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REVIEW ARTICLE

LIFE IN AIR: HELICOPTER EMERGENCY MEDICAL SERVICES

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ABSTRACT

The use of a helicopter as a primary response vehicle for the ambulance service is presented. A brief analysis of the activities of the air ambulance is described and an appraisal of its effects on the overall performance of the service is given. Emphasis is given to patient acceptability and also to the flexibility of the helicopter in terms of its response to different situations. In conclusion, The air ambulance, as part of an integrated ambulance service, is an effective provider of good pre-hospital care.

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INTRODUCTION

Struck down by a sudden, lethal illness or injury, patients require immediate access to specific critical care specialty services, the highest level of medical care available in modern healthcare. If immediate access is not possible, because of circumstance and or geography, then patients experience a sequence of rapid and increasingly sophisticated interventions and transportation by emergency medical services (EMS) until the appropriate level of critical care is reached. This sequential response of healthcare systems to time-dependent emergencies often results in delayed access to these critical-care services when they are needed most. Now, imagine introducing a component to radically change that response time, improve efficiency, integrate and improve access for millions of citizens to critical care and specialty care services, while reducing healthcare system costs. This critical component is air medical services (AMS) and, particularly, helicopter emergency medical services (HEMS). HEMS, the processes of diagnosis, decision making, transportation, emergency stabilization, and critical care are no longer sequential, but occur simultaneously—faster and more effectively. High quality critical care becomes available through HEMS closer to the point of injury or onset of illness and HEMS makes the highest quality, specialty-center based, critical care accessible to more people. Until comparatively recently in our history, patients stricken by a sudden, catastrophic illness or injury were at great risk of dying. But in the past half century, with the advent of systems of care including modern emergency departments, emergency medical services, and the specialization of emergency medicine, trauma surgery, and other care, this risk has been lowered dramatically. Interventional cardiology, radiology, neonatology, pediatrics and other evolving specialties and sub-specialties now offer critical-care services to further improve the chances of recovery from a medical emergency. It was once common for critical-care units and services to be found in community general hospitals in towns large and small. But over the past two decades, as further specialization has occurred and the need for certain patient volumes to assure sufficient quality of those services has been established, it has become clear that this deployment is not sustainable at every hospital. Now, critical care services and specialists have largely disappeared from rural areas. These services and practitioners are typically sustainable only in urban and suburban centers whereas the requirement is more in rural area which constitute 68% of the Indian population. This reality has created a disparity between rural and urban settings for patients who require critical-care services for their time-dependent conditions. In rural areas with only ground ambulances available, remoteness delays system alerting and response. An ambulance brings the patient to a local hospital for initial care. The local hospital staff performs basic diagnostics and initial stabilization, but they are unable to administer the time-dependent specialty care needed. These facilities then must arrange for the patient to be transferred to a specialty care center. Transfer resources are mustered, the patient is eventually transferred long distances

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by ground ambulance, and the patient arrives at a specialty center where critical care is finally provided (but often too late to make a difference)—*the rural healthcare system responds in hours*. The challenge for AMS is to reduce the impact of this urban/rural disparity and it has proven to be a game changer in this regard.

Air medical services are now a resource that bridges geographic barriers to bring patients to specialty critical care with minimal delay. At the same time, they bring critical care intervention to patients in the field and in smaller hospitals. As an essential component of the healthcare system, AMS rallies critical care resources in a new time frame of minutes instead of hours, replacing sequential steps with parallel actions. This organizing effect of AMS, and especially HEMS, extends to every specialty critical service targeting time-dependent, life-threatening conditions. These include trauma, heart attack and other cardio-respiratory emergency, stroke, pediatric and neonatal emergency, high-risk obstetrics, and burn specialty systems of critical care. Air medical services allow all patients, regardless of location, to benefit from these systems of care which are anchored in urban areas in order to operate with high volume, high quality, and at lower cost when compared to the older model of attempting to duplicate such services in all communities. While air medical transport may appear to be expensive on a single-case basis compared with ground ambulance transport, examining the benefits behind the cost—particularly on a system-wide basis—shows that it is very cost-effective.1-4 This is especially true when compared to the cost of building new rural specialty care or general healthcare facilities and/or expanding ground ambulance capabilities throughout rural area to meet the need for time-dependent patient care, other emergency readiness, and long-distance transports.

