-combative patients pose a significant threat to the safe completion of each medical transport mission. These include patients with head injuries, intoxication from alcohol and/or drugs, psychiatric disturbances, potential for seizure activity, and any patient with the potential for cerebral hypoxia. From the history, physical exam, and diagnostic tests performed, appropriate medical treatment should be initiated prior to the application of restraints and/or initiation of transport.

Physical restraints such as "hard" and "soft" limb restraints and stretcher belts/straps cannot always guarantee adequate immobilization in the extremely combative patient. Pharmacological restraints such sedatives, hypnotics and neuromuscular blocking drugs can help ensure immobilization in adequate dosages. These agents require that the patient be monitored, have a definitive airway, and be well oxygenated. [1]

### ASSOCIATION POSITION

The transport of prisoners or patients who are under arrest may require accompaniment by a correctional officer or some type of law enforcement personnel. Such accompanying personnel will often be carrying a firearm or other weapon, which presents additional risk to the crew and passengers should the patient/prisoner break free from restraints, or should an aviation-related hard landing or vehicle crash, etc. occur. Further, the placement of handcuffs or other restraints may interfere with common transport monitoring techniques, placement of intravenous lines, etc.

The Air & Surface Transport Nurses Association believes safe transport of combative or potentially-combative patients would be improved if:

1 The transport nurse assumes the responsibility to carefully evaluate each patient for potential combativeness prior to transport.

2 Each program, under direction of the medical director(s), develops written protocols for the transport of patients deemed potentially combative.

3 Options for monitoring and patient care procedures while maintaining adequate patient restraint are identified, as well as the procedure to be followed should it be determined that the patient cannot be transported safely either by ground or air.

4 Each program has a formal policy regarding the transport of prisoners (including patient restraint techniques, provisions for weapon searches by law enforcement personnel, transport of accompanying prison "guards" including proper securing of their weapons/firearms, etc.).

References:

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## TRANSPORT NURSE REFUSAL TO PARTICIPATE IN A TRANSPORT AS A RESULT OF SAFETY CONCERN

## BACKGROUND

Federal Aviation Regulations (FAR), Part 91.5, mandate that the pilot in command (PIC) has "….full responsibility and authority for aircraft operations, of which safety is intrinsic…".[1] Unquestionably, the PIC has the final responsibility for the safe operation of the aircraft. This responsibility includes complete authority to refuse or cancel a transport based upon weather conditions or upon any other factor that, in the judgment of the pilot, would adversely affect the safe operation of the aircraft.

The Air & Surface Transport Nurses Association (ASTNA) supports the pilot's authority, without exception, in this regard. Further, the Association's Practice Standards for Flight Nursing, *Aircraft Safety Standards for Nursing, Comprehensive Standard IV* states: "…the flight nurse will make no attempt to influence the pilot's decision to accept or turn down a transport request." [2]

Likewise, a ground transport crew may have concerns about the driver related to, for example, his/her fatigue level or the proper functioning of a ground unit. Concerns may also include serious weather conditions such as precipitation, snow/ice, road conditions, high winds, tornadoes, etc.

The Air & Surface Transport Nurses Association maintains that, in addition to the pilot/driver, each and every transport crew member has not only the right, but also the responsibility to refuse to participate in a transport when there is a legitimate safety concern.

The transport nurse, when voicing concerns for his/her own safety, as well as that of the patient(s) and other crew members, should be protected by written policy of the program so that refusal to participate in and/or complete a transport does not lead to disciplinary or other negative action being taken against the nurse. The policy, "It takes a 'yes' from all crew members to accept and/or continue a transport, but a 'no' from only one crew member to turn down or abort a transport " should apply in every situation. The most recent safety survey conducted among members of ASTNA (2007) showed that only 52% of respondents' programs had a written policy to allow for the nurse to refuse participation in, and/or continued participation in a transport as a result of concern for personal safety. This same survey identified that only 63% of respondents had seen such refusal(s) actually practiced within their individual programs. [3] A general feeling often expressed among nurses informally is that their jobs would indeed be jeopardized should they ever turn down or abort a transport. Competitive practices and "political" rivalries create an atmosphere of pressure on each team member to take risks in accepting and/or continuing transports that would otherwise not be taken.

