

Helicopter Medical Emergency Services

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Precious lives are lost many times, not because of the severity of the medical condition or injury, but due to the delay in getting the right medical care at the right time. People so affected are mostly those living in remote, inaccessible areas, though it is equally true for a motorist who meets with a severe accident in an expressway or a stroke/heart-attack victim who gets stranded in an ambulance in a traffic jam in the roads of any sprawling city or a trekker/skier who encounters a mishap during trekking/skiing. Can something be done to help them?

A report of 2017 by the Ministry of Road Transport and Highways (MoRTH), states that 150785 lives were lost in India in 2016 due to road accidents alone. In addition to these fatalities, many lives were also lost due to medical emergencies like cardiac-arrests, strokes etc and other natural and man-made disasters. *The loss of these lives could have been significantly reduced, if the victims were provided with emergency medical assistance within the golden-hour period and transported in a well-equipped Emergency Medical Service (EMS) to a hospital or trauma centre.* The EMS could be a Ground Emergency Medical Services (GEMS) ie an ambulance on roads or speed-boat on rivers or Helicopter Emergency Services (HEMS) or Air-ambulance in the air.

Among the EMSs, HEMS has a unique place. *HEMS is an EMS with a Mobile Life Support System in a helicopter.* Helicopters are versatile machines which can provide the fastest evacuation of victims from any accident sites, however remote and under-developed it maybe. They are ideally suited for India which has a vast, diverse terrain; unconnected remote areas and road networks that are underdeveloped and poorly maintained in towns and that are potholes punctuated, congested and mostly narrow in cities. However due to the constraints imposed by various institutional, regulatory and policy issues in India, no HEMS are operational here, though it is popular elsewhere.

This policy paper tries to identify some issues hampering HEMS operations in India and explores how to incentivise HEMS, by looking at related policies in other countries, published articles, primary and secondary data, and relevant Gol policies.

Golden-Hour, Helicopters and HEMS:

Many of these deaths due to road accidents and disasters could be reduced and life-long trauma of many accident victims ameliorated, if EMS is provided to the victims during the “golden-hour.” *“Golden-hour” in EMS parlance refers to a time period lasting from a few minutes to several hours following traumatic injury being sustained by a casualty, during which there is the highest likelihood that prompt medical treatment will prevent death.* Emergency medicine research/statistics show that chances of survival of accident victims are very high, if proper EMS is provided to victims during this golden-hour by evacuating them at the earliest from accident site to a trauma-care facility.

Helicopter is one of the most versatile transport-modes invented. These omnidirectional machines can fly in all directions (forward/reverse/up/down/diagonal) and even stand-still(hover) in air. They operate day or night, require virtually no runway for taking-off and landing; can fly over mountains, desert, sea or water-bodies. They can fly fast, taking the shortest aerial route to the destination, making them *the fastest mode for evacuation from congested roads, forests, inaccessible mountains, or even ski-slopes.* Helicopters carrying trained medical personnel and fitted with emergency medical equipment can provide immediate medical care to accident victims at/from the site itself and while being transported to a well-equipped trauma management center. HEMS-helicopter is not only just a means of rapid transportation but also an airborne intensive care unit that can diminish the duration of therapeutic vacuum. HEMS can result in reduction of not only mortality or morbidity but also *in accidents induced disabilities* and is suited “in circumstances where either a GEMS cannot reach the incident in an appropriate response time or the patient needs to be transported to an *appropriate*” (not closest) “*facility over a long distance or over inhospitable terrain*”. (Muhlbauer et-al, 2015)

“Helicopters are ideal delivery systems for EMS due to their capability to hover and land without being constrained to runways and can vault across road traffic delays unaffected by terrain. HEMS utilizes the tenet of trauma management that clinical benefit increases considerably when care is delivered within the golden-hour.” (DGCA, 2016)