Air medical services may also provide access to care when ground ambulance services are not as rapidly available or have no access to an emergency scene. Approximately one out of every 1,000 people requires AMS each year. Air medical critical care transport reduces morbidity, improves overall health care system efficiency, and saves lives. More importantly, it helps critical care patients regain productivity—reducing the likelihood that a critical care patient will suffer long-term disability as a result of injury or illness. Air medicine does so by getting the patient to the right specialty critical care to determine what the patient needs to optimize recovery. Improvements in planning, operational coordination between competing regional healthcare systems, complex reimbursement, and regulatory planning are contemporary issues that have repeatedly caused AMS providers to adapt to a changing landscape. Also, safety of AMS is a continual concern. The picture of a helicopter at the scene of a car crash evokes not only HEMS' life-saving ability, but also the chaotic environment in which these services operate and the potential risks of that environment. Yet, air medical patient care and transportation may actually promise less risk to the patient than does a patient's ground ambulance ride or hospital stay. (Air Medical Services, 2011)

History

The concept of using aircraft as ambulances is almost as old as powered flight itself. Although balloons were not used to evacuate wounded soldiers at the Siege of Paris in 1870 (Lam, 1988), air evacuation was experimented with during the First World War. The first true Air Ambulance flight was made when a Serbian officer was flown from the battlefield to hospital by a plane of the French Air Service. French records at the time indicated that the mortality rate of the injured was reduced from 60% to just under 10% if they were evacuated by air. The first recorded British ambulance flight took place in 1917 in Turkey when a soldier in the Camel Corps who had been shot in the ankle was flown to hospital in a de Havilland DH9 in 45 minutes. In the 1920s several services, both official and unofficial, started up in various parts of the world. In 1920, the British, while suppressing the "Mad Mullah" in Somaliland, used an Airco DH. 9A fitted out as an air ambulance. It carried a single stretcher under a fairing behind the pilot. (Flight, 13 April 1956) The French evacuated over 7,000 casualties during that period. (Lam, 1990) In 1926, the United States Army Air Corps used a converted airplane to transport patients from Nicaragua to an Army hospital in Panama, 150 miles away. The routine inter-hospital military use of airplanes1 dates to World War II, as does the first air evacuation of U.S. soldiers from the site of injury, which occurred in what was then Burma. The National Academy of Science white paper contributed substantially to the development of the modern EMS system and its trauma subsystem and, together with the EMS Systems Act of 1973, was a precursor to significantly increased funding of EMS, trauma, and AMS. Its impact was compounded by the influence of returning military units, and military medical helicopter pilots discharged to law enforcement and other public safety flying roles. These led to the dual-purpose adaptation of military and public safety helicopters to the evacuation of injured civilians, such as the Military Assistance to Safety & Traffic (MAST) program, established in 1970, and the Maryland State Police aviation program which, in 1970, became "the first civilian agency to transport a critically injured trauma patient by helicopter."

The first civilian hospital-based medical helicopter service was established in 1972 at St. Anthony's Hospital in Denver, Colorado. Nationwide, many hospitals developed these services in conjunction with the implementation of organized trauma systems. By 1980, eight years later, some 32 helicopter emergency medical services (HEMS) with 39 helicopters were flying more than 17,000 patients a year. By 1990, this grew to 174 services with 231 helicopters flying nearly 160,000 patients. Ten years later, 231 helicopter services with 400 aircraft were flying over 203,000 patients each year. By 2005, 272 services operating 753 rotor-wing (helicopter) and 150 dedicated fixed wing (airplane) aircraft were in operation. In 2010, the Atlas & Database of Air Medical Services, (ADAMS) database of the Association of Air Medical Services reported 309 services operating 900 helicopters and 311 airplanes. The need to quickly bring critically injured patients to trauma care within "the Golden Hour" brought AMS (mainly medical helicopters) into existence with experience from trauma air medical evacuation at the battle front. From its inception in 1972, civilian era AMS experience doubling growth of both programs and helicopters every five years or so through the 1980s as programs were initiated around the country by hospitals that were also becoming trauma centers. The 1990s marked a slower but steady, 10–20% growth of programs and 30–50% increase in helicopters in each half of the decade.

