



Fig. 1: The Japanese HEMS program started in 2001 with five base hospitals; this number increases year on year (Photograph: AgustaWestland)

Realising the potential: challenges and opportunities for HEMS in Japan

Helicopter Emergency Medical Service (HEMS) started in Germany in 1970 (1). Consequently many other European countries and the USA followed suit and established their own HEMS systems. However, for more than 25 years, many people in Japan regarded HEMS as useless – resulting in high costs and showing little benefit. In 1995, the Hanshin-Awaji earthquake hit Japan and killed more than 6,000 people. Buildings, houses and highways were destroyed. Search and rescue (SAR) personnel, transportation and emergency care were completely insufficient for the number of casualties. The scene was largely inaccessible by road ambulance because roads had been destroyed. Only 17 patients were evacuated and transported by helicopter during the initial 72 hours (2, 3).

Japanese HEMS

The Japanese government began implementing a Helicopter Emergency Medical Service (HEMS) system in 2001 – the “Doctor-Heli” scheme. It involves an emergency physician and nurse being dispatched to the scene for providing adequate treatment to the critical patient as soon as possible (4). The crew is made up of a pilot, a mechanic, an EMS doctor and a nurse. HEMS revolutionised the Japanese Emergency Medical Service system in general. The basic philosophy of HEMS is “from transport to treatment, from hospital to scene and from ground to sky” (5), and so we call the HEMS system “offensive emergency medicine”.

The Japanese HEMS program started with five base hospitals. The number of hospitals, as well as HEMS missions, increases year on year. The number of annual missions in the 2011 fiscal year was 12,923 – an increase of 37% on the 2010 fiscal year (6). By the end of 2012, there were 40 hospitals offering a HEMS program in Japan. Patient classification showed that trauma was the principle category making up 45%, followed by stroke at 15% and cardiovascular emergency at 12%. Traffic injuries made up 45% of the trauma cases. The fleet of EMS helicopters currently being operated in Japan consists of the following models: AW109SP, Bell 429, BK117, EC135 and MD900.

Authors:

Kunihiro Mashiko
Hisashi Matsumoto
Yoshiaki Hara
Takanori Yagi

Shock & Trauma Centre
Chiba-Hokusoh Hospital
Nippon Medical School
Chiba
Japan

HEM-Net – history and activities

Japanese HEMS was promoted further by strong support from the non-profit organization “Emergency Medical Network of Helicopters and Hospitals” HEM-Net (7), which was established in 1999. Mr Takaji Kunimatsu, chairman of the HEM-Net Board of Directors, was formerly president of the National Police Agency and also the former ambassador to Switzerland. HEMS progress in Japan over the last decade would not have been possible without his outstanding contribution. Thanks to the tremendous effort of HEM-Net, a special Doctor-Heli legislation was passed in June 2007 (8). The total budget for HEMS (2 million Euros in 2007) was covered 50/50 by national and local government taxes. HEM-Net funds are also generated through donations from large businesses or industrial organisations. Although the means for covering HEMS operation cost differ from country to country, in Japan, the national government and local governments had to split the total budget, half each.

Thanks to a lobbying group of assembly members from both the governing and opposition parties, who are advocating HEMS, the ratio of HEMS budget distribution changed in 2009. The national government now has to contribute 75% to 90% and local government between 10% and 25% – depending on the budget of the local government. This means, the local governments have to pay only 0.2 to 0.5 million euros per year for the HEMS program.

“Public-private Partnership”

The Doctor-Heli Widespread Use Promotion Panel (DHWUPP) was formed in August 2010 (9) in Nippon Keidanren (Japanese Federation of Economic Organisations). In order to promote the nationwide deployment of HEMS, DHWUPP supports training of physicians and nurses, conducts HEMS research and holds seminars. HEM-Net started a flight physician/nurse training program in April 2010. One concept of this program is that the 10 base hospitals are responsible for providing between 2 weeks to 3 months training, depending on the trainee’s experience and knowledge as well as “on-the-job-training” supervised by the HEMS crews. The number of graduates who had participated in the HEM-Net fellowship program until December 2012 is 44 physicians and 76 nurses.

