

HELICOPTER EMERGENCY MEDICAL SERVICE PROVIDES FASTER AND MORE EFFICIENT PATIENT CARE

HELIKOPTERSKA HITNA MEDICINSKA SLUŽBA OMOGUĆUJE BRŽU I UČINKOVITIJU SKRB ZA BOLESNIKE

*Adis Keranović^{1,3}, Iva Miloš^{2,3}

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Abstract

Background: Helicopter emergency medical service (HEMS) represents an integral part of the patient care process in modern and advanced healthcare systems. The activation of the helicopter emergency medical team can be primary, meaning the helicopter emergency medical team is dispatched to the scene of an incident immediately after a report, and secondary, when the HEMS team is dispatched to an agreed meeting point with the ground emergency medical service team.

Materials and methods: The retrospective analysis includes patients for whose care the Zagreb base helicopter emergency medical team was primarily activated during 2025. All patients were treated at clinical centers in Zagreb. The time to scene and transport time of the ground emergency medical service (GEMS) team was estimated using Google maps with corrections, while the time of the helicopter emergency medical team was estimated using available data from medical and aviation records.

Results: Out of 398 interventions, 111 were primary interventions, of which 75 patients were treated at the corresponding clinical centers. The patients were mostly male, with a median age of 59 years. The most common indication for helicopter emergency medical team activation was injuries, followed by internal medicine and neurological emergencies. In 43 interventions, the helicopter emergency medical team had a shorter time to reach the patient. In 41 interventions, the ground emergency medical service team was equally fast or up to 5 minutes slower than the helicopter emergency medical team. Transport time to an appropriate facility was shorter with the helicopter emergency medical team in all 75 interventions.

Conclusion: The advantage of the helicopter emergency medical team in time to scene is conditioned by the geographical characteristics of the area and the distribution of the ground emergency medical service team, therefore helicopter emergency medical team may not always be faster in reaching the scene. However, the patient's transport to an appropriate facility is consistently shorter by helicopter.

Key words: ground emergency medical service; helicopter emergency medical service; primary intervention

Sažetak

Uvod: Helikopterska hitna medicinska služba (HHMS) predstavlja sastavni dio procesa skrbi za bolesnike u modernim i razvijenim zdravstvenim sustavima. Aktivacija helikopterskog hitnog medicinskog tima može biti primarna, što znači da se tim šalje neposredno na mjesto događaja odmah nakon dojave, ili sekundarna, kada se HHMS tim upućuje na dogovoreno mjesto susreta s timom zemaljske hitne medicinske službe.

Materijali i metode: Retrospektivna analiza obuhvatila je bolesnike za čiju je skrb helikopterski hitni medicinski tim iz zagrebačke baze primarno aktiviran tijekom 2025. godine. Svi bolesnici su zbrinuti u kliničkim centrima u Zagrebu. Vrijeme dolaska do mjesta

1 Department of Emergency Medicine, University Hospital Center Zagreb, Zagreb, Croatia

2 Emergency Medical Service of the Krapina-Zagorje County, Krapina, Croatia

3 Emergency Medical Service of the City of Zagreb, Zagreb, Croatia

* Corresponding author:

Adis Keranović, MD, PhD
Department of Emergency Medicine,
University Hospital Center Zagreb,
Kišpatićeva 12, 10 000, Zagreb,
Croatia
E-mail: adiskeranovic@gmail.com

ORCID ID:

Adis Keranović:
0000-0002-9506-6891

događaja i vrijeme transporta zemaljske hitne medicinske službe (ZHMS) procijenjeno je pomoću Google Maps uz korekcije, dok je vrijeme helikopterskog tima procijenjeno na temelju dostupnih podataka iz medicinskih i zrakoplovnih evidencija.

Rezultati: Od ukupno 398 intervencija, 111 su bile primarne, od kojih je 75 bolesnika zbrinuto u odgovarajućim kliničkim centrima. Većina bolesnika bili su muškarci, s medijanom dobi od 59 godina. Najčešći razlog aktivacije helikopterskog tima bili su ozljede, a zatim hitna stanja iz interne medicine i neurologije. U 43 intervencije helikopterski tim stigao je brže do bolesnika. U 41 intervenciji zemaljski tim bio je podjednako brz ili do 5 minuta sporiji od helikopterskog tima. Vrijeme transporta do odgovarajuće ustanove bilo je kraće helikopterom u svih 75 intervencija.