Another element of the past decade's rapid growth began with the Medicare and Medicaid provisions of the federal Balanced Budget Act of 1997 which called for a new ambulance fee

schedule beginning in 2000. The fee schedule which emerged from the resulting negotiated rule-making process between the Centers for Medicare and Medicaid Services ("CMS") and EMS stakeholders provided a more dependable, and in some cases a more favorable reimbursement plan for AMS for the subset of their patients covered under Medicare and Medicaid. This change meant that some hospital-based AMS services were challenged to reaffirm their financial commitment to directly providing AMS. It also provided incentive for some non-hospital based AMS providers who, in many cases, took over areas from hospitals that closed their AMS programs for financial reasons or who established bases on the outskirts of a traditional program response area. (Air Medical Services, 2011)

Aim

The emergency relief of sickness and injury and the protection of human life by the provision of an air ambulance. In time-critical medical emergencies we have identified four core aims:

- Save life
- Preserve life
- Increase survival rates
- Assist the speed of recovery

Objectives

- Raising the quality of care and effectiveness of Air Ambulances for patients through engagement with political leaders and policy makers.
- Improving understanding of air operations and pre-hospital care to deliver a world class service and continually improve patient outcomes.
- Promoting best practice.
- Highlighting issues and opportunities with policy makers.

Mission

While most people picture a medical helicopter landing at a car crash to help a victim, air medical services have increasingly taken on a variety of new missions in the last decade. Most scene responses are for injuries. Injuries also result in inter-facility trauma transfers, but inter-facility flights are often for critical illnesses, such as heart attacks or strokes requiring surgical procedures (including invasive cardiac treatment such as catheterization and interventional neuro-radiologic procedures). They also include acute respiratory problems requiring prolonged intensive care, sepsis, spinal cord problems, burns, specialty pediatric and neonatal illnesses and complications, limb reattachment, organ transplants, and complications in high-risk pregnancy.

AMS' First Mission: Trauma

Road-traffic accidents are increasing at annual rate of 3%. A vehicular accident is reported every 2 minutes and a death every 8 minutes on Indian roads. (Trauma in India-Factfile, 2017) It has been well demonstrated that organized trauma systems with trauma centers save live. These success markers indicate that HEMS reduces the overall cost of trauma to society and improves the likelihood that HEMS-transported trauma patients will rapidly return to being productive members of society. As a part of an organized trauma system, HEMS cuts the injury-to operating- room time significantly. Medical helicopters, dispatched simultaneously with ground EMS, allow over 54% of the population access to a full-service trauma center within 60 minutes— timely access they would not have without HEMS. (Air Medical Services, 2011)

Mission: Heart Attacks

It is estimated that 17.5 million people die each year in India from cardiovascular diseases, out of which 80% of the deaths are due to heart attacks. (Current state of heart disease statistics in India, 2017) A heart attack occurs when an artery in the heart is blocked by a clot, and the heart muscle supplied by that artery is therefore deprived of oxygen. HEMS medical teams have proven effective in diagnosing and dealing with these emergencies. Cardiac specialty center diagnostics may be extensive and complicated, and special medications, sophisticated monitoring, or a surgical procedure at a specialized cardiac intervention center are often needed to reestablish circulation. Done within those two hours, the heart may be undamaged or damage may be limited, allowing the patient not only to live, but to recover a normal life. (Air Medical Services, 2011)

Mission: Strokes

The estimated adjusted prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/100,000 in urban areas. The incidence rate is 119-145/100,000 based on the recent population based studies. (Pandian and Sudhan, 2013) Like heart attacks, some strokes are caused by interruption of blood predominately from a blood clot, only this time in the brain. As in heart attacks, there is a narrow window of time (optimally within 90 minutes but generally no more than four and a half hours) in which rapid diagnosis and clot-busting treatment can result in patients suffering little to no long term damage and disability from these events. Therefore, patients transported to specialty centers for clot-busting treatment of strokes can benefit from a well-coordinated ground and air transport system to accomplish early transfer. (Air Medical Services, 2011)

