Air Medical Journal 41 (2022) 376–379

Contents lists available at ScienceDirect

Air Medical Journal

journal homepage: http://www.airmedicaljournal.com/

Original Research

Analysis of the Activities of a Physician-Staffed Helicopter in the Coronavirus Disease 2019 Pandemic Phase

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A B S T R A C T

Objective: The purpose of this study was to investigate changes in the duration of activity of a physician-staffed helicopter emergency medical service (HEMS) in Eastern Shizuoka Prefecture before and during the coronavirus disease 2019 pandemic.

Methods: We retrospectively investigated the duration of dispatch activities from February 2020 to June 2021 (pandemic group, n = 1,032) and from April 2016 to January 2020 (control group, n = 3,054).

Results: There were no significant differences in the average age, percentage of male patients, interval from the request of HEMS dispatch to arrival, interval from arrival at the scene to leaving the scene, interval from leaving the scene to arrival at the hospital, or the ratio of requests for HEMS dispatch from the local fire department between the control and pandemic groups. In contrast, the interval from the first call to HEMS dispatch in the control group was significantly shorter than that in the pandemic group, and the ratio of requests for HEMS dispatch before contacting patients in the control group was significantly greater than that in the pandemic group.

Conclusion: The interval from the first call to HEMS dispatch was prolonged in the COVID-19 pandemic period. However, the actual activity time of the HEMS was not affected.

Since the outbreak of coronavirus disease 2019 (COVID-19) in late December 2019, there has been a worldwide pandemic in over 200 countries and regions around the world. In Japan, from January 3, 2020, to November 20, 2021, 1,726,063 confirmed cases of COVID-19 and 18,342 deaths were reported to the World Health Organization (https://covid19.who.int/). In Japan, to prevent COVID-19 infection, the Japanese government has recommended that people wear a mask, disinfect their hands with alcohol frequently, stay 2 m from others, avoid going out unnecessarily, and avoid the 3 C's (ie, closed spaces with poor ventilation; crowded spaces with many people; and close contact including intimate conversation, loud cheering, and exercise within close proximity to other persons) [1].

In 2004, our hospital in Eastern Shizuoka Prefecture, which is a popular sightseeing and leisure spot for people who live in metropolitan areas such as Tokyo, began to provide a physician-staffed helicopter emergency medical service (HEMS) and directly transported patients with various diseases and injuries from the scene to a medical facility or performed interhospital air transportation [2]. In Japan, the HEMS is used during daytime, and a request for dispatch can only be executed by the fire department or physicians in medical facilities. Our hospital (Juntendo University Shizuoka Hospital), which is located approximately 130 km southwest of Tokyo, serves as the base hospital for the HEMS in Eastern Shizuoka Prefecture and performed the second greatest number of HEMS dispatches in Japan in 2019. However, the number of HEMS dispatches in the Eastern Shizuoka Prefecture decreased since the COVID-19 pandemic started [3].

On April 21, 2020, at the start of the COVID-19 pandemic, the Japanese Society for Aeromedical Services recommended that HEMS not transport patients with COVID-19 and not transport patients who were considered to possibly be infected with COVID-19 after a

Supported in part by a Grant-in-Aid for Special Research in Subsidies for ordinary expenses of private schools from The Promotion and Mutual Aid Corporation for Private Schools of Japan.

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1067-991X/$36.00

https://doi.org/10.1016/j.amj.2022.04.007

medical check by the HEMS staff (https://square.umin.ac.jp/jsas/attachment/COVID-19_unyo0421.pdf). Patients with COVID-19 appear to have a higher risk of vascular events such as pulmonary embolism, acute coronary syndrome, and ischemic stroke as a result of endotheliopathy due to direct endothelial infection with COVID-19 and the indirect damage caused by inflammation [4–6]. Furthermore, some patients with COVID-19 present with either unrelated conditions (such as trauma) or vascular emergencies without typical signs (eg, fever, cough, or dyspnea) [7]. To treat such patients, we had to execute an "all hazards approach," including enforcing the use of personal protective equipment (eg, an N95 mask, face shield, and special gown) and history taking concerning recent personal behavior or the possibility of close contact with COVID-19 patients. Accordingly, it is possible that the activity of the HEMS was prolonged because of the COVID-19 pandemic. The purpose of this study was to investigate the changes in the duration of HEMS activity in Eastern Shizuoka Prefecture both during and before the pandemic.

Methods

The protocol of this retrospective study was approved by our institutional review board, and examinations were conducted according to the standards of good clinical practice and the Helsinki Declaration.