Worldwide experiences confirm that HEMS provide the fastest and most effective remote area medical evacuation, particularly from remote and inaccessible

sites like mountains, ski-slopes, forests, far-flung remote villages etc or even from highways and city roads clogged with traffic. HEMS is found to be the most effective at the time of cardiac arrests, strokes, high risk OB deliveries, neonatal care, organ transplants and for victims of accidents with high Injury Severity Score(ISS) index. Muhlbauer et-al's(2016) analysis brought out that HEMS was maximum used in motor vehicle accidents related trauma cases and it had significantly helped patients with ISS>15. This corroborates the outcomes of similar studies in USA, Germany, Japan, Australia and many African countries that HEMS improves patient care, increases patient survival and recoverability, especially for those with high ISS. It, in a way, extends the geographical reach of specialized medical centres and is a boon to victims of severe accidents in remote and congested areas. Studies show that the modal group of HEMS users are adult, earning, 45-60-age-group men, followed by 0-12 age-group-children and the least by women, consistent with gender-biases known (Muhlbauer et-al,2016). (Annexure-2). HEMS, infact, reduces health care costs in the long run. Ask the person who had to amputate his leg because of the gangrene developed due to delayed management of trauma at skiing. HEMS, however, is not very popular world over as yet, due to its high operational costs. But it's a matter of time that costs will come down when its operations are scaled up.

HEMS in the world:

HEMS, started in Korea in 1940s, is getting increasingly popular in Europe, USA, Brazil, Australia and many African Countries. While, having matured aviation and insurance sectors; availability of state-of-the-art hospitals with roof top helipads; access to sophisticated technologies; high speed autobahns/expressways ; high value attached to life; high per-capita income of people and hence affordability etc have been attributed to its growth in Europe and USA, the use of HEMS in many African countries was necessitated probably due to quite opposite reasons. These countries have vast geographical areas; undeveloped road infrastructure; many inaccessible or extremely remote areas; poor geographical spread of medical trauma care centres; shortage of doctors etc which has prompted HEMS operations here. Almost all major skiing resorts in Europe and many game resorts in Africa have operational HEMS.



HEMS in India:

India's vast geographical expanse and diverse physical features pose a big connectivity challenge. Roads ply 87% of traffic, though Indian Railways is one of the largest railway networks. The number of vehicles on Indian roads is increasing day-by-day. In 2015, 196million new vehicles were registered in India, @53720 vehicles/day(Tol18/8/2016). *With only 1% of the number of global vehicles, India contributes to 10% of deaths in road accidents worldwide annually*" (TIFAC, 2015). In 2016 there were 480652 road accidents which killed 150785 persons, mostly in the productive age group. National Highways accounted for 30% of these accidents and 34.5% of deaths. (MoRTH, 2017). In 2000, Planning Commission had assessed a social cost of Rs 55000Cr on account of road accidents in India. It is estimated that "a 7% GDP growth increases vehicle population by 10%" (TIFAC, 2015). With a 7%+GDP growth and push to develop highways, these mortifying mortality figures are bound to go up.

HEMS is useful for *rescuing* people during floods, earthquakes, fire, building collapses and providing immediate *relief* during these disasters, heavy rains, landslides, dam and cloud bursts. The role played by army, air force and civil helicopters during the floods rescue and relief operations in Kerala (2018) & Uttarakhand (2013) is well documented and highlights what HEMS can do for India.

Thus to reduce the untimely deaths due to road accidents and disasters, EMS is the need of the hour and the best EMS is HEMS.

However, HEMS in India is a non-starter. But then, India was a very late entrant in the field of effective, efficient Ground-EMS as well! Trauma-management centres and co-ordinated GEMS like "108-services" developed in India in the last decade only. HEMS is ideal for India which has vast, inaccessible hilly, mountainous and rural terrain; inadequate airport infrastructure; many narrow, congested, badly maintained roads; few and far flung trauma-management centres and insufficient medical professionals to attend to victims of large number of accidents/disasters taking place in its geographically spread-out expanse. Despite having "over 5.23 million kilometres of road network in India", there are still many inaccessible and difficult-to-access areas. Realizing the utility of HEMS during massive landslides when the road network gets cut off, the Uttarakhand government has embarked upon a plan to build heliports at all vantage points in the hilly state.

