

How to Improve the Doctor Helicopter System in Japan

Rin Gotoh¹, Ayami Morikawa¹, Momoko Soeda¹, Takumi Yasuda², Yoshino Tanaka³
University of Tsukuba¹, Tokushima University², International University of Health and Welfare³



Introduction

Doctor helicopters are one of the ways of transferring patients, and in Japan, it's the fastest. This term may not be common in the world, but it's a kind of Helicopter Emergency Medical Service, or HEMS. The standout feature of doctor helicopter is that it carries doctors and nurses directly to the place where patients are waiting, which has enabled medical staff to reach the sites for delivering early therapeutic intervention. Japan has the long and narrow land mass measuring about 3000 km from North to South and the population is diffused everywhere across that. Additionally, mountains occupy about three-fourths of the land and Japan also has a lot of islands. Theses geographic features make doctor helicopters a necessity for Japan's safety. However, there are several problems. For example, some places are not covered by doctor helicopter services and some hospitals are too busy while the others are not. Today, taking those into consideration, we would like to present our idea of how we can improve the doctor helicopter system in Japan.



Figure 1
Picture of
doctor
Helicopter i

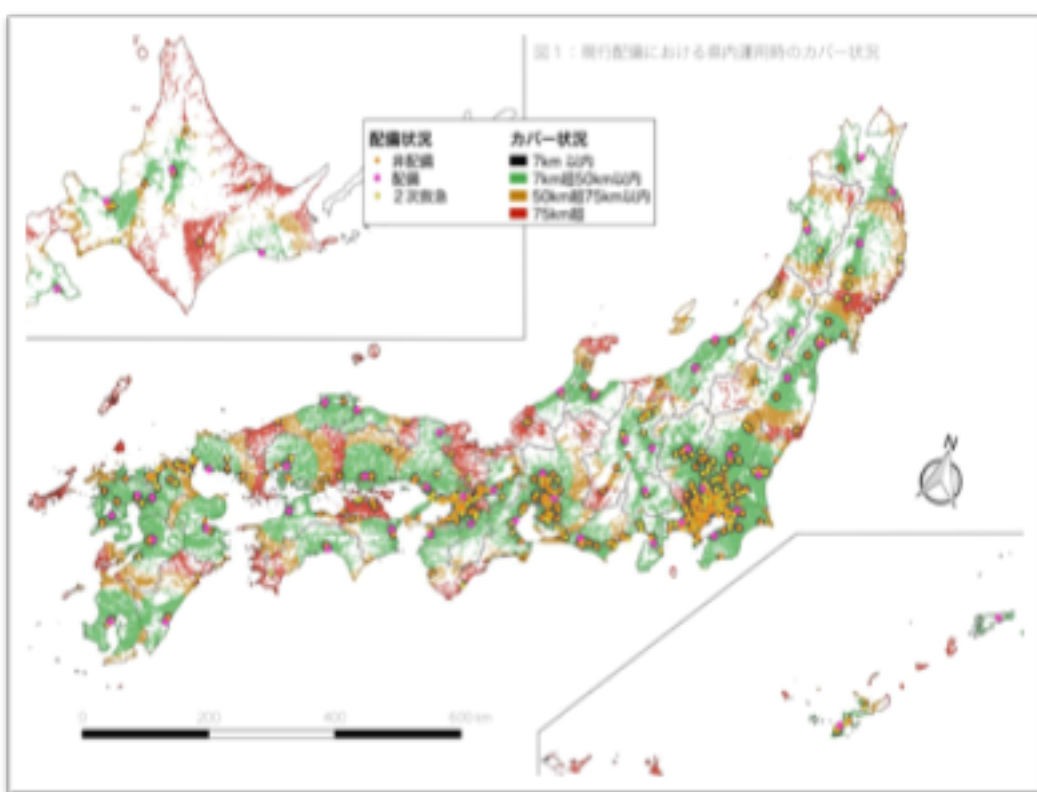


Figure 2 ▶
Map of
Japan ii

Methods

We compared doctor helicopter systems among Japan, Shizuoka Prefecture (Japan), Italy, Germany and Switzerland.

