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Appropriate and Safe Utilization of Helicopter Emergency Medical Services

Joint Policy Resource and Education Paper (PREP) of the Air Medical Physician Association (AMPA), the American College of Emergency Physicians (ACEP), the National Association of EMS Physicians (NAEMSP), and the American Academy of Emergency Medicine (AAEM)

This policy resource and education paper (PREP) is an explication of the policy statement "Appropriate and Safe Utilization of Helicopter Emergency Medical Services"

Introduction

Medical helicopters are instruments of time. They can equalize distance for patients with time-sensitive disease who are remote from definitive care, giving an opportunity for optimal outcome that is equal to those who are nearby. Helicopter emergency medical services (HEMS) can also bring life-saving medical care to patients, potentially sooner than they can reach appropriate care facilities, via transport medicine professionals that are specially trained, equipped, and skilled.

Helicopters were first widely used for patient transport during the Korean War. Patients were secured to stretchers on the outside of the helicopter and no care was provided during transport. Lives were saved. (1) There was no debate about effectiveness. Vietnam saw the use of larger aircraft, sometimes with the provision of "medic level" care during transport. More lives were saved. (2) Again, there was no debate about effectiveness.

The 1966 National Research Council white paper *Accidental Death and Disability* drew attention to the epidemic of injury-related death in the United States. (3) The late 1960s and early 1970s saw the first attempts to apply the lessons learned from combat casualty care to injured civilians in the United States. (2,4) The concept of trauma centers began, and early domestic HEMS focused on trauma response. (5-12) The utility of air medical transport soon became apparent for other time-critical illnesses. (13-22) More recent studies have further identified survival benefit from HEMS transport. (23-31)

The purpose of this manuscript is to highlight the purpose of HEMS, provide guidance regarding the appropriate and safe use of HEMS resources, and identify gaps in the approach to HEMS utilization. This paper supports the position statement *Appropriate and Safe Utilization of Helicopter Emergency Medical Services* issued jointly by the Air Medical Physician Association, the American College of Emergency Physicians, the National Association of EMS Physicians, and the American Academy of Emergency Medicine.

Patient Benefit from Appropriate Use of HEMS

Lives can be saved when early treatment is provided to patients with time-sensitive illness or injury. HEMS manipulates time: the time to reach definitive care, the time to receive critical interventions, and the time to match a complex patient being moved to a higher level of care with a transport medicine crew that is skilled in maintaining advanced care and anticipating complications. Medical helicopters are unlikely to provide benefit if they are used for situations that are not time-sensitive. (32)

Research regarding the effectiveness of HEMS is challenging. No randomized controlled comparisons of helicopter versus ground EMS transport have been published. It would be ethically challenging to randomize patients with known time-sensitive diseases, such as traumatic hemorrhage or ST-elevation myocardial infarction, to a study arm that would delay corrective intervention. Some studies have compared patients transported by helicopter with those transported by ground and concluded that "no difference" in survival indicated "no benefit" from air transport. (33,34) However, patients more distant from definitive care achieving the same survival as those nearby may well indicate successful HEMS utilization.

Medical helicopters are difficult to study because they do not constitute an actual treatment. Most studies have attempted to measure the effect of HEMS as a "treatment" instead of evaluating the effectiveness of its application as a "time instrument" to time-sensitive disease. Nonetheless, many studies have demonstrated patient benefit. Few, though, have weighed the degree to which time is affected in the delivery of salvaging care.

Some patients with unstable physiology or obvious anatomic injuries are clearly candidates for an increased likelihood of survival with early intervention. The analysis of HEMS for these patients should focus on whether time is manipulated effectively to their benefit.

From this perspective, analysis of HEMS should examine the utility of interventions provided to patients at the scene (or sending hospital) and during transport, as well as the effects of reaching corrective care sooner than they could have without the use of HEMS. Other patients are candidates for air transport, but their degree of time sensitivity is less obvious; more research is needed in this group. A prime example is trauma patients who have sustained a significant transfer of energy but do not have obvious major injury. These patients have a time- sensitive need for a skilled trauma evaluation and are at risk for life-threatening injury.

Transport to a non-trauma facility might delay diagnosis and thus increase the risk of death, yet many of these patients are ultimately found to have no serious injury. Further research is required to better identify which patients have occult injury and to guide the role of HEMS in providing access to timely evaluation.

Prior Published HEMS Utilization Guidance

The currency of effectiveness for medical helicopters is time savings: reducing the time necessary to bring specialized care to the patient or to bring the patient to appropriate care, or both. The Association of Air Medical Services first published guidelines on HEMS utilization in 1990. (35) This document identified many specific medical conditions as being time-sensitive, but it did not provide guidance with regard to the amount of time savings necessary for HEMS to be effective. In 1992 the NAEMSP published air medical dispatch guidelines which were revised and re-published in 2002. (36,37) These guidelines identified various time-sensitive conditions that were potentially appropriate for HEMS, but did not specify any approaches to time-savings. In a like fashion, guidance issued by AMPA and ACEP have addressed appropriate medical conditions for HEMS but do not provide direction with regard to time. (38,39)

HEMS Utilization Guidelines Must Be Developed and Followed

Helicopters must shorten the time to delivery of care in order to provide patient benefit.

