

The role of the Helicopter Emergency Medical Service as support for ground emergency medical services.



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ABSTRACT

INTRODUCTION: An essential link in the rescue system is the Polish Medical Air Rescue (PMAR). In Poland, PMAR helicopters are stationed at 21 permanent bases. Air teams are available directly to the place of the incident and as inter-hospital transport. They also play a significant role when they reach the patient first before the arrival of the ground emergency medical services (EMS).

MATERIAL AND METHODS: The study was conducted based on data from 2017-2018 covering 687 missions of "Rescuer 19" - a helicopter stationed in Sokołów Podlaski (eastern region of central Poland). The results of own research were expressed in the form of arithmetic means and average standard errors. To determine the relationship between variables, the Chi-square, and r-Pearson test was used. All results were considered significant at $p < 0.05$.

RESULTS: In 2017, the PMAR team performed 250 missions, and in 2018 - 437. "Rescuer 19" in 71.9% of cases was available to support ground EMS, and only 17.8% was available alone. The average time of arrival to call in 2017-2018 was $M=20$ [min] ($SD\pm 8.86$), from the start $M=17$ [min] ($SD\pm 7.32$), duration of the mission since the call $M=114$ [min] ($SD\pm 49.33$), from the start $M=108$ [min] ($SD\pm 50.71$), and the distance $M=40.4$ [km] ($SD\pm 25.16$).

CONCLUSIONS: The vast majority of PMAR missions are HEMS flights. An air ambulance team is available in most cases as support for ground EMS. Only every fifth HEMS mission is carried out by PMAR alone, without ground EMS.

KEYWORDS: HEMS, PMAR, medical air rescue, emergency medical services, ambulance, rescue flights

INTRODUCTION

The Emergency System (ES) In Poland is prioritized to provide medical assistance to patients in a state of emergency. The above actions are performed by units of the ES, as well as by units from the National Rescue and Firefighting System (NRFS), which closely cooperate with it. Nowadays, every day there are accidents and sudden illnesses, where the implementation of emergency medical services (EMS), followed by further treatment in hospital emergency room (ER) or in other specialized facilities (e.g., Burn Treatment Center, Trauma Center) is the only way to increase the chances of survival for patients. Then, EMS appears at the place of call, in the form of wheeled ambulances, boats or helicopters [1].

The history of Polish Medical Air Rescue (PMAR) is rich and interesting. Already in the interwar period, sanitary aviation operated, but throughout this period the planes were used only for transports [2]. It was not until 2000 that the Independent Public Health Care Aviation Emergency Service „SP ZOZ LPR” was established, which changed its priorities and focused primarily on Emergency Medical Services, followed by inter-hospital transport.

In 2010, the PMAR acquired funds for the purchase of 23 new EC 135 helicopters. Fleet replacement allowed, among others, to fly not only during the day but also at night [3]. Now there are 21 permanent bases in Poland, including 4 round the clock and one seasonal base which is being launched during the summer holidays.

The base in Sokołów Podlaski (eastern region of central Poland) is located at ul. Aleja 550-lecia, in which a helicopter codenamed "Rescuer 19" is stationed. It is one of the youngest bases in Poland. The Sokołowska branch began its work at the end of November 2016. The authors of the work attempted to assess the extent to which PMAR support ground emergency medical service (G-EMS) on the example of the base in Sokołów Podlaski.



Figure 1. Currently used EC 135 helicopters in PMAR. [1]