But due to *many regulatory, bureaucratic and policy hurdles and the not-so-sector-friendly business environment, HEMS has not taken off till now.* (Annexure-1)

A. The Constraints:

India has only a few civil helicopters. Their numbers reduced from 291 in 2012 to 267 in 2016. (Annexure-3) [$<1\%$ of 34000 civil-helicopters world-over. Sao-Paulo city (comparable to Mumbai) in Brazil has 750 helicopters. (Rotor India-2017)]. 70% of the Indian fleet are used for oil and gas off-shore and power operations and VIP movements. (Rotor India, 2019 pg 49)

A.1 Regulatory bottlenecks:

General Aviation and helicopters are given no importance in the civil aviation sector in India. DGCA's (the Indian aviation regulator) many regulations meant for fixed-wing planes, illogically enforced on helicopters add to its woes. National Civil Aviation Policy,(NCAP),2016 acknowledges in section-16 that *"Helicopters play a key role in remote area connectivity, intra-city movement, tourism, law enforcement, disaster relief, search and rescue, emergency medical evacuation etc and that India currently has less than 300 civilian helicopters which is very low as compared to other developing nations"*. But, adequate policy push is not given for augmenting helicopter operations (Annexure-4) Some of the main interventions mentioned are: Separate regulations for helicopters to be notified by DGCA; a separate helicopter cell to be created in DGCA; government will facilitate the development of at least four heli-hubs; MoCA will coordinate with MoF, MHA, NHAI, Indian-Railways, insurance-companies, hospitals, helicopter-operators to facilitate HEMS; DGCA will bring out regulations exclusively for HEMS etc. *After 70 years of helicopter-operations in independent India, this policy finally acknowledged the need of separate regulations and a separate cell in DGCA for helicopters.*

DGCA has issued the HEMS operational circular on 11/2/2016 (DGCA, 2016) (Annexure-5). HEMS operations have not yet started, though some corporate hospitals have started air-ambulance services for quick organ transportation and for transferring critically ill, rich patients between hospitals. Such instances are also rare, as it costs over Rs1.25-lakhs-per-hour. Notwithstanding the stipulation in the NCAP, no substantial actions are seen to promote HEMS. Though a Helicopter Cell has finally been setup at DGCA to address various issues faced by helicopter industry, various regulatory issues like dedicated routes, air traffic and meteorological services for helicopters at main airports; increasing the number of licensed helicopter pilots,

their periodic training-schedules, nudging airport-operators to reduce RNFC, landing, parking charges for helicopters etc have not yet been addressed.

A.2. Cost of operations and maintenance(O&M):

The most important factor affecting growth of helicopter operations are its high O&M costs. This offsets its advantage of its ability to land/takeoff without runways.

Aviation Turbine Fuel (ATF) is highly taxed (upto 29% in some states) that it costs almost double in India, compared to many countries.(On 8/8/2018, per-kilo-litre ATF costed Rs-74335 in Kolkata, compared to Rs-40000(appx) in Kuwait). Taxes & restrictions on import and storage of spare parts, *dollar denominated expenditures in a weak rupee regime*, high maintenance costs, high charges imposed by airports for navigation, landing, parking, security and ground-handling etc balloons up the cost.

Capital costs: Import duty on helicopters is another concern. HEMS helicopters operate with Non-scheduled Operator's Permit, which attract customs duty of 2.5 % plus 5% GST on helicopters. The duty imposed in 2007 and GST imposed in 2018 has added to the cost of acquiring helicopters.

A twin-engine helicopter with medical personnel and equipment is preferred to a single-engine fixed wing plane permitted for medical evacuation. DGCA circular on HEMS specifies Performance-class-A helicopter with IFR capability. Helicopters with medical aids, stretcher and other medical equipment for HEMS are very expensive. To keep the medical equipment on board in fully operational condition, there is the need for periodic checking, testing and calibration of equipment etc. Even if so readied and kept, there is no assurance of regular HEMS sorties. In absence of regular assured business, the operators prefer multi-role helicopters. A helicopter used for normal passenger carriage is converted into an air ambulance, in an hour's time. But this can be done only if adequate notice is given to the operator. Such helicopters cannot be relied for emergency transportation of victims of accidents, which require immediate deployment.

HEMS operation requires special in-flight training for doctors and other medical personnel required to be on board. Sufficient number of such personnel will need to be trained to ensure round the clock availability. Pilots will also need to be on call-duty. As pilots are subjected to very strict duty-time limitations, extra pilots will

be needed for each helicopter in HEMS operations. These high cost of skilled manpower adds to the non-viability of HEMS operations.