## ASSOCIATION POSITION

Although the final responsibility for accepting or refusing a transport rests exclusively with the pilot/driver, each transport crew member has a responsibility to ensure his/her own safety. In particular, the transport nurse has the added responsibility to ensure the patient's safety since the patient has an altered ability to meet that need. Without exception, when the transport nurse has a legitimate concern for his/her safety, or that of the patient and/or other crew members, the nurse has the responsibility to voice those concerns and to refuse participation in the transport prior to its initiation, or to refuse continued participation in a transport in progress.

The Air & Surface Transport Nurses Association believes personal safety for each transport nurse would be enhanced if:

1 All medical transport programs refuse to participate in or condone practices of competing in any manner for missions that are turned down by other local teams for reasons of safety, weather, etc. Never should such competition be encouraged or allowed, between team members themselves, or between administrative persons, operators, mechanics, or other personnel. All pertinent safety related information related to why the team declined the mission (i.e. weather, potential hazards etc.) should be identified and shared between programs in the same locale.

2 Each transport program establishes a written policy acknowledging the responsibility of each team member to refuse participation in, or continued participation in any transport as a result of concern for personal, patient, and/or co-worker safety.

3 Each program's written policy defines the acceptable reason(s) for refusal to participate in a transport.

4 The written policy includes a mechanism for appropriate documentation of the concern/event and timely review of such by program administration and/or safety personnel. The outcome of such review should include an action plan for continued quality improvement monitoring and/or tracking.

References:


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2. National Flight Nurses Association (1986). Aircraft safety standards for flight nurses. In Practice Standard for Flight Nursing. *(Comprehensive Standard IV: Crew Safety)*, Chicago, IL, National Flight Nurses Association.

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## SAFETY CONSIDERATIONS SPECIFIC TO GROUND CRITICAL CARE

## BACKGROUND

Ground critical care nursing is a unique practice, distinct from EMS, in its knowledge base, staffing, medical equipment, and typically functioning in larger ambulances. Accordingly, it brings with it the risks known to EMS as well as additional threats to safety by nature of critical care.

An 11-year study of fatal ambulance crashes showed that 82% of fatally injured EMS rear occupants were unrestrained. [1] Transport nurses must be belted and stay belted, not only to protect themselves, but unsecured occupants in the patient compartment can injure other occupants and/or the patient. Unsecured equipment has also been shown to be a major cause of death in EMS fatalities. [2] By virtue of having more and often heavier equipment, critical care ground transport nurses are at higher risk.

Another well documented source of increased risk to crash is the use of lights and sirens with 60% of crashes and 58% of fatalities occurring during emergency use. [3] Yet the use of lights and sirens may not save a significant amount of time. [4] Transport nurses must consider carefully if minutes will make a difference in the outcome of their patient and weigh the risk of putting the patient, driver and team's lives at greater risk.

Sled tests of patients on stretchers positioned the length of the ambulance with the head toward the cab demonstrate that shoulder straps, and, when clinically appropriate, elevation of the head, help keep the patient from being ejected from the stretcher and as well support the back. [5]

Drivers are the first line in defense against accidents. With few national standards, it is up to the program to set policies which promote the optimal practices in hiring, education and management of their drivers. Aspects to consider are: minimum age; pre-employment and annual drivers' history; orientation to the critical care environment and equipment; driver duty time, to include a maximum of 10 hours driving within a 24-hour period; mandatory rest time for drivers prior to reporting to work; Emergency Vehicle Operations-type course; non-emergent driving course; and application of the Occupational Safety and Health Administration (OSHA), National Highway Transportation Safety Administration (NHTSA) and Network of Employees for Traffic Safety (NETS) Guidelines for Employers to Reduce Motor Vehicle Crashes document.[6, 7] Programs may also take advantage of the American National Standards Institute/American Society of Safety Engineers ANSI/ASSE Z15.1-2006 motor vehicle operations standard which provides an effective risk management program for motor vehicle operations. Its key components include: management, leadership and administration; operational environment; driver considerations; vehicle considerations; and incident reporting and analysis.[8]