If used for patients without time-sensitive conditions, the added financial cost and increased transport risk yield no medical benefit. Opportunity for good outcome may be lost if air transport is not considered for patients with appropriate indications. Guidelines must be implemented to identify patients whose conditions and locations make them most likely to benefit from HEMS. These guidelines must address the issue of targeted time savings in order for HEMS to be effective. These targets will vary according to local resources and whether the need is to bring advanced care to the patient more quickly, move the patient to appropriate care more quickly, or both.

Many EMS and regional health care systems have issued guidance as to what medical criteria should prompt transport to a trauma center, stroke center, or cardiac center, but few have undertaken the challenge of directing the mode of transport. In far too many jurisdictions in the United States, ground EMS providers have no specific guidelines for when to request the HEMS programs that operate in their area. Even fewer HEMS utilization guidelines have been established for use by referring physicians in community hospitals. Potential requestors of medical evacuation services must be supported with guidelines to assist them in determining which patients are likely to benefit from HEMS transport. The structure for decision-making must be more than simply the opinion of an individual physician or EMS provider. HEMS utilization may be an infrequent event for an individual caregiver and without guidance, it is possible for a well-intentioned transport request to result in little or no time savings or clinical benefit to the patient.

Distinction Between the Need to Fly and the Safety of Flight

The aviation and medical components of helicopter transport are naturally intertwined, yet the decision to use HEMS for medical reasons must be kept separate from the aviation decision whether or not a patient transport can be completed safely. Air medical operators must use a safety management system (SMS) that shields the assessment of flight risk from knowledge of patient type or acuity. The Federal Aviation Administration defines an SMS as the formal, top-down business approach to managing safety risk, which includes the necessary organizational structures, accountabilities, policies, and procedures. (40) An SMS goes beyond the technical and human factors of safety and incorporates the safety culture of an organization. An effective SMS shields pilots and crew members from inappropriate pressure to fly.

HEMS Integration

The Institute of Medicine report *Emergency Medical Services at the Crossroads* states that, "...to function effectively, [all of] the components of the emergency and trauma care system must be highly integrated."(41) Integration "means that all of the key players in a given region...must work together to make decisions, deploy resources, and monitor and adjust system operations based on performance feedback." For HEMS to be most effective, they must be integrated within a regional EMS and healthcare delivery system and willing to work collaboratively with all other elements of the system for the overall benefit of the system and the patient population. Although EMS systems have progressively implemented the concepts of system integration in many areas, this has not been necessarily true with regard to HEMS.(42) An analysis of the geographic distribution of HEMS programs in the United States demonstrates a significant lack of access in some areas and what could be characterized as overabundance in others.(43,44) Between 2004 and 2011, the fleet of civilian rotor wing air medical aircraft in the United States increased from 637 to 909, for an increase of 43%.(45) Some argue that increased competition between adjoining HEMS programs leads to increased efficiency and improved customer service. Others feel that increased competition results in inappropriate pressure to accept flights and limits funds available for upgrades of navigational safety equipment. A report issued by the Government Accountability Office concluded that there was insufficient evidence to draw solid conclusions regarding the effect of competition on HEMS operations. (46)

The guiding principle behind HEMS integration must be the ability to manipulate time on behalf of patients. It is necessary, however, to allow variation in HEMS utilization guidelines according to the capabilities and needs of the regional health care system. EMS and regional health care systems must ensure that patients are taken to the facilities appropriate for their conditions. The appropriate distance for transport from a trauma scene without utilizing HEMS will differ according to the skills and capability of local ground EMS personnel. Interfacility transport of potentially unstable patients who are being moved for an immediate intervention will less often need to be accomplished by air in areas with abundant ground critical care resources. HEMS utilization for trauma mechanism patients should be addressed in regional guidelines and must take into consideration the capabilities and resources of the EMS and regional health care systems. The need to transport trauma mechanism patients by air will be less common in regions or states where there are abundant designated trauma centers, while in other locations HEMS may represent the best approach to give patients access to a timely and skilled trauma evaluation. These decisions cannot be left up to individual caregivers, hospitals, or HEMS programs; they must be addressed regionally through utilization guidelines with ongoing quality assurance regarding the decision to utilize HEMS and evidence-based refinement of guidelines.

Drivers of utilization can vary widely in HEMS programs that are not integrated into the EMS system. System integration has the ability to limit non-clinical drivers such as convenience and economics and to emphasize utilization based on clinical criteria and proven improved clinical outcome. In this way, the potential benefit to the patient and population is balanced against the cost and potential risks to the patient and crew. Strong oversight that establishes, monitors, and adjusts system criteria for HEMS utilization limits individual variability and decisions that are not primarily patient focused. Most emergent transport decisions are made on patients' behalf without the opportunity for their input. Oversight helps to maintain public trust. Treating HEMS resources as part of a regional health care system and not as isolated silos can limit drivers that do not benefit the system or the individual patient. HEMS physician involvement in regional planning, quality assurance, and oversight is essential.

Future Directions

The Air Medical Physician Association, the American College of Emergency Physicians, the National Association of EMS Physicians, and the American Academy of Emergency Medicine believe that national guidelines for the appropriate utilization of HEMS must be developed. For the reasons discussed in this article, we further believe that, although national in scope, these guidelines must consider regional capabilities and needs to facilitate local, regional, and state implementation. In addition, a National HEMS Agenda for the Future should be developed to address HEMS utilization and availability and to identify and support a research strategy for ongoing, evidence-based refinement of utilization guidelines.

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