POSITION PAPER

NATIONAL ASSOCIATION OF EMS PHYSICIANS

GUIDELINES FOR AIR MEDICAL DISPATCH

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INTRODUCTION

Air medical transport has become a well-established part of the emergency medical services (EMS) system. Through the use of aircraft, patients are moved swiftly and safely throughout the world. However, for a number of reasons, the use of air medical transport remains somewhat controversial. One reason for this controversy is that debate continues to surround appropriate utilization of air medical transport. Since the topics of triage to air transport were last addressed by the National Association of EMS Physicians' (NAEMSP's) Air Medical Task Force (hereafter abbreviated as "the Task Force"), there has been significant evolution of thought concerning appropriateness of air medical dispatch. Therefore, the goal of this position paper is to outline current recommendations guiding utilization of air medical transport.

This position statement builds on earlier work by the Task Force and replaces two previous position statements.[1,2] The first NAEMSP position statement on the subject was published in *Prehospital and Disaster Medicine* in January-March 1992 as a contribution of the 1992 Task Force.[1] The 1994 Task Force published a follow-up paper addressing non-trauma and pediatric considerations.[2] The current Task Force members gratefully acknowledge the work of the previous documents' authors: Drs. Nicholas Benson, Catherine Carruba, Dan Hankins, Richard Hunt, and David Wilcox. The current authors have also drawn upon the work of other organizations, including the Association of Air Medical Services (AAMS)[3] and the American Academy of Pediatrics (AAP),[4] which have produced similar documents.

This position statement has also been endorsed by the Air Medical Physician Association (AMPA), by approval of its Board of Directors.

DISCUSSION

Air medical transport has grown to the point where we commonly speak of people being "life-flighted." As of this writing, the AAMS, which represents the vast majority of U.S. air medical providers, reports 271 air medical program members, 193 of which have a helicopter EMS component.[5] The growth of air medical transport is, at least in part, due to a perception that provision of such a service results in benefits to the patients and/or regions where air transport exists. In some cases, the benefit results from the increased level of care provided by the air medical crew; these individuals are generally trained to a higher level of care than available ground EMS providers. In other cases, the putative explanation for improved outcome is the increment in speed afforded by the air transport vehicle. However, there is continued debate surrounding use of air transport.

One source of debate is cost. Economic analyses have suggested that helicopters are cost-effective,[6] and that utilization of helicopters is no more expensive than deployment of similarly configured ground ambulances with comparable staffing levels and response times.[7] However, acceptance of these premises is far from universal, and acquisition and maintenance of aircraft undoubtedly represent a significant expense in an era of limited health care dollars. Within this economic envelope, payers for health care including commercial insurance, managed care organizations, and public payers, including Medicare and Medicaid in the United States and government sup-

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TABLE 1. Questions That Can Assist in Determining Appropriate Transport Mode

- Does the patient's clinical condition require minimization of time spent out of the hospital environment during the transport?
- Does the patient require specific or time-sensitive evaluation or treatment that is not available at the referring facility?
- Is the patient located in an area that is inaccessible to ground transport?
- What are the current and predicted weather situations along the transport route?
- Is the weight of the patient (plus the weight of required equipment and transport personnel) within allowable ranges for air transport?
- For interhospital transports, is there a helipad and/or airport near the referring hospital?
- Does the patient require critical care life support (e.g., monitoring personnel, specific medications, specific equipment) during transport, which is not available with ground transport options?
- Would use of local ground transport leave the local area without adequate emergency medical services coverage?
- If local ground transport is not an option, can the needs of the patient (and the system) be met by an available regional ground critical care transport service (i.e., specialized surface transport systems operated by hospitals and/or air medical programs)?

ported programs in the world, recognize the medical utility of air transport for selected patients.

Safety is also a consideration in the debate about utilization of air medical transport. Air ambulance crashes, although infrequent, are well publicized, and air transport programs must allocate both time and dollars in a continuing effort to maximize safety.