Zaključak: Prednost helikopterskog tima u vremenu dolaska do mjesta događaja ovisi o geografskim karakteristikama područja i raspodjeli zemaljskih timova hitne službe, stoga helikopterski tim ne mora uvijek biti brži u dolasku na mjesto intervencije. Međutim, transport bolesnika do odgovarajuće ustanove je dosljedno kraći kada se koristi helikopter.

Ključne riječi: helikopterska hitna medicinska služba; primarna intervencija; zemaljska hitna medicinska služba

Introduction

The chain of care for emergency patients in Croatia consists of ground emergency medical service (GEMS) teams, unified emergency admissions, and recently, helicopter emergency medical service (HEMS) teams. HEMS in Croatia was established in April 2024 and operates in four bases: the Rijeka and Split bases are operational 24 hours a day and the Osijek and Zagreb bases are operational during daylight hours. Interventions to which the HEMS team is assigned can be primary, secondary or interhospital transports. The HEMS team can be dispatched directly to the scene of the intervention immediately after receiving the call and such interventions are called primary. In secondary interventions, the helicopter service team is dispatched to the agreed meeting point with the GEMS team (1). The Zagreb base covers the area of nine surrounding counties, which is home to almost half of the population of Croatia (2). The hospital system in Croatia is organized at the regional and national levels. Regional hospitals provide secondary-level healthcare and, by their very organizational structure, do not have all medical and diagnostic services, and are therefore not able to provide definitive care for certain categories of patients, such as polytraumatized patients, patients with cerebrovascular incident or myocardial infarction. National hospitals have such an opportunity.

The Croatian network of primary percutaneous coronary intervention is organized according to regional centers covering certain areas, meaning that the patients who require such intervention are not always transported to the nearest hospital. The treatment of cerebrovascular incidents depends on local protocols, which mostly include initial treatment and thrombolysis in the nearest facility that can provide it. However, the latest guidelines for stroke treatment recommend direct transport to a facility capable of performing endovascular thrombectomy, especially if there is no possibility of rapid subsequent interhospital transport (less than 45 minutes) (3). In many countries, the guidelines for injured patient care increasingly emphasize rapid transport to an appropriate

facility that can provide definitive care for the patient's life-threatening injuries. This is precisely why it is important to develop thrombectomy centers and thus ensure patient care (4,5,6).

Numerous studies have been conducted on the effectiveness and cost-effectiveness of helicopter emergency services, and most note that it is difficult to draw definitive conclusions due to data heterogeneity.

Evidence on the effectiveness and cost-effectiveness of helicopter emergency services remains inconclusive due to variability in study data.

The key conclusion is that early arrival at an appropriate facility improves better outcomes and quality of life. However, HEMS is not necessarily always faster. Studies by individual countries on the cost-effectiveness of emergency helicopter service depending on the distance from the appropriate facility have shown that HEMS has an advantage over GEMS if the distance is greater than 50 km (7,8). The aim of this study was to compare time to scene/patient and transport time between HEMS and GEMS in primary activations of the Zagreb HEMS base during 2025.

Methods

This retrospective study includes all patients for whose care the emergency helicopter service of the Zagreb base was primarily activated between January 1, 2025 and December 21, 2025. General patient data, medical intervention criteria, and flight data were obtained from medical and flight records from the "e-hitna" program. The HEMS team time to scene includes activation time and flight time to the intervention site. The activation time must not exceed 5 minutes, but can sometimes be longer due to specific circumstances. Ideal approach for GEMS would be to determine EMS team response times using official EMS operational data but we were not able to use it.



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Therefore, times related to the GEMS team were estimated using Google Maps in an ideal time period without traffic congestion. It is assumed that the team to arrive at the intervention site is the one whose base is closest, regardless of whether it is a team with a doctor or with two nurses.

All patients, except children, were transported by helicopter service to the same clinical hospital. It was assumed that GEMS teams would transport these patients to tertiary centers in Zagreb according to existing protocols if the definitive care for their condition was not available in the corresponding institution. Statistical analysis was performed using Microsoft Excel. Quantitative data were expressed as medians.

Results

During 2025, the Zagreb HEMS base was activated a total of 398 times, of which 111 were primary interventions, meaning that the helicopter team was activated and sent to the scene of the incident immediately after the intervention was reported.