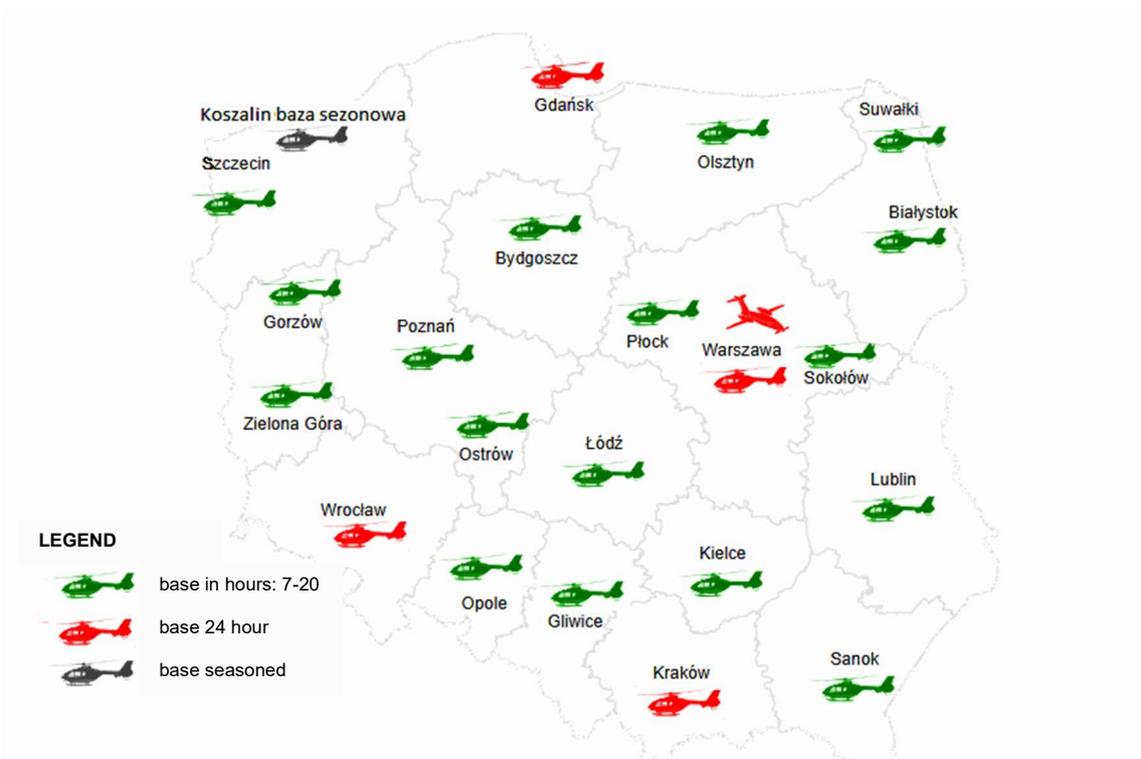


Figure 2. Arrangement of PMAR bases

MATERIAL AND METHODS

The research was carried out based on data obtained from the Department of PMAR. The acquired data include 687 "Rescuer 19" missions carried out in 2017-2018, which is stationed in Sokołów Podlaski. The results of own research were expressed in the form of arithmetic means and average standard errors. To determine the relationship between variables, the Chi-square, and r-Pearson test was used. All results were considered significant at $p < 0.05$.

RESULTS

Implemented missions

In the years 2017-2018 "Rescuer 19" stationed in Sokołów Podlaski intervened a total of 687 times. Presented in Table 1 is A detailed list of completed missions .

Table 1. Number of PMAR in Sokołów Podlaski team missions in 2017-2018.

The year and type of mission	2017		2018	
	HEMS flight	Rescue transport	HEMS flight	Rescue transport
Mission status				
Accomplished	198	38	342	50
Cancelled	6	0	38	1
Unfulfilled	8	0	5	1
Together	212	38	385	52
All accomplished missions	250		437	
Together	687			