Results

Table 1 i iii iv v vi

Country or region	Japan	Shizuoka prf	Italy	Germany	Switzerland
Populaton (thousand people)	126,800	3,642	60,480	82,790	8,556
Land Area (Km ²)	378,000	7,777	301,300	357,400	41,280
Population density	335.449	468.303	200.73	231.645	207.267
Number of helicopter (number of base)	53(52)	2(11)	(51)	78	17(13)
Major Operators	Public	Public	Public	ADAC, DRF	Rega
Funding	Public	Public	Public	Public-private	Private
Boarding staff	4 (pilot, mechanic, doctor, nurse)	4 (pilot, mechanic, doctor, nurse)	4 (2 pilots, doctor, nurse)	4 (pilot, doctor, 2 paramedics)	
Rescue Hoist	×	×	○	×	○
Operating hour	8am~sunset	8am~sunset	24h	7am~sunset	
The number of dispatch	27,901	1,660		106,414	11,186
Cover range (km radius)	50~75	40,80	80	50	
Respons time (min)	20	15	8~20	8	15(latest)
Strong points		Relatively fast respons	Satellite navigation system	The model of Munich	Smartphone applicaton
Weak points		Too much operating			Late arrival in spite of the range
Features		keyword respons			

Figure 3
Cover range of
Germany vii

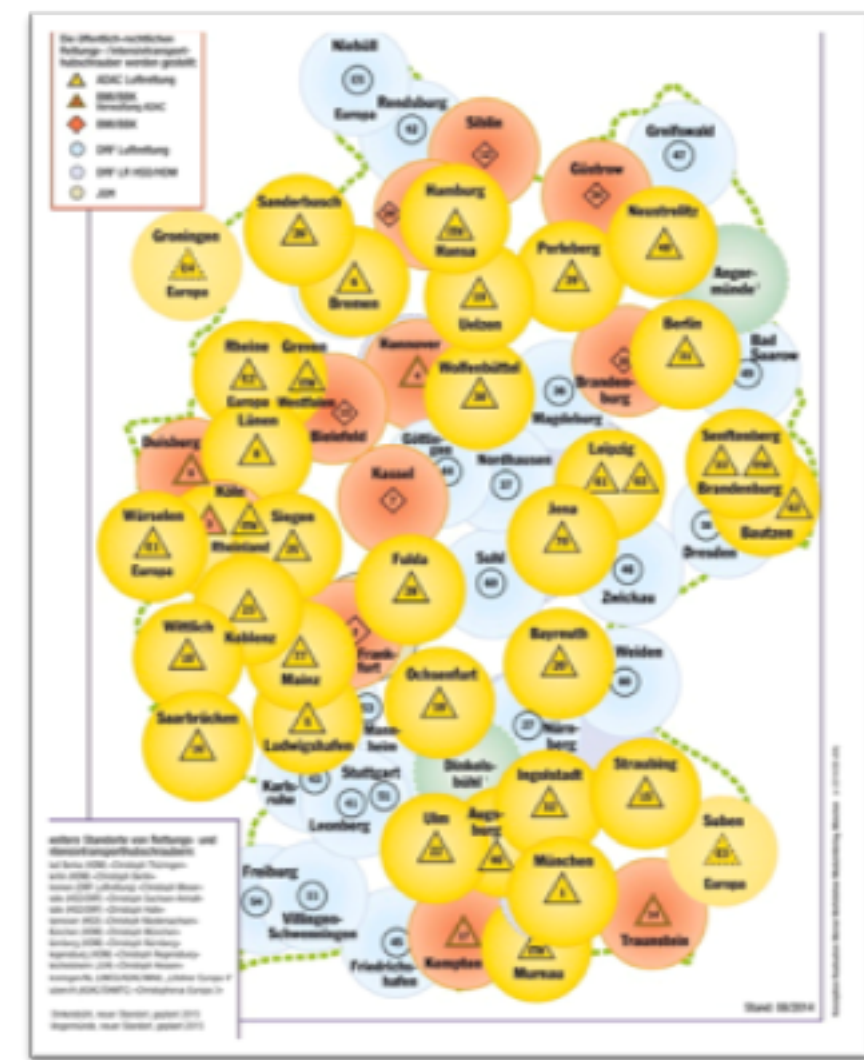


Figure 4
Cover range of
Italy i

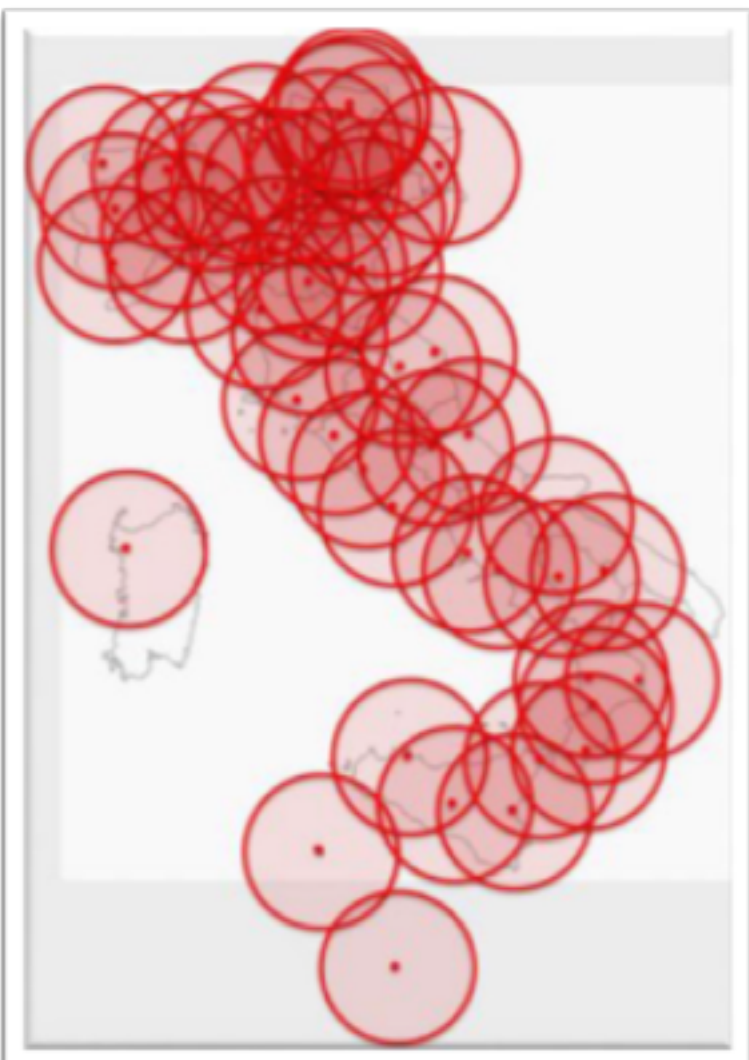


Figure 5
Helicopter bases in
Switzerland iii



Discussion

From our study we can make a number of observations. Firstly, the average arrival time in Japan is relatively late; the fastest is Germany. This could be because Japan owns fewer helicopters. So we calculated the number of aircraft required in Japan with reference to the number of helicopters per population in Germany and came to a figure of 120 units. Currently, however there are only 53 units. To increase the number of helicopters up to 120 would be a significantly expensive investment.

To address this problem we focused on the Swiss system, which uses a membership system to cover the cost of the doctor helicopter services. Like the Swiss system, we propose shifting to a personal burden under a membership system. We calculated the annual cost per member would be 700 yen (\$6.5). The reason it has not been a personal burden in Japan until now is the ethical issue of equal access to medical care. But at this price, we considered that nearly every citizen could join.

Switzerland has other effective systems, too. One is the smartphone application by which people can easily contact the doctor helicopter operation center and the information of their location and health data stored in the app are automatically sent. This can save valuable time in an emergency and reduce mistakes.