Another source of debate is the relatively limited literature directly addressing outcomes benefit associated with air transport. At the time the original NAEMSP and AAMS documents were produced, there was very little research available on which the committees could base their recommendations. Although this situation has improved somewhat during the last decade, research regarding the appropriate deployment of complex medical care systems remains in its infancy. This document represents what we believe to be the current state of the art, based upon a sometimes subjective interpretation of the best available evidence.

Some caveats must be considered prior to outlining the Task Force's guidelines. These caveats, at least as important as are the actual guidelines, address some limitations inherent to the process of creating this position statement.

First, and foremost, the specific criteria and diagnoses listed in the guidelines are *not* intended to be a comprehensive listing, but rather an indication of the types of entities for which air medical response may be appropriate. As a related note, the guidelines are intended to assist prehospital provider decision making, rather than override judgment of those at the patient's side. In fact, many EMS systems have their own criteria for air medical dispatch. Such criteria (e.g., specific mechanism-of-injury triage tools) inevitably differ between regions based on demographic, geographic, and health care resource considerations. Furthermore, air medical dispatch rules continue to evolve with increasing regionalization of nontrauma care (e.g., for patients with acute coronary or neurological syndromes). The growing number of specialized ground critical care vehicles has also impacted indications for air medical dispatch, as some patient populations traditionally transported by air are good candidates for high-level-of-care ground transport. It is also reasonable to assume that the nationwide issue of emergency eepartment ground ambulance "diversion" could affect helicopter utilization patterns. In short, no group of practitioners or researchers can foresee every circumstance; good medical care requires that scientific principles be individualized for each patient and situation. As an aid to guiding individual patient triage decision making, the questions as outlined in Table 1 may be helpful.

Just as appropriateness of air medical dispatch can be judged only in light of a given patient's situation, regional and logistic considerations are also necessary. For example, a patient with an amputation of a dominant thumb may require helicopter or fixed-wing evacuation from an offshore island or remote wilderness area; conversely, a patient with severe vehicular trauma occurring within or near city limits may be best served by ground transport.[6]

Due to the fact that most literature addresses helicopter (rotor-wing) rather than airplane (fixed-wing) aircraft, this position statement concentrates on the former transport mode. However, general guidelines for fixed-wing transport are also provided. Additionally, as specialized (i.e., "critical care") ground transport continues to evolve, this modality will likely be used for some patients historically undergoing air transport.

It should be noted that, as applied to helicopter transport, these guidelines are for *response*, not necessarily *transport*. (In cases where fixed-wing transport is activated patients, will nearly always be transported unless there is a change in clinical status.) Even in the most conservative EMS system, there will be an occasional case where air transport is activated appropriately, but upon availability of further information it becomes clear that completion of the transport by air is not indicated. Examples of such cases include situations where patients at a trauma scene are re-evaluated and found to be either obviously uninjured or to have unsurvivable injuries (in these cases the air transport crew may best serve the

patient by assisting ground EMS during surface transport to the nearest facility or by following local protocols for patient death).

Ground EMS services, air medical services, hospitals, and third-party payers should understand that in order to make the air transport resource available to those who need it, a certain level of overtriage is unavoidable. Also, decision making about patient transport should take into account the capabilities of local and regional EMS and hospitals. Given the inherent uncertainty surrounding prehospital diagnosis and triage, an EMS system with zero air transport overtriage is almost certainly underutilizing its helicopter resource. On the other hand, while this position statement is intended to address air medical dispatch (as considered prospectively), it must be emphasized that an ongoing process of utilization review is critical to optimizing utilization of the air transport resource. Such utilization review can be focused upon both triage characteristics (e.g., mechanism of injury) and retrospective review of patient course at the receiving hospital (e.g., early discharge without diagnostic or therapeutic intervention).