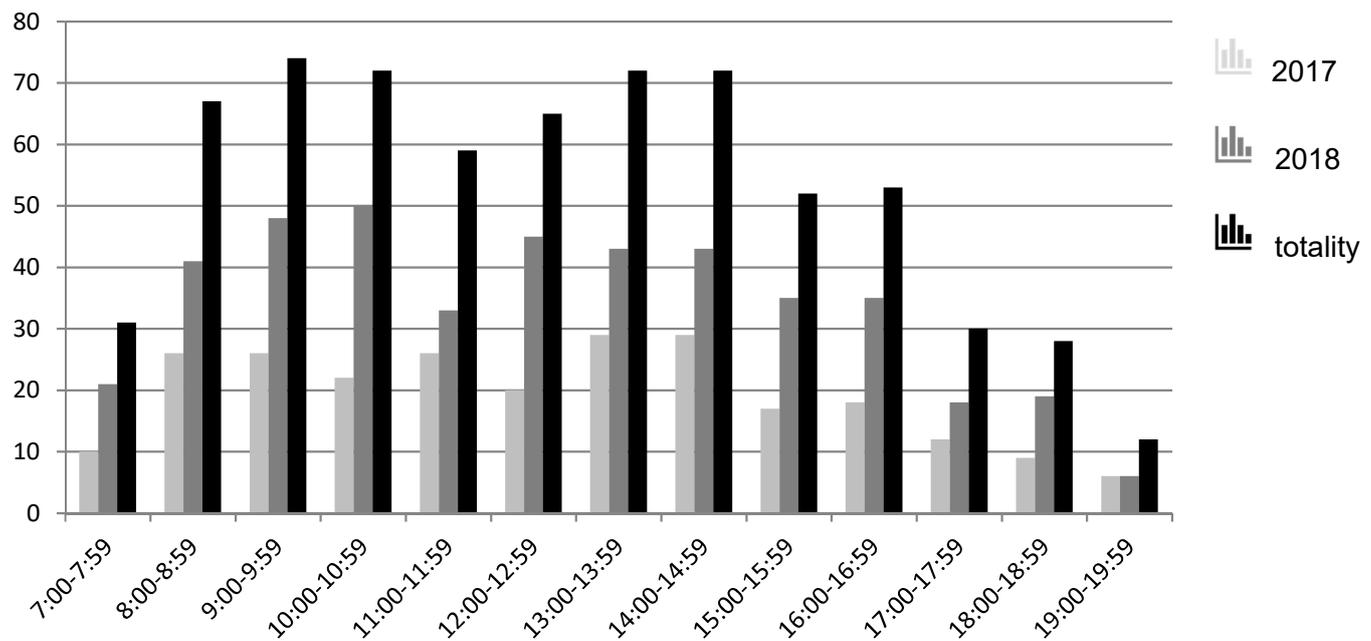


Figure 3. The number of interventions depending on the time of day.

An increase in the number of flights performed by the PMAR helicopter after 8:00 was noted. The numbers specifying the number of departures depending on the time remain at a similar level until 15:00. Since during these hours the base is not open all year round, because the helicopter can only fly when there is sufficient visibility - from dawn to dusk. Both in 2017 and 2018, an increase in the number of events was observed from 8:00 to 15:00 (Figure 3). A statistically significant correlation was found between the number of interventions depending on the hour (r-Pearson: $p = 0.045$).

It can be observed that rescue transports constituted a small part of the intervention in 2017-2018. In 2017, it was only 38 flights, which is equal to 15.2% of all interventions in a year, while in 2018 the number of rescue transports was 50 flights, which is equal to 11.4% of all interventions in a given year. It was noted that the number of HEMS flights as well as between hospital transports increased to 172.73% and 131.59% respectively. No statistical significance was obtained depending on the number of HEMS flights and inter-hospital transports in a given period, obtaining in the Chi2 test: 1.349 ($p = 0.242$).

Comparing the average PMAR arrival time at the scene of the event (M-20 min), no differences were found in individual years. However, a slight decrease in other values was observed in 2018 compared to 2017 (Table 2).

Table 2. Median variables covering implemented missions in individual years

Analyzed value	The year		
	2017	2018	Together
The arrival time since call-out [min]	M=20 SD±9,03	M=20 SD±8,76	M=20 SD±8,86
The arrival time from take-off [min]	M=17 SD±7,1	M=16 SD±7,54	M=17 SD±7,32
Duration of the mission since call-out [min]	M=119 SD±60,63	M=111 SD±40,1	M=114 SD±49,33
Duration of the mission from take-off [min]	M=112 SD±60,61	M=101,5 SD±35,91	M=108 SD±50,71
The distance [km]	M=43,8 SD±25,22	M=38,35 SD±24,96	M=40,4 SD±25,16

PMAR as help for G-EMS

The number of cases in which "Lifeguard 19" was available to support ground teams is 494 (71.9%), while up to 122 (17.8%) of the events were alone. In 2017, some of the missions in which the „Rescuer 19" was available as support accounted for 78% (n = 195), and alone only 15.2% (n = 38). In 2018, the PMAR helicopter was available to support G-EMS in 68.4% (n = 299) cases, while in 19.2% (n = 84) of the mission the PMAR was disposed of independently.