A total of 75 patients were treated at tertiary centers. The remaining patients, out of a total of 111, were not treated in a tertiary center for several reasons. Most commonly, this was because the intervention was discontinued, patient died, or the patient was managed at another healthcare facility and did not require treatment in a tertiary center. The median age was 59, with the exception of two patients for whom data was not available (Figure 1). The majority were men, 54 of them (Figure 2).

The helicopter team was most often dispatched to traffic accidents and other injuries, as many as 48 times. It was activated 16 times due to suspected neurological events, and 9 times due to internal medicine emergencies, most often due to suspected acute coronary syndrome. The team was dispatched twice to treat a patient with choking due to a foreign body airway obstruction.

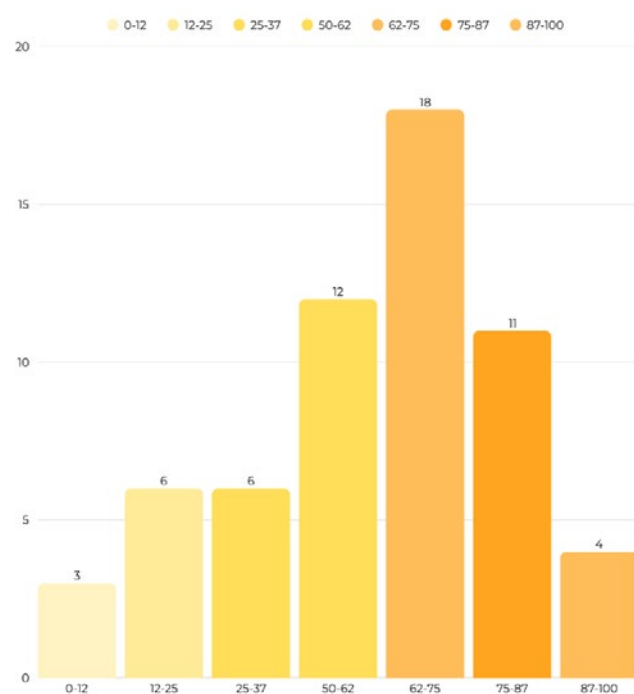


Figure 1. Patients' age distribution

The HEMS team had a shorter time to the scene of the intervention in 43 cases, the GEMS team in 31 cases, and arrival times were equal in one case. The median difference in time to scene between helicopter and ground teams was 3 minutes in favor of the helicopter team.

In the analyzed interventions, the median time to transport patients to an appropriate facility that can provide definitive care was 48 minutes for GEMS and 13 minutes for HEMS teams. The patient transport time was shorter with the helicopter team, with a median of 34 minutes for all interventions (Figure 3).

The median duration of the entire intervention was 30 minutes for HEMS versus 70 minutes for GEMS. The median difference in total intervention duration between the HEMS and GEMS teams was 34 minutes (Figure 4).

Based on this, we conclude that the patient care and outcomes of our patients are better due to faster transport and more timely management in an appropriate healthcare facility.

Discussion

Helicopter emergency medical service represents an upgrade to the existing network of ground emergency medical service teams. In most analysed interventions, the time to scene was faster with the helicopter service, but the difference is not statistically significant and depends on geographical specificities of the location, GEMS network distribution, road connectivity and traffic conditions. Statistically significant differences in time to scene of the GEMS and HEMS teams occur in the case of interventions in rural and difficult-to-reach areas.

However, the transport time to an appropriate facility was faster by helicopter in all analyzed interventions, which is expected given the often long distances transport to tertiary centers in Zagreb.

