Air medical transport myths

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ABSTRACT

The role of air medical and land-based critical care transport services is not always clear amongst traditional emergency medical service providers or hospital-based health care practitioners. Some of this is historical, when air medical services were in their infancy and their role within the broader health care system was limited. Despite their evolution within the regionalized health care system, some myths remain regarding air medical services in Canada. The goal is to clarify several commonly held but erroneous beliefs regarding the role, impact, and practices in air medical transport.

RÉSUMÉ

Le rôle des services médicaux d'urgence par voie aérienne ou par voie terrestre n'est pas toujours bien compris par les fournisseurs traditionnels de soins médicaux d'urgence ou par les professionnels de la santé en milieu hospitalier. Certaines idées fausses relèvent du passé, à l'époque où les services médicaux aériens en étaient à leurs premiers balbutiements et où leur rôle au sein d'un système de soins de santé élargi était peu important. Malgré l'évolution des services médicaux aériens au sein de systèmes de soins de santé régionaux, certaines idées fausses persistent sur leur compte au Canada. L'étude avait donc pour but de réfuter un certain nombre d'idées à la fois répandues mais fausses sur le rôle du transport médical aérien, son importance et ses pratiques.

Keywords: Emergency medicine, critical care transport, prehospital EMS

INTRODUCTION AND BACKGROUND

The air medical and land-based critical care transport industry has grown significantly in the past 3 decades. The scope, level of expertise, and configuration of the transport crews have also evolved due to many factors. These include provider specialization, increasing complexity of therapies, the need to timeliness for some therapies, and the desire to mitigate risk in the transport setting.

Most Canadian provinces have well-developed provincial prehospital and transport medicine services that include helicopters and fixed wing aircraft, with some services augmenting the aircraft with specialized land-based critical care transport vehicles for shorter distances in more densely populated areas. The medical crews typically have skills that enable provision of critical care in the transport setting, be it on aircraft or land-based critical care transport vehicles.

The role of air medical and land-based critical care services is not always clear among traditional emergency medical service (EMS) providers or hospital-based health care practitioners. Some of this is historical, when air medical services were in their infancy and

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their role within the broader health care system was limited. Despite their evolution within the regionalized health care system, some myths remain regarding air medical services in Canada. The goal is to clarify several commonly held but erroneous beliefs regarding the role, impact, and practices in air medical transport.

Myth: The air ambulance is always faster

Speed itself cannot be the only variable when considering the use of an air ambulance.[1] Air ambulances are not typically located where the patient requiring transport is located, so time to respond is a key factor when determining whether to use an air ambulance. When used appropriately, an air ambulance should shorten the time for patients to receive critical interventions or to reach definitive care.[2] If either cannot be achieved, the patient may still benefit from the use of an air ambulance staffed with specialized teams or if the time spent in transit can be reduced.

The air ambulance is not always the faster choice. In making a request for an air ambulance, land EMS agencies and hospital personnel must consider the patient needs, proximity to definitive care, presence of suitable landing site at both sending and receiving sites, need for land EMS transfers to and from landing sites, immediate availability of the air ambulance, and the time required while awaiting the air ambulance to arrive versus immediate transport by land EMS using sending facility staff. The use of a nonsimultaneous dispatched helicopter for scene responses results in faster times to definitive care for trauma patients, compared with ground EMS (GEMS) transports, only when distances from scene to the receiving facility is greater than 45 miles (75 km).[3] The point at which a helicopter is faster for an interfacility transport is at least double that distance, and is dependent on the helicopter being able to land at a helipads at both sending and receiving hospitals.

Several provinces have created usage standards for air ambulances[4] to ensure they are used when they will positively impact patient care. Apart from patient care, one consideration taken into account in air ambulance usage is the potentially negative impact on local service delivery when a land EMS unit is used for ground transport over great distances. Using a land ambulance to transport a critically ill patient over great distances removes the ambulance from its local service area, and may also require additional hospital-based staff to safely transport a critically ill and potentially unstable patient.