Recently, the concept of New Public Management has become popular in Japan. It means that public property should receive financial support from the government as well as the private sector. As mentioned above, the Doctor-Heli system is supported by a group of assembly members; that means the public sector and the DHWUPP of Nippon Keidanren (private sector) jointly support HEMS. Therefore, Doctor-Heli is a typical example of services established under this New Public Management principle in Japan.

Effect of HEMS

Transferring the seriously ill and injured is becoming a more formalised procedure across the globe. Along with this EMS innovation, lots of studies have been conducted to evaluate the value of HEMS from various viewpoints



Fig. 2: A special Doctor-Heli legislation was passed in June 2007, thanks to the tremendous effort of HEM-Net (Photograph: K. Mashiko)

(10, 11, 12, 13). The primary factor is not the speed of the transport but the helicopter medical crew administering life-saving care at the scene of the accident or at the outlying hospital.

We have already stated that HEMS has improved the outcome of life-threatening trauma patients in the Japanese emergency medical system. Kerr et al. (14) suggested rapid air transport of victims in traumatic events by specialised personnel in Maryland has a positive effect on the outcome of severely injured patients.

Annual change in traffic injury statistics in Japan shows a rapid reduction of traffic injury death since the introduction of HEMS (15). That is to say that the number of deaths has decreased significantly due to the HEMS system. The rate of traffic accident deaths (24 hour death) in Japan was 3.5 per 100,000 population in 2012.

Golden Hour Strategy

The goal of trauma care is to get seriously injured patients into a trauma centre for diagnosis, critical care and appropriate surgical treatment within the “golden hour” (16). It recommends that EMS notification takes less than 1 minute, EMS arrival at scene takes less than 10 minutes, with hospital admittance in under 45 minutes and definitive care within 60 minutes (17). In Japan, the time

Fig. 3: In Japan, the time from HEMS call to helicopter landing at scene (response time) is 18 minutes (Photograph: K. Mashiko)



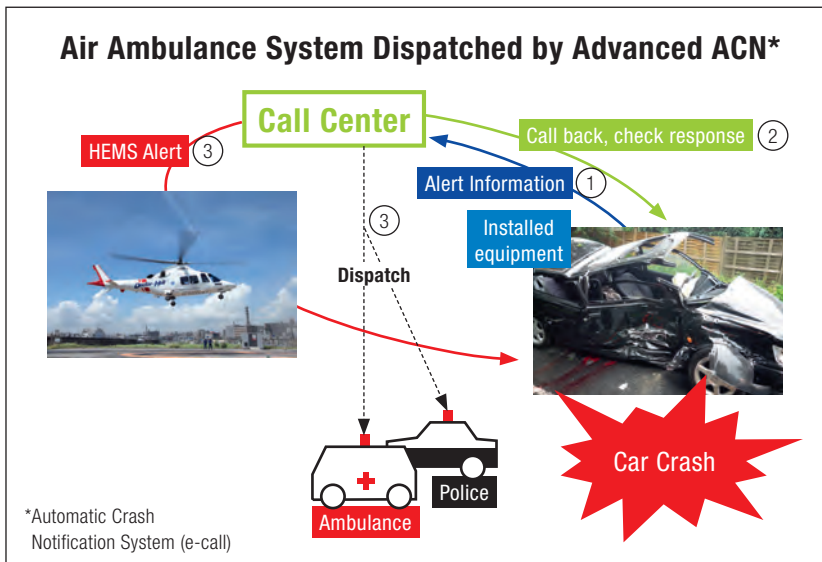


Fig. 4: Crash data may include information about crash severity, the direction of impact, air bag deployment, multiple impacts and rollovers (if appropriate sensors are part of the system)

lapse from a crash to EMS notification is 5 minutes. The time from EMS notification to HEMS call is 15 minutes and time from HEMS call to helicopter landing at scene (response time) is 18 minutes (18). Therefore, the HEMS doctor starts medical treatment 38 minutes after crash and the time interval from crash to the arrival at hospital is 67 minutes, which is too late to save the life of a critically injured patient.