Mission: Complications of Pregnancy

In a national Family Health Survey conducted in India, among the total participants, more than half of them had complications in their pregnancy. (Walia and Agarwal, 2014) When a pregnant woman experiences complications, they can be life threatening for both mother and child, and often require the specialized care found in regional hospitals. Timely AMS transfer to such facilities while the patient(s) receives care from obstetrical/neonatal specialists has been shown to be safe, cost-effective and beneficial, especially compared to the alternative of caring for a severely disabled neonate who potentially requires lifelong care. (Air Medical Services, 2011)

Mission: Children

Children are very resilient patients who often do not show signs of a severe illness or injury until they are close to death and then they suddenly deteriorate. The newly born have their own set of unique diagnostic challenges including premature infants with respiratory, cerebral, cardiac, and gastrointestinal abnormalities, and neonates with congenital abnormalities. The

average emergency physician encounters these high-level pediatric or neonatal problems infrequently and many hospitals no longer care for children because they cannot maintain the expertise. When this occurs, these patients require access to neonatal and pediatric intensive care units and highly specialized physicians. As with other specialties, these services are becoming increasingly limited and centralized into urban centers. Therefore, access to the care for these neonates, premature infants, and young children is another primary use of AMS, with the speed and higher level of care provided en route by an air medical team benefiting these patients over huge geographic areas. (Air Medical Services, 2011)

Mission: Traumatic Brain Injury

It is estimated that nearly 1.5 to 2 million persons are injured and 1 million succumb to death every year due to traumatic brain injury in India.[9] Traumatic brain injury (TBI) is frequently associated with the severely injured, multiple-trauma patient. It is the leading cause of death and disability in children and in adults in their most productive years, making the resulting economic loss one of the highest in medicine.120 As with other major injuries, treatment of traumatic brain injury is time-critical, principally because of brain swelling. Air medical transports have proven to be effective over large geographic areas allowing regionalization of systems of care to improve the outcome of TBI and lower the cost to society. (Air Medical Services, 2011)

Mission: Complex Surgical and Medical Conditions

Air medical service is indicated for a number of other time-critical patient conditions. Examples of these include dissecting aortic aneurysms, limb reimplantation surgery, burns, major infection, poisoning or overdose, organ transplantation (movement of patients and organs), respiratory complications requiring ventilator support, need for emergency dialysis, or the need for care in a hyperbaric chamber (e.g., carbon monoxide poisoning and diving incidents). (Air Medical Services, 2011)

Mission: Mass Casualty Situations and Major Regional/National Incidents and Preparedness for Disasters

As per the international disaster database data, India has suffered from 773 natural disasters during 1990–2009. Manmade disasters are also on the rise demanding stringent intervention. (Asish and Suresh, 2016) Helicopters and fixed wing aircraft play a vital role in emergency preparedness because of their ability to rapidly move patients to specialty care across a wide regional area. Hospitals close to a mass casualty site become overwhelmed early in an event with numerous cases of all types. The patients are injured or ill; incapacitated due to long-term electricity failures, lack of fresh water. In cases of impending disaster, helicopters are also useful in evacuating critically ill patients from hospitals in areas threatened by tornado, hurricane or other disaster, and are often utilized to bring medical staff, equipment and critically-needed supplies (such as blood and blood products) to the scene. Fixed wing air ambulances can expand that capacity by meeting with medical helicopters or critical-care ground ambulance units to bring in supplies or transport patients even further distances. (Air Medical Services, 2011)

Advantages

Air medical services have four major means of accomplishing what other healthcare and EMS system resources cannot.

1. Improved Access to Patients over Dramatically Larger Geographic Areas

Patients isolated from ground EMS or hospitals by distance, lack of ambulance-passable roads and/or by terrain features such as mountains, canyons, forests, and islands, benefit greatly from air medical service. Helicopter EMS is also a powerful tool in urban/suburban road congestion over sometimes short distances, though its primary advantage is in covering longer distance and greater geographic areas at lower costs than ground EMS.

2. Rapid Access to Definitive Treatment at Specialty Care Centers

Helicopter air ambulances are typically used for the transport of patients from the scene of an injury directly to a hospital, and for flights between smaller hospitals and trauma centers or specialty hospitals (e.g., burn or cardiac centers). Air medical transport is beneficial not only because it provides a higher level of medical care and decision-making to the patient en-route, but also because it provides a speedier response of this level of care to determine what critical-care system response is required. Helicopters fly point-to-point, minimizing the time out of hospital, and avoiding the traffic delays experienced by ground ambulances while bringing physician level care to the patient.