Ground critical care is often sought for acutely ill, bariatric patients because their weight precludes rotor wing or fixed wing transport. Pressure may be experienced to transport these patients with comments such as "you're the only ones who can move this patient". However, without proper equipment to accommodate the morbidly obese patient, an accident can compromise the patient and team's safety if the patient is not adequately secured to the stretcher, compounding injuries to the patient and/or the team.

## ASSOCIATION POSITION

The Air & Surface Transport Nurses Association believes safety would be enhanced if each ground transport medical transport program has:

1 Operational policies addressing the wearing of seat belts at all times; reporting of crashes to CONCERN and NHTSA's Fatality Analysis Reporting System; avoidance of lights and sirens (when possible); accident/incident plans and drills; and loading training with specified roles.

2 A thorough orientation for drivers to the ground vehicles operated by the program; limited driving time to no more than 10 hours per day and restricted from performing work prior to coming on duty as a driver for the program.

3 Mechanisms to ensure securing of all medical equipment, gas tanks, supply packs, and needle boxes inside the patient compartment.

4 Policies, training and management of drivers and vehicles that promote safety.

5 Adequate stretcher bases to support both the patient and medical equipment; hydraulic assists and loading ramps are encouraged. The transport of morbidly obese patients will be undertaken with stretchers designed and tested to accommodate them, for example, bariatric stretchers; and loading mechanisms or loading systems are available that can also support the weight of the morbidly obese patient.

References:

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## TRAINING IN SURVIVAL TECHNIQUES AND EMERGENCY EQUIPMENT AND PROCEDURES

## BACKGROUND

The operation and mission profile of an EMS or medical transport program differs significantly from that of a commercial or private aviation program. Helicopter operations are often required to land at emergency landing sites. In addition, many air medical programs are single pilot operations. Therefore, the nurses must be familiar with proper aircraft position reporting procedures, aircraft radio operations, and visual techniques for monitoring the outside environment for potential hazards. To allow for maximum relay of information between the pilot(s) and other crew members, intercom communication should be maintained as much as possible.

In the critical care ground transport environment, transport nurses must be aware of the hazards that are unique to their environment. The hazards are those inherent to any type of ground travel such as traffic, road conditions, distance, etc. The ground transport nurse must know how to react to, and protect themselves against, hazards that may be encountered in this environment.

In the event of an unscheduled landing or crash, the nurse or other team member may be required to carry out emergency shut-down procedures, ascertain Emergency Locator Transmitter (ELT) activation, and operate aircraft/vehicle radios. Emergency evacuation/egress and shutdown procedures differ among programs according to the various aircraft/vehicles utilized, as do the specific survival situations that may be encountered in varying geographic locale.

Experience has shown that items most likely to be available for team members' use are those within arm's reach. Basic survival equipment generally consists of those things most essential for obtaining rescue, extricating oneself from the aircraft/vehicle and enhancing chances of survival, (i.e. signaling mirror, whistle, utility knife or multi-use tool, compact space blanket or other protective covering, and fire starting supplies). [1] These items can be packaged in a small, "fanny pack" container so as not to take up valuable space within the aircraft/ambulance cabin.