A.3. Infrastructure and security related issues:

Airports at metros discourage operations of the slow moving helicopters as it puts time restrictions on the already squeezed-out and crowded operations of scheduled airlines. These PPP airports resist giving space for parking and sheds for maintenance of helicopters, as they are low revenue yielding propositions. Other than regular airports, landing areas for helicopters require adequate infrastructure for operations and security. Most helipads have only a small piece of level ground to be used for operation. A proper helipad in regular use must have a building with sitting lounge; security checks/ fueling arrangements; fire-fighting equipment, maintenance hangar, crew rooms, a dispatch office and a radio contact frequency etc. The landing area, if unpaved, must have grassy area to preclude clouds of dust during landing and takeoff, which could obstruct view. Importantly, adequate security personnel are needed to ensure that air space is secured as per ICAO guidelines and also to keep onlookers away to prevent any accident. In addition, the takeoff paths must be clear of obstructions; electric wires etc and should not be over crowded or hostile areas. So somebody has to make the minimum and must have arrangements at the landing spots, if they are not regular, notified helipads.

Though helicopters used in HEMS will require dedicated landing areas in hospitals, none of the major hospitals have a heliport attached to them. So the helicopters now have to land at the city airport and patients transported to hospital by road ambulance. However, if dedicated helipads are developed in hospital premises or on roof top of hospitals, HEMS helicopters can bring patients directly to/from hospital. This is a preferred practice and followed by most advanced countries. However, for operating from building roof-tops, SOPs are to be developed and approved by regulatory authority. Getting clearance from security agencies to use these facilities is another major hurdle.

A.4. Bad optics in a “socialistic, democratic” set-up is perhaps the biggest bane for aviation sector; and helicopters in particular. Touted as elitist’s mode of transport, policies and tax-structures are loaded heavily against it, making operational costs exorbitant. Pro-poor image conscious Government and politicians

are reluctant to even discuss these issues in public, though helicopters have now become a necessary accessory during elections these days.

B. Way forward:

Government may constitute a HEMS Mission for ensuring a coordinated, well-orchestrated, planned growth of HEMS. On a pilot basis, HEMS may be introduced by Ministry of Health for the people living in remote, mountainous and sparsely populated centers in North-East or Himalayan areas. MoRTH/NHAI/MoCA in consultation with insurance companies should frame policies for effective usage of HEMS to quickly evacuate critically injured road-accident victims to trauma-mitigation centres.

Govt may encourage establishment of Trusts/Societies to promote the use of HEMS. (Air-Ambulance, a philanthropists funded HEMS, operating from rooftop of Royal London hospital, has been responding to seriously-ill or injured-casualties in a London since 1990 and has flown over 17000 missions by 2005.)

MoCA/DGCA must:

- (a) review the regulatory measures to push growth of HEMS for public good
- (b) review the ATC procedures to accord priority in departures /arrivals of helicopters involved in EMS to meet golden hour requirement by notifying a dedicated and separate departure/arrival area with standardized route operating procedures for conducting HEMS missions as quickly as possible after the requirement for the mission arises.
- (c) request State governments and National Highway Authority (NHA) to develop Public use heliports for HEMS
- (d) involve private sector to develop heliports/helipads on fast track
- (e) encourage development of low cost heliports at every district headquarters and consider using old airports for general aviation and helicopter operation
- (f) request Min-of-Finance to reduce taxes on the ATF or bring it under GST; facilitate setting up of MROs in India and relax stringent conditions kept for the procurement and stocking of aircraft parts.
- (g) ensure that BCAS and MHA do not over-specify the security requirements, and also facilitate roof-top operations from hospitals.

(h) take up with MoRTH, NHAI, IRDA and insurance companies to work out an inexpensive solution for HEMS usage in highway sector.

AAI should (a) establish a Heliport Cell to oversee development of Heliports and Heli-routes (b) issue clear cut advisory circulars for design, construction and operation of roof-top heliports for hospitals, especially in metros (c) review ATC procedures to facilitate HEMS operations.

If Government sheds its ostrich-like approach to a booming aviation sector, reduces taxes on ATF, maintenance, spare parts of helicopters etc and brings-in a conducive regulatory framework similar to those in Europe or USA for operations of HEMS in India, many valuable lives can be saved.

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