Table 2. PMAR stand-alone missions and as an aid to G-EMS in individual years

Status	The year			
	2017		2018	
Help until HEMS	Yes	No	Yes	No
The number of patients	195	38	299	84
Incompleted data	17		54	
Together	250		437	
Together in years 2017-2018	687			

DISCUSSION

The establishment of the PMAR base in Sokołów Podlaski should be assessed as an apt investment, as it allowed to fill the gap on the map of Poland between the bases: Warsaw, Białystok, and Lublin. Based on the conducted research, it can be concluded that the Sokołów base performs significantly more HEMS missions than inter-hospital transports. PMAR crew is much more often available as support for ground EMS. The assessment of the dependence of the time of day on the number of departures for events showed a statistically significant correlation of the number of interventions depending on the time (r-Pearson: $p=0.045$). There was no increase in the number of departures in the afternoon. The peak number of missions lasts between 9-11 and 13-15.

On average, "Rescuer 19" covers a distance of 40.4 km to the place of call within 20 minutes from the moment of the call. This is an unattainable result for G-EMS driving on roads full of cars. The PMAR brings many benefits to the ES because it covers a vast area and shortens the time to reach the patient. Especially nowadays, when there is heavy traffic on the streets, traffic jams are formed, and ground EMS has problems with traffic on congested roads. Another plus of an air ambulance is a helicopter that can land practically anywhere where there is sufficient free and even space with a 35x25m rectangular area during the day and 50x25m at night. According to the provisions, the aviation PMAR may land in three fixed places: hospital landing, municipal landing and landing at the place of incident. [4]

The difference between the number of missions in 2018, which was 173% higher than in 2017, may also be interesting. This may be the result of training dispatchers in cooperation with the PMAR, which taught them to use the more significant potential of the Helicopter Emergency Medical Service.

According to the authors, further development of daytime bases by reclassifying them into 24-hour bases can bring measurable benefits. Thanks to the agreement concluded on July 31, 2008, between the then Commander-in-Chief of the Fire Service, the PMAR Director, the principles of PMAR's cooperation with Fire Department units were regulated [5]. The role of the fire brigade is often to enable HEMS teams to operate safely at night. It is then necessary to secure the landing pad in such a way that the landing of the PMAR crew is not endangered. Performing night flights requires additional training of pilots and firefighters. Further research is indicated to determine the optimal location conditions for rescue helicopter bases and to qualify interventions, which should only apply to missions requiring emergency medical interventions [6].

CONCLUSIONS

The vast majority of PMAR missions are HEMS flights. A PMAR is available in most cases as support for ground EMS. The smallest amount of intervention of "Rescuer 19" from the base in Sokołów Podlaski takes place from 7:00 to 8:00 and from 15:00 to 20:00, while the largest from 9:00 to 11:00 and 13:00 to 15:00. PMAR in the studied region on average over each mission to cover a distance of 40.4 km to the place of call in 20 minutes, which is a definite time advantage over ground teams.

Disclosure statement

The authors did not report any potential conflict of interest.

REFERENCES

- [1] Gałązkowski R, Pawlak A, Pszczółowski K. Rola jednostek Krajowego Systemu Ratowniczo-Gaśniczego w funkcjonowaniu systemu Państwowe Ratownictwo Medyczne w rejonach wiejskich w Polsce. *Bezp Tech Poż.* 2014; 34 (2):15-26
doi:<https://dx.doi.org/10.12845/bitp.34.2.2014.1>
- [2] Jeśman C, Kopociński K, Kopociński Z. Początki lotnictwa sanitarnego w Polsce. *Archiwum historii i filozofii medycyny* 2010; 73: 61-64.
- [3] Gałązkowski R, Michalak G. Model realizacji lotów nocnych wykonywanych przez śmigłowce Lotniczego Pogotowia Ratunkowego. *Med Og Nauk Zdr.* 2012; 18(4): 383-386.
- [4] Andrzejewska S, Kamyszek K, Grabarczyk S. Środki transportu lotniczego wykorzystywane w ratownictwie. *Logistyka* 2014; 4(1): 36-45.
- [5] Gałązkowski R. Model współdziałania Państwowej Straży Pożarnej i Lotniczego Pogotowia Ratunkowego, jako bezpieczny sposób wdrożenia w operacje nocne nowych śmigłowców ratunkowych. *Bezp Tech Poż.* 2010; (4): 65-71.
- [6] Munro S, Joy M, de Coverly R, Salmon M, Williams J, Lyon RM. A novel method of non-clinical dispatch is associated with a higher rate of critical Helicopter Emergency Medical Service intervention. *Scand. j. trauma resusc. emerg. med.*, 2018; 26(1): 84.
doi:<https://dx.doi.org/10.1186/s13049-018-0551-9>