## ASSOCIATION POSITION

Frequently provided training/review of procedures and skills to be utilized in the case of a crash or other emergency incidents can have a significant positive effect on the confidence of medical transport crew members. When crew members feel prepared and practiced about what to do when an emergency occurs, they are much more likely to remain calm and able to react appropriately in these situations. [2]

The Air & Surface Transport Nurses Association believes transport nurse safety, and/or positive outcome in the event of an incident or survivable crash, will be enhanced if:

1 Training in the location and operation of fuel shut-off switches, battery switches, the Emergency Locator Transmitter (ELT), and the use of aircraft/vehicle radios is provided initially and on an annual basis, or more frequently as necessary.

2 Training in basic survival techniques, with regard to the particular terrain, weather, altitude, and other parameters potentially encountered by those team members in the event of an incident is provided initially and on an annual basis, or more frequently as necessary.

3 Each crew member has immediate and easy access (within the aircraft/vehicle cabin area) to basic survival equipment.

4 Training deficits and/or survival education needs, as well as any safety issues identified through the quality improvement process, are handled within a timely manner, and not delayed until the annual training time.

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## CREATING HEALTHY WORK ENVIRONMENTS DESIGNED TO PROMOTE AND SUSTAIN THE TRANSPORT NURSE'S WELL-BEING

## BACKGROUND

"Today there is a global health workforce crisis – one marked by critical imbalances….The reasons for the crisis are varied and complex, but key among them are unhealthy work environments and the poor organizational climate that characterize many workplaces"[1]. The importance of healthy work environments (HWE) is now recognized as an international issue affecting millions of nurses worldwide.

> "There is mounting evidence that unhealthy work environments contribute to medical errors, ineffective delivery of care, and conflict and stress among health professionals. Negative, demoralizing and unsafe conditions in workplaces cannot be allowed to continue. The creation of healthy work environments is imperative to ensure patient safety, enhance staff recruitment and retention, and maintain an organization's financial viability."[2]

The concept of HWE goes well beyond traditional wellness programs, CISM and employee assistance programs, although these certainly remain a vital part of employee wellness and should be recognized as part of a HWE. Communication, collaboration, effective decision making, leadership, safe staffing, recognition and an environment that addresses occupational hazards.[1,2,3] These key concepts commonly found in HWE are echoed throughout this position paper and are essential for safety in the transport environment.

Exposure to critical incidents occurs commonly among transport nurses and other EMS personnel. A critical incident is defined as any event which has a stressful impact powerful enough to overwhelm an individual's usual coping skills. It can be any unexpected, out of the ordinary, or highly emotionally distressing event. Although it is quite normal for persons to experience emotional aftershocks when they have been involved with and/or witnessed a particularly difficult event, left unaddressed, the resultant signs and symptoms of stress can affect the person's physical health, feelings, thoughts, and behaviors both professionally and personally. Critical incident stress management (CISM) and its components of per-incident education, peer support, defusing, and debriefings are rapidly becoming the standard of care in the emergency services. [4]

In October 2000, the Surface to Air Response Team (START) for CISM began as a nationwide response team dedicated to providing CISM education and interventions to those associated with specialized transport teams and airborne law enforcement. [5]

The not-for-profit team of volunteers is comprised of specially trained mental health professionals that have a background in transport, such as nurses, paramedics, airborne law enforcement officers, communication specialists and mechanics. CISM interventions have been adopted by the United Nations for use internationally.

## ASSOCIATION POSITION

The Air & Surface Transport Nurses Association believes safety would be enhanced through improved transport nurse performance and job satisfaction if each medical transport program develops:

1 A Healthy Work Environment

2 A formalized physical fitness program, which allows for personalized adjustments and consideration of specific individual needs, such as age, sex, etc.

3 A stress management program, including access to Employee Assistance Programs and appropriate leaves of absence when needed.

4 Critical Incident Stress Management (CISM) programs, both informal and formal. Peer support and debriefings on an informal basis could be utilized more frequently, in cases when a small number of team members are affected. Formal CISM should be utilized in cases when multiple team members and/or the surrounding community, other EMS providers, co-workers, etc. are all impacted by a major event. Formal CISM requires involvement of an outside group of trained professionals who are not members of the impacted groups.

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