Just as it is important to appropriately incorporate air transport into the scene *and* interfacility transport needs of a region, utilization review should be aimed at both mission types. As for interfacility transports, the historical prerogative of referring hospital treating physicians to determine transport mode is subject to increasing scrutiny. Because of understandable concerns about Consolidated Omnibus Reconciliation Act/Emergency Medical Treatment and Labor Act (COBRA/EMTALA)-related liability for intratransport deterioration, referring physicians may occasionally overtriage patients to helicopter transport. It is hoped that these guidelines may help frame the transport decision-making process in such fashion as to optimize transport mode appropriateness, maximize resource utilization, and serve as a foundation to support case-by-case triage decisions made by referring physicians.

The increasing complexity of transport decision making has emphasized the importance of air transport services' medical directors being available for real-time consultation as to transport mode. Research has shown that regions may benefit from detailed assessment of their specific geographic/logistical situations, with generation of maps serving as guides to assist in air vs. ground triage.[8]

Prior to creating this position paper, the literature concerning the transport of trauma and nontrauma patients was reviewed and summarized by a subcommittee of the NAEMSP Air Medical Services Task Force. The reader is referred to these annotated bibliographies, published previously in *Prehospital Emergency Care*,[9,10] for an overview of studies addressing air transport and patient outcomes. The literature reviews are not comprehensive, and the literature has continued to grow even in the short interval between researching of the bibliographies and publication of the reviews. For example, recent studies have reinforced arguments in favor of helicopter transport of blunt trauma patients[11,12] and strongly suggested outcomes benefit for interfacility air transport for a subset of patients with acute myocardial infarction.[13] Additionally, the Task Force recognizes that air transport modalities should play a cooperative role in systemwide responses to disasters and mass casualty incidents; the potential contributions of air transport services in these situations are not discussed in this paper since they have been outlined in *Prehospital Emergency Care*.[14]

In summary, the guidelines that follow are offered as a noncomprehensive overview of clinical and logistical situations in which air medical dispatch may be appropriate. The Task Force offers these guidelines as an aid to EMS systems' operational planning, with the earlier mentioned caveats—most importantly, that no set of guidelines should be interpreted as dogma and that the judgment of those at the patient's side should always count foremost in decision making.

Guidelines

1. General
   a. Patients requiring critical interventions should be provided those interventions in the most expeditious manner possible.
   b. Patients who are stable should be transported in a manner that best addresses the needs of the patient and the system.
   c. Patients with critical injuries or illnesses resulting in unstable vital signs require transport by the fastest available modality, and with a transport team that has the appropriate level of care capabilities, to a center capable of providing definitive care.
   d. Patients with critical injuries or illnesses should be transported by a team that can provide intratransport critical care services.
   e. Patients who require high-level care during transport, but do not have time-critical illness or injury, may be candidates for ground critical care transport (i.e., by a specialized ground critical care transport vehicle with level of care exceeding that of local EMS) if such service is available and logistically feasible.

2. Comparative considerations for air transport modes
   a. Rotor-wing
      i. Advantages
         (a) In general, decreased response time to the patient (up to approximately 100 miles distance depending on logistics such as duration of ground transfer leg)
         (b) Decreased out-of-hospital transport time
         (c) Availability of highly trained medical crews and specialized equipment

ii. Disadvantages
(a) Weather considerations (e.g., icing conditions, weather minimums)
(b) Limited availability as compared with ground EMS

b. Fixed-wing
i. Advantages
(a) In comparison with rotor-wing, decreased response time to patients when transport distances exceed approximately 100 miles
(b) In comparison with ground transport, decreased out-of-hospital transport time
(c) Availability of highly trained medical crews and specialized equipment
(d) In comparison with rotor-wing, less susceptibility to weather constraints
ii. Disadvantages
(a) Requires landing at airport, with two extra transport legs between airports and the patient origin and destination
(b) In comparison with ground transport, more subject to weather-related unavailability (e.g., icing, snow)
(c) Overall, less desirable as a transport mode for severely ill or injured patients (though extenuating circumstances may modify this relative contraindication to fixed-wing use)