We investigated the dispatch activity from February 2020 to June 2021 (COVID-19 pandemic period [the pandemic group]) and from April 2016 to January 2020 (before the COVID-19 pandemic period [the control group]). The following details of the dispatch activity were collected: patient age and sex, the interval from the first call to the fire department to HEMS dispatch, the interval from the request for HEMS dispatch to arrival at the rendezvous area, the interval from arrival at the rendezvous area to leaving the rendezvous area, and the interval from leaving the rendezvous area to arrival at the hospital. We also investigated whether the request for HEMS dispatch was made before or after emergency medical technicians (EMTs) contacted the patients. In addition, we investigated whether the request for HEMS dispatch was made by a local fire department where our hospital was located. Furthermore, we investigated the temporary diagnosis made at the scene by the physician on board the HEMS by classifying cases into endogenous or exogenous diseases. Finally, we compared the number of cardiac arrest events between the 2 groups. The exclusion criteria were interhospital transportation, leaving the patients at the rendezvous area due to mild symptoms (these patients were transported to a nearby medical facility by ground ambulance), and if the aforementioned data were lacking.

The data were analyzed using the Student unpaired *t* test and the chi-square test. *P* values <.05 were considered statistically significant. Data are shown as the mean ± standard deviation.

Results

Overall, there were 4,583 dispatches in the control group and 1,783 dispatches in the pandemic group. Among these, the following cases were excluded: interhospital transportation (control group, n = 946; pandemic group, n = 449), dispatches in which the patient was not transported by HEMS (control group, n = 449; pandemic group, n = 265); and missing data (control group, n = 134; pandemic group, n = 37). After excluding these subjects, 3,054 dispatches in the control group and 1,032 dispatches in the pandemic group were analyzed.

Table 1 shows the results of the investigation. There were no significant differences in the average age, percentage of male patients, interval from the request of HEMS dispatch to arrival, interval from arrival at the scene to leaving the scene, interval from leaving the scene to arrival at the hospital, ratio of requests for HEMS dispatch from the local fire department, or ratio of endogenous/exogenous disease between the control and pandemic groups. In contrast, the interval from the first call to HEMS dispatch in the control group was significantly shorter than that in the pandemic group, and the ratio of requests for HEMS dispatch before contacting patients (84.7% vs. 77.6%) and of patients with cardiac arrest (8.3% vs. 5.2%) in the control group were significantly greater than those in the pandemic group.

Table 2 shows the details of endogenous diseases, and Table 3 shows the details of exogenous diseases. Among these diseases, the greatest change in the percentage between the 2 groups was observed for cardiac arrest.

Discussion

To the best of our knowledge, this is the first report to demonstrate that the interval from the first call to the HEMS dispatch before the COVID-19 pandemic was significantly shorter in comparison to during the pandemic. However, the actual activity time did not differ between the control and pandemic groups. Previous reports showed how to manage COVID-19 patients during air medical evacuation or how to prepare medical and flight staff during the COVID-19 pandemic in order to avoid COVID-19 infection [8–14]. Gardiner et al [15] investigated trends in air medical evacuation by comparing the prelockdown, lockdown, and postlockdown times during a period of COVID-19 social isolation [15]. As a result, the number of air medical evacuations was reduced during the lockdown period. However, they did not investigate the timing of HEMS activities.

One possible reason why the interval from the first call to HEMS dispatch in the control group was significantly shorter than that in the pandemic group was that the fire department might have hesitated in making urgent requests for HEMS dispatch because the HEMS had a policy of not transporting patients with COVID-19 and did not transport patients with possible COVID-19 infection. Before the COVID-19 pandemic, the fire department tended to use key word methods to execute

Table 1
Results of Activity in Eastern Shizuoka Prefecture Before (Control Group) and During (Pandemic Group) the Coronavirus Disease 2019 Pandemic Period

	Control (n = 3,054)	Pandemic (n = 1,032)	*P* Value
Age (years)	57.4 ± 23.6	58.9 ± 23.2	.07
Sex (male/female)	2,110/944	723/309	.55
Interval (min)			
From first call to dispatch of HEMS	13.6 ± 9.2	14.9 ± 9.7	.005
From dispatch of HEMS to arrival at scene	21.2 ± 6.7	20.8 ± 6.2	.32
From arrival at scene to leaving scene	14.8 ± 4.1	14.7 ± 7.0	.90
From leaving scene to arrival at hospital	42.1 ± 11.0	41.6 ± 10.0	.56
Request of HEMS before contacting patients (yes/no)	2,589/465	801/231	<.0001
Request of HEMS from local fire department (yes/no)	1,162/1,892	361/671	.07
Endogenous/exogenous disease	1,370/1,684	451/581	.41
Cardiac arrest (yes/no)	256/2,798	54/978	.001

HEMS = helicopter emergency medical service.