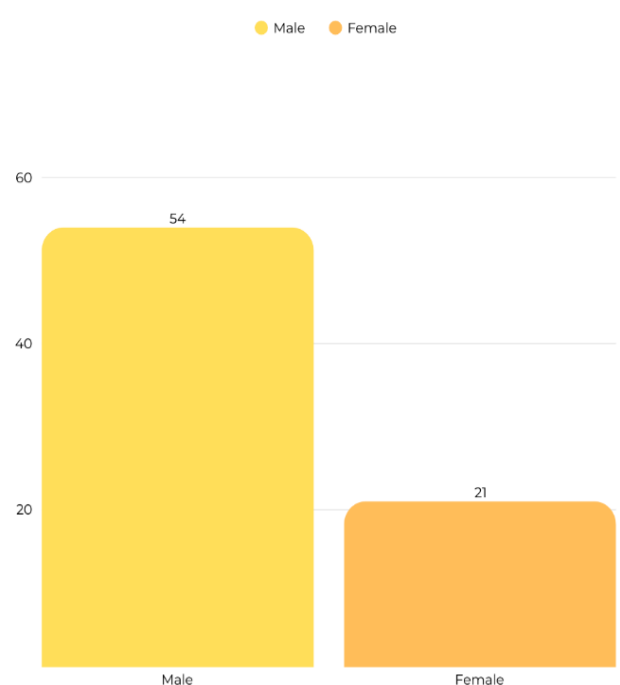


Figure 2. Patients' sex distribution

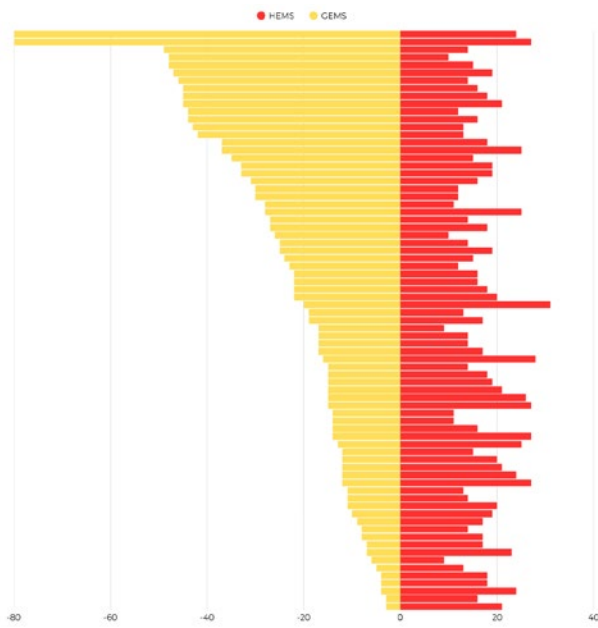


Figure 3: Arrival times for GEMS and HEMS

HEMS improves transport times to appropriate facilities, particularly in rural areas, potentially enhancing patient survival despite variable time-to-scene advantages over GEMS.

We do not have data for 30 days mortality for our patients but reviewing the literature, we found evidence that response and transport times and earlier arrival to an appropriate healthcare facility significantly affect patient survival. This finding indicates that patient care for our patients is therefore improved.

The efficiency of the overall treatment of life-threatening patients is additionally conditioned by the organization of the hospital network at the national level. Due to their organizational structure, regional hospitals are not equipped to provide definitive treatment for certain patient conditions, which is why transport to a higher level of care is necessary.

HEMS provides a critical advantage for life-threatening cases in hard-to-reach areas, reducing transport time to specialized care.

Conclusion

The establishment of specialized centers and categorizations, such as trauma centers, cerebrovascular stroke centers, percutaneous coronary intervention centers and burn centers, represents a key step in improving emergency patient care. It is in this context that HEMS fulfills its full clinical and organizational value. The possibility of rapid and direct

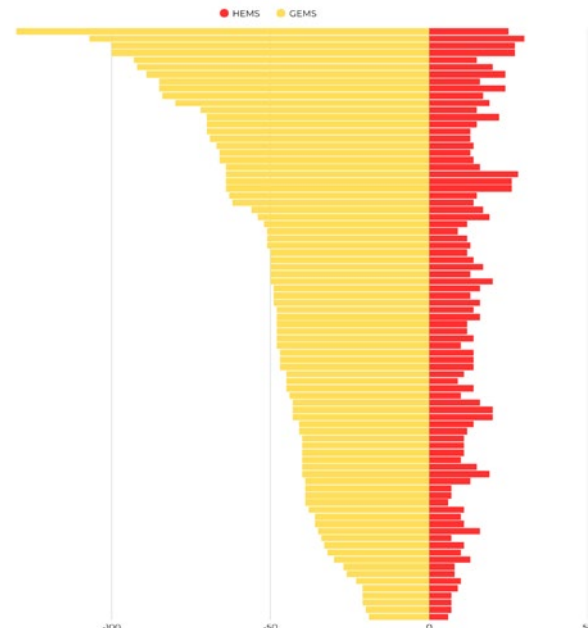


Figure 4: Transport times for ground emergency medical service (GEMS) and helicopter emergency medical service (HEMS)

transport of the patient to a specialized center shortens the total duration of the intervention and reduces the time until the provision of definitive patient care, potentially improving clinical outcomes.

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