3. Logistical issues that may prompt the need for air medical transport
a. Access and time/distance factors
i. Patients who are in topographically hard-to-reach areas may be best served by air transport.
(a) In some cases patients may be in terrain (e.g., mountainside) not easily accessible to surface transport.
(b) Other cases may involve the need for transfer of patients from island environs, for whom surface water transport is not appropriate.
ii. Patients in some areas (e.g., in the western United States) may be accessible to ground vehicles, but transport distances are sufficiently long that air transport (by rotor-wing or fixed-wing) is preferable.
b. Systems considerations
i. In some EMS regions, the air medical crew is the only rapidly available asset that can bring a high level of training to critically ill/injured patients. In these systems, there may be a lower threshold for air medical dispatch.
ii. Systems in which there is widespread advanced life support (ALS) coverage, but such coverage is sparse, may see an area left "uncovered" for extended periods if its sole ALS unit is occupied providing an extended transport. Air medical dispatch may be the best means to provide patient care and simultaneously avoid deprivation of a geographic region of timely ALS emergency response.
iii. Disaster and mass casualty incidents offer important opportunities for air medical participation. These roles, too complex for detailed discussion here, are outlined elsewhere.[11]

4. Clinical situations for **scene** triage to air transport (also known as "primary" air transport) are outlined below. In some cases (e.g., flail chest), the diagnosis can be clearly established in the prehospital setting; in other cases (e.g., cardiac injury suggested by mechanism of injury and/or cardiac monitoring findings), prehospital care providers must use judgment and act on suspicion. Absent unusual logistical considerations as an overriding factor, scene air response involves rotor-wing vehicles rather than airplanes. As a general rule, air transport scene response should be considered more likely to be indicated when use of this modality, as compared with ground transport, results in more rapid arrival of the patient to an appropriate receiving center or when helicopter crews provide rapid access to advanced level of care (e.g., when a ground basic life support team encounters a multiple trauma patient requiring airway intervention).
a. **Trauma**: Scene response to injured patients probably represents the mode of helicopter utilization with the best supporting evidence.
i. General and mechanism considerations
(a) Trauma Score <12
(b) Unstable vital signs (e.g., hypotension or tachypnea)
(c) Significant trauma in patients <12 years old, >55 years old, or pregnant patients
(d) Multisystem injuries (e.g., long-bone fractures in different extremities; injury to more than two body regions)
(e) Ejection from vehicle
(f) Pedestrian or cyclist struck by motor vehicle
(g) Death in same passenger compartment as patient
(h) Ground provider perception of significant damage to patient's passenger compartment
(i) Penetrating trauma to the abdomen, pelvis, chest, neck, or head
(j) Crush injury to the abdomen, chest, or head
(k) Fall from significant height
ii. Neurologic considerations
(a) Glasgow Coma Scale score <10
(b) Deteriorating mental status
(c) Skull fracture
(d) Neurologic presentation suggestive of spinal cord injury
iii. Thoracic considerations
(a) Major chest wall injury (e.g., flail chest)
(b) Pneumothorax/hemothorax
(c) Suspected cardiac injury
iv. Abdominal/pelvic considerations
(a) Significant abdominal pain after blunt trauma
(b) Presence of a "seatbelt" sign or other abdominal wall contusion

(c) Obvious rib fracture below the nipple line
(d) Major pelvic fracture (e.g., unstable pelvic ring disruption, open pelvic fracture, or pelvic fracture with hypotension)

v. Orthopedic/extremity considerations
(a) Partial or total amputation of a limb (exclusive of digits)
(b) Finger/thumb amputation when emergent surgical evaluation (i.e., for replantation consideration) is indicated and rapid surface transport is not available
(c) Fracture or dislocation with vascular compromise
(d) Extremity ischemia
(e) Open long-bone fractures
(f) Two or more long-bone fractures

vi. Major burns
(a) >20% body surface area
(b) Involvement of face, head, hands, feet, or genitalia
(c) Inhalational injury
(d) Electrical or chemical burns
(e) Burns with associated injuries

vii. Patients with near drowning injuries

b. **Nontrauma**: At this time the literature support for primary air transport of noninjured patients is limited to logistical considerations. It is conceivable that clinical indications for scene air response may be identified in the future. However, at this time prehospital providers should incorporate logistical considerations, clinical judgment, and medical oversight in determining whether primary air transport is appropriate for patients with nontrauma diagnoses.