In order to reduce the time interval from EMS notification to HEMS dispatch, the decision to call Doctor-Heli should be managed by dispatch personnel from the fire department. We created a key word system for HEMS dispatch such as fall from height, intrusion of the car, ejection, rollover, etc. for trauma, which means high-impact accident. In the case of medical emergencies, loss of consciousness, convulsion, severe headache with vomiting over 40 years old, chest or back pain with sweating over 40 years old, etc. are good candidates of the keywords (19).

Automatic Crash Notification

Now it is planned to introduce the Advanced Automatic Collision Notification (AACN) system (20). The AACN sends crash data to an advisor if a vehicle is involved in a moderate or severe crash. These data include information about crash severity, the direction of impact, air bag deployment, multiple impacts and rollovers (if appropriate sensors are part of the system) and accident site information (via GPS). Advisors can relay this information to emergency dispatchers, helping them to quickly determine the appropriate combination of emergency personnel, equipment and medical facilities. This AACN information may also include injury prediction – derived from the above-mentioned information.

The dispatch centre operator may also be able to make a call to the person inside the vehicle if he or she needs ambulance help. If the answer is “yes” or if there is no answer, the operator asks the police and fire department to send a police car and a ground ambulance to the scene (21). Fig. 4 shows the usual style of the AACN and new HEMS alert pathway using AACN, which will be


added in the near future. MacKenzie et al. (22) reported that the overall risk of death is significantly lower when care is provided in a trauma centre than when it is provided in a non-trauma centre.

In December 2011, AACN simulation was performed by HEM-Net, in which an AACN car crashes into a concrete wall at a speed of 50 km/h. An ambulance and a Doctor-Heli dispatch were performed from the call centre based on AACN information, and time from crash to initiating medical care by HEMS doctor at the scene was measured. The distance from the accident site to a HEMS base hospital was 40 km. As a result of this study, the time from crash to medical treatment at the scene was 21 minutes using AACN. It is estimated that the time taken to provide medical treatment using AACN & HEMS in car crashes is reduced from 36 minutes to 21 minutes after crash. Therefore it is clear that we can save many critically injured lives with AACN & HEMS. Key aspects for establishing AACN in Japan: system construction on national scale, institutional design with the Event Data Recorder, call centre installation from medical viewpoint which means implementing air ambulance dispatch protocol, standard real time instruction and advice to Emergency Medical Technicians.

Future Perspectives

In Japan, Doctor-Heli is already recognised as an essential tool for critically injured or ill patients suffering from trauma, stroke, cardiovascular disease etc. who require critical care transport. However, in the future, Doctor-Heli will have a very important role to play in disaster relief, which means medical evacuation/SAR, paediatric emergency, obstetric and perinatal emergency and rural emergency. The keywords for future HEMS are medical consolidation and hospital collaboration. The future objectives of Japanese HEMS are:

- Nationwide HEMS coverage (50 to 70 bases)
- System planning, such as the 15-minute-rule in Germany to improve response time
- Expansion of mission times from daytime to night
- Coordinated system of Doctor-Heli and fire department helicopters (25); 73 rotorcraft

In the Great East Japan Earthquake that occurred on 11 March 2011, with a magnitude of 9.0, on the Pacific coast of the Tohoku Region (the north-eastern part of the Japanese mainland), and which had unbelievably devastating effects (26, 27), 18 rotorcraft out of the 26 Doctor-Heli helicopters were dispatched countrywide and promptly flew into the disaster area and saved 149 patients within the first 4 days of the MEDEVAC mission. It is possible that this stands as a best-practice example of how HEMS should work. 

For more information, visit:

» [www.http://hemnet.jp](http://hemnet.jp)

For references, please visit:

» www.airrescue-magazine.eu