When considering use of an air ambulance, the clinician needs to consider times and distances to definitive care, whether or not land ambulances are needed between landing sites at sending or receiving facilities, local resources, and the level of care available in the transport setting. Clinicians should seek consultation with experts in prehospital and transport medicine, typically available by means of the regional or provincial air ambulance dispatch center, in determining whether an air ambulance is indicated for transport of the critically ill patient.

Myth: All ambulance crews are the same

Air ambulance usage often focuses on the "air" portion of the response. What is frequently missing is the level of clinical care provided by the air medical crew. The scope of an air medical crew typically exceeds that of their land EMS counterparts, and the mandate of the air medical services goes beyond that of the land EMS service. While air medical systems may work in partnership with other public service agencies, their roles extend beyond emergency response to hospital-based and intensive-level care for patients being transferred between health care facilities. In a regional health care system where centers of excellence provide tertiary or quaternary care services, these critical care transfers are essential links in delivery of health care.

Land EMS systems provide primary response to the calls from the public, and assess undifferentiated conditions at the roadside, public place, or private residence. The land paramedic's scope of practice is often limited to symptom relief, resuscitative skills, and provision of acute interventions targeting immediate threats to life. Transport times to hospital in urban and suburban areas are typically short, but can be prolonged in rural and remote settings.

While air medical crews also provide primary response, their role is increasingly geared to critical care interfacility transports within regionalized health care systems. To meet the needs of this patient population, air medical crews have staffing models that may include any combination of physicians, nurses, and paramedics.[5] The optimal crew configuration is controversial,[6,7] but must include the ability to manage patients requiring critical care therapies, interventions, and continuation of specialized care while in transport. The crew's scope of practice is a key predictor of patient safety and well-being,[8,9] and needs to include advanced airway

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maneuvers, management of a mechanically ventilated patient, vasopressor and inotrope therapy, invasive lines and tubes, and interpretation of laboratory and imaging studies. Some systems also include the ability to transport patients with specialized needs, including those who are dependent on an intra-aortic balloon pump (IABP) or extracorporeal membrane oxygenation (ECMO). Finally, air medical crews can be in transit with a potentially unstable patient in an aircraft or land critical care transport unit for several hours. This scope of practice and patient care needs in the air medical setting typically exceeds that of traditional land EMS systems.

While they function side by side in a regionalized delivery model, there is a clear distinction between land EMS and air medical crews in terms of scope, service delivery, and patient contact time. Air medical crews are adept at providing care comparable to a hospital-based critical care setting, and have knowledge, skills, and competencies commensurate with patient needs in this setting.

Myth: Helicopters don't make a difference

The role of helicopter EMS (HEMS) in combat casualties is well known, but their civilian role is controversial. Targeting HEMS use for patient populations or settings where there is proven benefit in patient outcome or service delivery can address this controversy. HEMS can transport specific patient populations to centers of excellence, and provide a level of care that meets or exceeds that available in GEMS settings. This combination of the right patient being cared for by the right crew, with timely transport to the right destination, is key to maximizing impact of HEMS on patient outcome.

Identifying the patients who may benefit from HEMS at the call-taking and vehicle allocation stage is challenging. Studies highlight three distinct patient populations, namely multisystem trauma,[10–14] acute stroke, and ST-segment elevation myocardial infarction (STEMI), where appropriate HEMS usage may improve patient outcome and service delivery. This is especially true in rural areas, where timely access to tertiary care services is challenging.