Another important feature is the rescue hoist. This enables operation not only in mountainous areas and rough terrain, but also in urban areas with narrow roads. In addition, no time is required for setting up a rendezvous point where the helicopter can land.

In Italy they have an effective satellite navigation system. With this system, pilots can accurately grasp not only the location information but also the altitude, regardless of the weather day and night. Therefore, this enables operation at night and in bad weather, which is not currently available in japan.

From the above, the conclusions were drawn.

※1 Helicopter adopting costs per unit: 300,000,000 yen (\$2,800,000)
Helicopter durable year: 30 years
Helicopter running cost per unit per year: 200,000,000 yen (\$1,870,000)

Figure 6

Application screen 1 iii



Figure 7

Application screen 2 iii

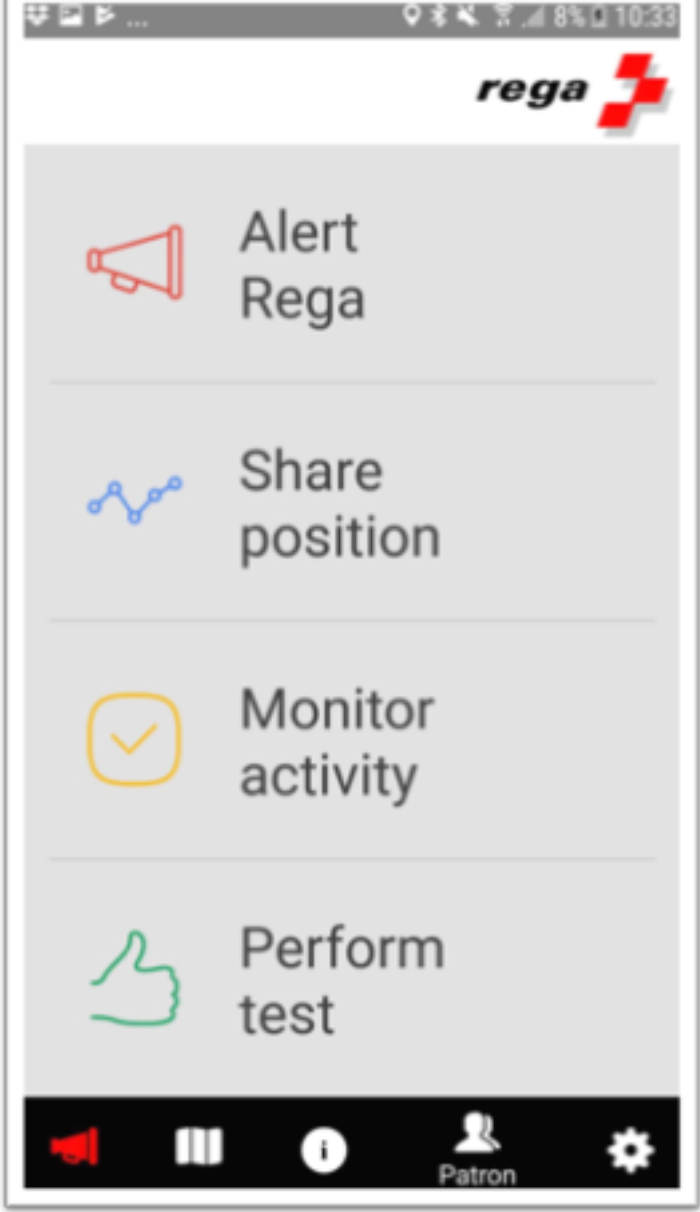
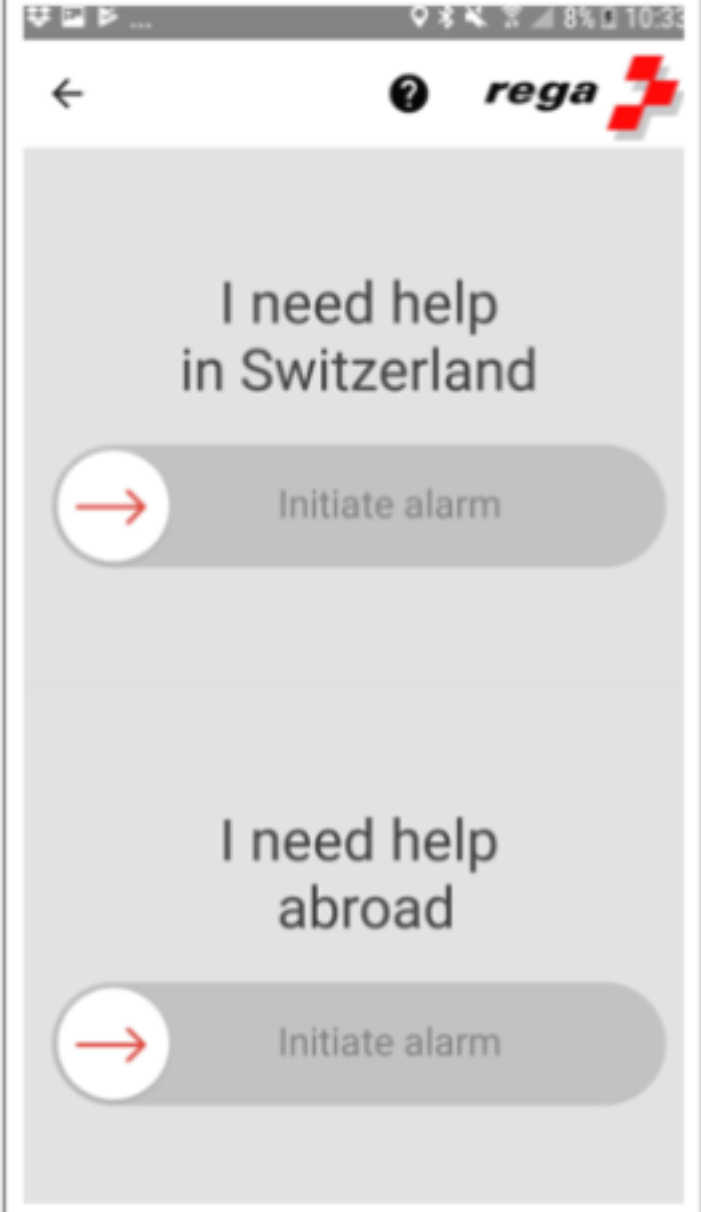