Table 2
Details of Endogenous Disease

Diagnosis	Control	(%)	Pandemic	(%)	Total
Stroke	396	28.9	133	29.5	529
Acute coronary syndrome	243	17.7	84	18.6	327
Cardiac arrest	192	14.0	50	11.1	242
Convulsion	107	7.8	37	8.2	144
Consciousness disturbance	93	6.8	31	6.9	124
Acute aortic dissection	64	4.7	28	6.2	92
Heart failure	58	4.2	18	4.0	76
Bowel bleeding	32	2.3	15	3.3	47
Respiratory failure	42	3.1	12	2.7	54
Arrhythmia	37	2.7	10	2.2	47
Shock	27	2.0	9	2.0	36
Syncope	25	1.8	9	2.0	34
Acute abdomen	18	1.3	6	1.3	24
Sepsis	18	1.3	6	1.3	24
Gynecologic disease	13	1.0	2	0.4	8
Mental disease	5	0.4	1	0.2	6
Total	1,370	100.0	451	100.0	1,821

early requests for HEMS dispatch to facilitate early medical intervention by physicians. For example, if the first call included chest pain, the patient might have acute coronary syndrome. In such cases, the fire department would request HEMS dispatch before the EMT checked the patient. Key words for dispatch of the Eastern Shizuoka HEMS include unconsciousness, pulseless, dyspnea, chest pain, severe back pain, sudden-onset severe headache, paralysis, dysarthria, suffocation, ongoing convulsion, high-energy trauma, drowning, or decompression illness. However, since the start of the pandemic period, patients with these findings may be infected with COVID-19. Accordingly, the fire department may execute a request for HEMS dispatch after the EMTs checked the patient to determine whether or not the patient had fever, dyspnea, or low oxygen saturation. The finding in the present study that the ratio of requests for HEMS dispatch before contact with the patient was significantly greater in the control group than in the pandemic group may support our hypothesis. Another possibility was that the fire department conducted patient history taking concerning recent personal behavior or the possibility of close contact with COVID-19 patients when deciding whether or not to request HEMS dispatch. Such history taking may have prolonged the first call to request HEMS dispatch.

One possible reason as to why the actual activity time did not differ between the control and pandemic groups was regarding our efforts to avoid prolonging the activity time of the HEMS staff. For example, we always donned the personal protective equipment during the flight. Furthermore, the EMT contacted the patient for COVID-19–related history taking using a cellular phone while the flight was inbound. Such ingenuity might affect our activity of the HEMS.

In the present study, the ratio of patients with cardiac arrest in the pandemic group was significantly smaller than that in the control group. In Japan, which has an aging society, the annual number of deaths is expected to increase until 2040 [16]. In addition, there were no fatal cases due to COVID-19 in Japan from April 2016 to January 2020 (the same period as that for the control group) and 14,784 fatal cases due to COVID-19 from February 2020 to June 2021 (the same period as that of the pandemic group). However, surprisingly, the total number of deaths in 2020 in Japan (during the COVID-19

Table 3
Details of Exogenous Disease

Diagnosis	Control	(%)	Pandemic	(%)	Total
Trauma	1,327	78.8	464	79.9	1,791
Extremity	413	24.5	154	26.5	
Head	256	15.2	85	14.6	
Spine	155	9.2	60	10.3	
Multiple	161	9.6	60	10.3	
Chest	164	9.7	49	8.4	
Pelvis	100	5.9	30	5.2	
Face	44	2.6	14	2.4	
Abdomen	31	1.8	11	1.9	
Perineum	3	0.2	1	0.2	
Anaphylaxis	72	4.3	38	6.5	110
Suffocation	33	2.0	23	4.0	56
Burn	32	1.9	15	2.6	47
Drowning	47	2.8	12	2.1	59
Heat stroke	37	2.2	12	2.1	49
Decompression illness	27	1.6	5	0.9	32
Cardiac arrest	64	3.8	4	0.7	68
Hypothermia	15	0.9	4	0.7	19
Intoxication	20	1.2	2	0.3	22
Electrocution	3	0.2	2	0.3	5
Foreign body ingestion	3	0.2	0	0.0	3
Mountain sickness	4	0.2	0	0.0	4
Total	1,684	100.0	581	100.0	2,265

pandemic period) was 0.6% lower than in 2019. This decrease in death due to infection was likely due to the effectiveness of countermeasures implemented to prevent COVID-19 [3,16,17]. In addition, the Japanese national government and Tokyo metropolitan government implemented state of emergency measures, such as asking the public to refrain from going out and crossing into other prefectures. These measures resulted in a decrease in the number of tourists visiting Eastern Shizuoka Prefecture by not only public transport but also private cars and motorcycles, which may have otherwise led to fatal accidents. These events might have resulted in the decrease in the number of patients with cardiac arrest in the pandemic group.

The present study was associated with some limitations, including its single-center and retrospective design. In addition, the final patient outcomes and the activities of the fire department were not investigated.

Conclusion

The interval from the first call to HEMS dispatch was prolonged in the COVID-19 pandemic period. However, the actual activity time of the HEMS was not affected.

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