The beneficial aspects of HEMS (over GEMS) in patients with multisystem injuries can be difficult to evaluate. Shorter times to definite care are not always the key factor. As previously mentioned, HEMS providers are typically more experienced, have a broader scope of practice, and provide interventions not available in GEMS. As HEMS providers deliver time-sensitive interventions, they can bypass the local hospital and transport patients with significant injuries to directly to a trauma center. This survival advantage of air medical transport is not limited to primary scene responses, as HEMS also improves outcome in secondary (interfacility) transport from smaller centers to definitive care.[15] Finally, making triage and system-related changes focuses HEMS usage on patients more likely to benefit from air medical transport.[16]

The premise of HEMS use for STEMI is that "time is muscle," with the logic that getting patients to primary coronary intervention (PCI) faster will improve outcome.[17–19] HEMS can benefit these patients by improving time to definitive care in carefully selected situations. The goal is to deliver the STEMI patient to a PCI-capable center within the time window where angioplasty is of benefit. Time may not be a factor for STEMI patients in urban settings. However, HEMS permits timely access to PCI-capable centers in rural and remote settings, resulting in improved patient outcomes.[20–22]

HEMS usage in acute ischemic stroke follows a similar argument. The time savings to specialized stroke care translates to greater eligibility for therapies that improve outcome.[23–25] While HEMS may save time to definitive care, HEMS must be dispatched and transport initiated without delay to be beneficial.[26] Unlike the 12-lead electrocardiogram to identify a STEMI, there is nothing short of computed tomography to reliably identify an ischemic stroke. The high proportion of "stroke mimics"[27] lessen the impact of HEMS in patients with suspected acute ischemic stroke.

The key issue in HEMS use is a balance between identifying the patient populations in whom HEMS is beneficial, while limiting its use for those where benefit is questionable or absent. Doing so minimizes any controversy that surrounds HEMS use and improves availability of HEMS when the patient will truly benefit from their use.

Myth: Patients have equal access to health services across Canada

The Canada Health Act indicates "the primary objective of the Canadian health care policy is to protect, promote and restore the physical and mental wellbeing of residents of Canada" and facilitate reasonable access to

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health services without financial or other barriers on uniform terms and conditions.[28] Geography is an independent determinant of health. People living in remote settings or northern communities have lower life expectancies and poorer health status than their urban or southern counterparts.[29] In addition, life expectancy is even lower for indigenous populations, whose longevity ranges from 5 to 15 years less than nonindigenous Canadians.[30]

Access to hospital-based or specialty care is challenging due to Canada's vast geography. Air medical transport systems play a key role in bridging these disparities for 18% of the population who live in rural and remote areas of Canada. The most significant disparities in access to care are seen in rural, remote, and indigenous communities, where physicians, nurses, paramedics, or first responders may not be available locally.[31] Providing primary and emergency care is challenging, particularly when most provinces have centralized tertiary care and emergency services. Small and rural hospitals have closed, and many struggle to retain sufficient numbers of physicians and nurses to remain open.[32]

Regional hospitals coupled with air medical transport may provide practical advantages and cost savings. Given closures or lack of staffing in smaller facilities, staffing of a single aircraft capable of providing critical care services to a large geographical area and timely transport to definitive care may be more efficient and cost-effective than corresponding land vehicle requirements to provide the same service coverage.[6] In practical terms, a single aircraft can efficiently cover the area of approximately seven land ambulances. Staffing the aircraft with a critical care crew also accomplishes two goals: bringing skilled medical personnel to rural and remote locations to provide higher level of care and deliver time-sensitive therapies quickly, and transporting patients to specialized care over great distances in a timely manner. Use of such air medical response system can sometime be the only way to access timely therapies for populations without road access or local EMS services. Despite their ability to provide access to emergent and time-sensitive care, akin to a safety net in times of trouble, the air ambulance is not a substitute to access to primary, preventative, and other forms of nonemergent health care services. They do, however, enhance access to health care, and help lessen the disparity between rural and urban settings across Canada.