Figure 8

Application screen 3



Conclusion

As a result of comparing the Japanese system with those of 3 countries, we concluded that the following ideas would make our system better: increase the number of doctor helicopter up to 120; adopt membership system; create an application; use hoist; adopt satellite navigation system.

Reference

i. Emergency Medical Network of Helicopter and Hospital HEM-Net. (2008). *HEM-Net*. Retrieved from <http://www.hemnet.jp/>

ii. Inoguchi, S. (2018, September 27). *Study on the issue of doctor helicopter*. Retrieved from <https://www.mhlw.go.jp/content/10802000/000360983.pdf>

iii. Rega - Swiss Air-Rescue. (2019) *Rega*. Retrieved from <https://www.rega.ch/en/>

iv. Japanese Society for Aeromedical Services. *Doctor helicopter around the world*. Retrieved from <https://plaza.umin.ac.jp/GHDNet/circle/17/c1123.pdf>

v. Doctor helicopter. *Seirei Mikatahara General Hospital*. Retrieved from <http://www.seirei.or.jp/mikatahara/activity/emergency/doctor-helicopter/index.html>

vi. Doctor Helicopter. *Juntendo University Shizuoka Hospital*. Retrieved from <https://www.hosp-shizuoka.juntendo.ac.jp/departmen/lifesaving/doctor-helicopter/>

vii. *Medizin Verlag Werner Wolfsefellner – München*. Retrieved from <http://www.wolfsefellner.de/liste-der-stuetzpunktkarten.html>