3. Earlier Availability of Key Treatment Equipment and Supply Resources

Air medical services are increasingly used to address other acute local medical care needs as well. The delivery of blood and blood products, specialized drugs, or specialized life-support equipment to outlying hospitals is one example, while bringing emergency medical personnel to a small hospital (staffed perhaps by one physician and nurse) or major incident site to assist local medical personnel with multiple patients is another. Suddenly doubling or tripling the physician-level care and critical-care intervention capabilities in a rural hospital with the landing of a helicopter outside can make the difference between life or death inside.

4. Earlier Availability of Physician-Level Diagnostic, Decision-Making and Treatment Capabilities

The medical crews aboard air ambulances provide significantly more sophisticated skills and equipment than are found on most ALS ground ambulances, eliminating the need for intermediate stops at a local hospital for interventions. These crews bring the additional skills, expertise, medications and equipment common to large, urban critical care facilities whenever they respond to a community hospital, to the scene of an injury or accident, or to a pre-planned ground ambulance rendezvous point. Critical care for difficult breathing and cardiac complications, blood and blood products, specialized drugs, and more sophisticated patient monitoring tools make medical helicopters closely resemble a flying emergency department, trauma, and critical-care unit. In the past, flight physicians acted as the second crew member in several

programs. Some continue to do so, mostly at academic institutions with emergency residency training programs. (Air Medical Services, 2011)

Recommendations

1. Evoke an environment of preparedness to include: Reduction, Readiness, Response & Recovery
2. Have a plan which is dynamic/ strategic and practice the plan to use the emergency services in 'real' time
3. Plan needs to include de-confliction strategies.
4. The major incident plan should be 'a work in progress'. It should be reviewed and updated annually based on deficiencies identified in simulated, actual use, or if there is an organizational or technological changes.
5. Have all air ambulance assets tasked from one place.
6. Make arrangements for the ambulance service mobile phone provider to erect temporary booster mast near the incident scene.

Conclusion

For the Air Ambulance to be maximally effective, its use must be unconstrained by adverse local arrangements such as lack of proper landing sites at hospitals. Although expensive to run, it can effectively cover a large geographical area which would otherwise need many land ambulances, and is therefore cost effective. The Air Ambulance has shown itself to be effective as a primary response emergency ambulance. It has been acceptable to patients and offers considerable advantages in critical pre-hospital care. It has shortened the Therapy Free Interval for ill patients and improves one of the links in the long chain of integrated care of the trauma patient. The air ambulance service can also be implemented for the tertiary care in the hospitals of India.

REFERENCES

Agarwal S. and Walia GK 2014. Prevalence and risk factors for symptoms suggestive of Pre-Eclampsia in Indian Women. *J Womens Health Issues Care*, 3(6):2-9.

Air Medical Services: Critical Component of Modern Healthcare Systems. Med Evac Foundation International: USA; 2011.

Asish K. and Suresh V. Setting up and functioning of an Emergency Medicine Department: Lessons learned from a preliminary stu12dy. *Indian J Anaesth*., 2016. 60:108-14.

Current state of heart disease statistics in India (Available at www.blog.medicalcounsel.com) (Accessed on 21/05/ 2017).

Flight, 13 April 1956. (Available at www.flightglobal.com) (Accessed on 17/05/2017).

Gururaj G. Epidemiology of traumatic brain injuries: Indian scenario. *Journal of Neurological Research*, 2013 24(1): 24-28

Lam DM. To Pop A Balloon: Air Evacuation During The Siege of Paris, Aviation 1870.

Lam, DM. Wings of Life and Hope: A History of Aeromedical Evacuation. *Problems in Critical Care*, 4(4): 477-494; December. 1990.

Pandian JD. and Sudhan P. Stroke Epidemiology and Stroke Care Services in India. *Journal of Stroke*, 2013. 15(3):128-134.

Space, & Environmental Medicine, 59(10): 988-991; October; 1988.

Trauma in India-Factfile (Available at http://www.traumaindia.org) (Accessed on 18/05/2017).

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