5. Clinical situations for air transport in **interfacility** transfers are best summarized as being present when: 1) patients have diagnostic and/or therapeutic needs which cannot be met at the referring hospital, and 2) factors such as time, distance, and/or intratransport level of care requirements render ground transport nonfeasible.

a. **Trauma**: Injured patients constitute the diagnostic group for which there is best evidence to support outcome improvements from air transport.
i. Depending on local hospital capabilities and regional practices, any diagnostic consideration (suspected, or confirmed as with referring hospital radiography) listed above under "scene" guidelines may be sufficient indication for air transport from a community hospital to a regional trauma center.
ii. Additionally, air transport (short- or long-distance) may be appropriate when initial evaluation at the community hospital reveals injuries (e.g., intra-abdominal hemorrhage on abdominal computed tomography) or potential injuries (e.g., aortic trauma suggested by widened mediastinum on chest x-ray; spinal column injury with potential for spinal cord involvement) requiring further evaluation and management beyond the capabilities of the referring hospital.

b. **Cardiac**: Due to regionalization of cardiac care and the time-criticality of the disease process, patients with cardiac diagnoses often undergo interfacility air transport. Patients with the following cardiac conditions may be candidates for air transport:
i. Acute coronary syndromes with time-critical need for urgent interventional therapy (e.g., cardiac catheterization, intra-aortic balloon pump placement, emergent cardiac surgery) unavailable at the referring center
ii. Cardiogenic shock (especially in presence of, or need for, ventricular assist devices or intra-aortic balloon pumps)
iii. Cardiac tamponade with impending hemodynamic compromise
iv. Mechanical cardiac disease (e.g., acute cardiac rupture, decompensating valvular heart disease)

c. **Critically ill medical or surgical patients**: These patients generally require a high level of care during transport, may benefit from minimization of out-of-hospital transport time, and may also have time-critical need for diagnostic or therapeutic intervention at the receiving facility. Ground critical care transport is frequently a viable transfer option for these patients, but air transport may be considered in circumstances such as the following examples:
i. Pretransport cardiac/respiratory arrest
ii. Requirement for continuous intravenous vasoactive medications or mechanical ventricular assist to maintain stable cardiac output
iii. Risk for airway deterioration (e.g., angioedema, epiglottitis)
iv. Acute pulmonary failure and/or requirement for sophisticated pulmonary intensive care (e.g., inverse-ratio ventilation) during transport
v. Severe poisoning or overdose requiring specialized toxicology services
vi. Urgent need for hyperbaric oxygen therapy (e.g., vascular gas embolism, necrotizing infectious process, carbon monoxide toxicity)
vii. Requirement for emergent dialysis
viii. Gastrointestinal hemorrhages with hemodynamic compromise
ix. Surgical emergencies such as fasciitis, aortic dissection or aneurysm, or extremity ischemia
x. Pediatric patients for whom referring facilities cannot provide required evaluation and/or therapy

d. **Obstetric**: In gravid patients, air transport's advantage of minimized out-of-hospital time must be balanced against the risks inherent to intratransport delivery. If transport is necessary in a patient in whom delivery is thought to be imminent, then a ground vehicle is usually appropriate, although in some cases

the combination of clinical status and logistics (*e.g.* long driving times) may favor use of an air ambulance. Air transport may be considered if ground transport is logistically not feasible and/or there are circumstances, such as the following:

i. Reasonable expectation that delivery of infant(s) may require obstetric or neonatal care beyond the capabilities of the referring hospital
ii. Active premature labor when estimated gestational age is <34 weeks or estimated fetal weight <2,000 grams
iii. Severe pre-eclampsia or eclampsia
iv. Third-trimester hemorrhage
v. Fetal hydrops
vi. Maternal medical conditions (e.g., heart disease, drug overdose, metabolic disturbances) exist that may cause premature birth
vii. Severe predicted fetal heart disease
viii. Acute abdominal emergencies (i.e., likely to require surgery) when estimated gestational age is <34 weeks or estimated fetal weight <2,000 grams

e. **Neurological**: In addition to those with need for specialized neurosurgical services, this category is being expanded to include patients requiring transfer to specialized stroke centers. Examples of neurological conditions where air transport may be appropriate include:
   i. Central nervous system hemorrhage
   ii. Spinal cord compression by mass lesion
   iii. Evolving ischemic stroke (i.e., potential candidate for lytic therapy)
   iv. Status epilepticus
f. **Neonatal**: Regionalization of neonatal intensive care has prompted the development of specialized (air and/or ground) services focusing on transport for this population. Given the fact that, in neonates, rapid transport is often less of a priority than (time-consuming) stabilization at referring institutions, some systems have found that the best means for incorporating air vehicles into neonatal transport is to use them to rapidly get a stabilization/transport team to the patient; the actual patient transport is then performed by a ground vehicle. In some systems, patients are transported (usually with a specialized neonatal team) by air when the ground transport out-of-hospital time exceeds 30 minutes. Examples of instances where air medical dispatch may be appropriate for neonates include:
   i. Gestational age <30 weeks, body weight <2,000 grams, or complicated neonatal course (e.g., perinatal cardiac/respiratory arrest, hemo-dyamic instability, sepsis, meningitis, metabolic derange-ment, temperature instability)
   ii. Requirement for supplemental oxygen exceeding 60%, continuous positive airway pressure (CPAP), or mechanical ventilation
   iii. Extrapulmonary air leak, interstitial emphysema, or pneumothorax
   iv. Medical emergencies such as seizure activity, congestive heart failure, or disseminated intravascular coagulation
   v. Surgical emergencies such as diaphragmatic hernia, necrotizing enterocolitis, abdominal wall defects, intussusception, suspected volvulus, or congenital heart defects
g. **Other**: Air medical dispatch may also be appropriate in miscellaneous situations such as the following:
   i. Transplant
      (a) Patient has met criteria for brain death and air transport is necessary for organ salvage
      (b) Organ and/or organ recipient requires air transport to the transplant center in order to maintain viability of time-critical transplant
   ii. Search-and-rescue operations are generally outside the purview of air medical transport services, but in some instances helicopter EMS may participate in such operations. Since most search-and-rescue services have limited medical care capabilities, and since most air medical programs have similarly limited search-and-rescue training, cooperative effort is necessary for optimizing patient location, extrication, stabilization, and transport.
   iii. Patients known to be in cardiac arrest are rarely candidates for air medical transport.
      (a) A previous NAEMSP position paper[15] has addressed situations in which resuscitation efforts should be ceased in the field for adult nontraumatic cardiac arrest victims. In such cases air transport should not be considered an alternative to discontinuing (futile) efforts at resuscitation.
      (b) In situations where patients are in cardiac arrest and do not meet local criteria for cessation of resuscitative efforts, or in jurisdictions in which prehospital providers cannot cease such efforts, air transport is an option only in very rare cases (e.g., pediatric cold-water drowning where helicopter transport to a cardiac-bypass center is considered).

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Erratum

The National Association of EMS Physicians apologizes for the error that occurred in the order of authors for abstract 44 (poster session) on page 175 of the January–March 2003 issue of *Prehospital Emergency Care*. The correct title and authors are as follows: An Experimental Model of Heat Storage in Working Firefighters **Carin M. Van Gelder, MD, L. Alex Pranger, MEng, William P. Weismann, MD, Sandy Bogucki, MD, PhD,** *Yale University and The BioStar Group, New Haven, Connecticut, and Germantown, Maryland*.