Myth: Flying a patient is not as safe

Air medical transport exposes the patient to several environmental risks and physiological stressors. Patients may experience worsening hypoxia, hypothermia, noise and vibration, dehydration, fatigue, and third spacing.[33] Despite these factors, the adverse event rate for patient transport using appropriately trained air medical crews is similar to that of in-hospital events.[34–37]

Adverse events occur in approximately 1 in 10 hospital admissions. These are significant events that lead to injury, prolonged hospitalization, and death.[36] Despite the less-controlled transport environment, the rate of adverse events in air medical transport is similar or lower than that observed in hospital. In a large Canadian air and land critical care transport system, in-transit critical events were observed in 5.1% of all air medical transports, corresponding to a rate of 1 event per 12.6 hours of time in transit.[38] The observed rate was 6.5% in land critical care transports,[37] and 12.3% in the pediatric population undergoing critical care transport.[39]

Complications do occur but most can be managed by appropriately trained transport teams, and death in transport is rare.[37–39] This contrasts with reviews of hospital patient safety studies demonstrating in-hospital adverse event rates of 9.2%, of which 7.4% are lethal.[36] While transport- and hospital-specific event rates are not comparable due to differences in patient contact time, the evidence supports the safety of air medical transport with appropriately trained and skilled air medical crews. Indeed, there should be no debate of whether or not to transport a patient requiring specialized care at a regional center of excellence.[40] As indicated previously, the key is use of skilled air medical crews who are familiar with the transport environment to carry out the patient transports.[41] Skilled medical crews are the key to ensuring patient safety in the transport setting.

A final consideration regarding safety includes a risk assessment due to flying itself. The accident and fatal accident rate for helicopter transport ranges from 0.57 to 0.75 and fatal accident rate of 0.04 to 0.23 per 10,000 missions,[42,43] or 4.38 accidents per 100,000 flying hours, with one accident every 16,721 missions and one patient death as a direct result of a helicopter accident in 50,164 missions.[44] This compares with a crash rate of 7.0 of 100,000 land ambulance transports without lights and sirens and 17.1 of 100,000 with lights and sirens.[45] While the aviation-related risk is relatively small, it must be considered in comparison to that of a land ambulance

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when considering options for patient transport to definitive care.

Myth: Sooner is better – ad hoc v. dedicated transport teams

Whether to wait for dedicated transport teams versus transporting the patient in the land ambulance with an ad hoc hospital-based team of medical professionals is not always clear. In some settings, using a local land ambulance and an ad hoc medical team may deliver the patient to definitive care faster than air ambulance. However, faster may not always be better. The question should focus on (a) what can a specialized team bring to the transport, and (b) is this worth the wait?

The answer to the first question is what the air medical crew brings in terms of knowledge, skills, judgement, and experience specific to the transport environment. The air medical crew is better equipped to manage critically ill patients in the transport setting.[46] The challenge of providing care in this potentially unstable environment is well described.[47–50] When compared with dedicated air medical crews who are specifically trained to work in the air medical and transport setting, ad hoc teams have a higher rate of adverse events, many of which can be avoided.[47,48,50,51] While randomized trials in this domain are not practical, guidelines from expert panels support use of specialist transport teams to carry out interfacility patient transports as a means to mitigate risk to the patient, prevent adverse events, and have the required training to manage complications that do occur in transit.[42,52,53]

The answer to the second question is a matter of timing. If an air medical crew is available and can provide timely transport to definitive care, it is worth the wait. If such a crew is not available, there needs to be a discussion between the sending and receiving staff, ideally in consultation with experts in transport medicine, to determine whether an ad hoc team is the best option for that particular combination of patient care needs, available hospital resources, and the time sensitivity in accessing definitive care.

In summary, interfacility transport of critically ill patients is associated with logistical, operational, technical, and medical challenges that benefit from the specialized knowledge, skills and judgements of transport teams. The clinician must weigh these considerations when determining the optimal transport mode for their patient. Familiarity with the air medical and land-based critical care services available locally and regionally is essential to make safe, effective, and patient-centered decisions regarding transport. In the larger services in Canada, a physician with expertise in prehospital and transport medicine is available for consultation to help plan optimal, safe transport for the critically ill patient.

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