EURASIAN JOURNAL OF EMERGENCY MEDICINE
Review
DOI: 10.4274/eajem.galenos.2026.89814
Eurasian J Emerg Med. 2026;25: 281-7

Aeromedical Patient Transfer in a High-volume Health System: Centralised Coordination and Governance in Türkiye

Behçet Al[1], Yunus Emre Gemici[2]

[1]Göztepe Prof. Dr. Süleyman Yalçın City Hospital, İstanbul Medeniyet University, Faculty of Medicine, Department of Emergency Medicine, İstanbul, Türkiye
[2]Göztepe Prof. Dr. Süleyman Yalçın City Hospital, Clinic of Emergency Medicine, İstanbul, Türkiye

Abstract

Aeromedical patient transfer plays a crucial role in ensuring continuity of time-sensitive care in health systems characterized by high patient volumes, geographic diversity, and regional disparities in access to healthcare. This review examines the core organizational and governance principles of aeromedical patient transfer systems and evaluates the centrally coordinated aeromedical model implemented in Türkiye, in the context of the global literature, to generate context-sensitive policy insights for high-volume health systems.

A narrative, policy-informed review approach was adopted. The global literature on aeromedical patient transfer was examined, with a focus on organizational models, central coordination mechanisms, clinical prioritization, medical leadership, and safety-oriented governance. Türkiye's air ambulance system was analyzed against national regulatory frameworks and operational structures and contextualized through comparison with international practices.

Türkiye has developed a centrally coordinated aeromedical model integrating air ambulance services into the national emergency medical services system. The model is characterized by centralized decision-making, standardized clinical indications, strong medical leadership, and systematic integration of operational safety and risk management. Aeromedical resources are treated as limited, high-value health assets, with deployment guided by clinical benefit and system-level priorities rather than transport speed alone.

The Turkish experience suggests that the effectiveness of aeromedical patient transfer in high-volume health systems depends more on governance, coordination, and rational resource allocation than on fleet size or technological capacity. While not intended for direct replication, this centrally coordinated model offers adaptable principles that may support coordinated access to specialized care in other middle-income countries

Keywords: Aeromedical transfer, coordination, health system, Türkiye

Introduction

Aeromedical patient transfer should be seen not just as a way to physically move patients from one place to another, but as a key part of the health system focused on reducing geographic and structural disparities in access to healthcare. Especially for populations in rural and remote areas, air ambulance systems offer a complementary service that allows timely access to definitive care for time-critical clinical conditions. Increasingly, it is emphasized that the effect of aeromedical transfers on health outcomes depends less on flight capacity or fleet size and more on how these services are organized, coordinated, and governed within the health system (1,2).

Aeromedical services originated from military needs, particularly during the First and Second World Wars, when they were developed to facilitate the rapid evacuation of wounded soldiers to medical facilities. Over time, these services were integrated into civilian health systems and became widely used to manage trauma, acute cardiovascular events, stroke, obstetric emergencies, and intensive care patients (3,4). Today, aeromedical transfers conducted by fixed-wing and rotary-wing aircraft constitute a key component of emergency medical services in many countries. However, substantial variation exists across countries in organizational structures, utilization indicators, and governance models for aeromedical services (2).

Corresponding Author: Prof. MD. Behçet Al, Göztepe Prof. Dr. Süleyman Yalçın City Hospital, İstanbul Medeniyet University, Faculty of Medicine, Department of Emergency Medicine, İstanbul, Türkiye
E-mail: behcetal@gmail.com **ORCID ID:** orcid.org/0000-0001-8743-8731

Cite this article as: Al B, Gemici YE. Aeromedical patient transfer in a high-volume health system: centralized coordination and governance in Türkiye. Eurasian J Emerg Med. 2026;25: 281-7.

Received: 20.01.2026
Accepted: 31.03.2026
Published: 06.04.2026

Globally, the configuration of aeromedical systems varies considerably across countries, depending on their geographic characteristics, distribution of health infrastructure, economic capacity, and governance approaches. In countries with large land areas, high proportions of rural populations, or limited access to healthcare facilities, aeromedical patient transfer is positioned as a core service delivery modality. In contrast, in countries with well-developed road networks and extensive emergency medical services infrastructure, aeromedical transport tends to be used more selectively and based on stricter indications (2,5). This diversity underscores the need to examine aeromedical transfers not only within a clinical framework but also in relation to health system design and policy choices.

Türkiye is a middle-income country with high patient volumes, serving a population exceeding 86 million and recording more than one billion healthcare encounters annually. Meeting healthcare demand at this scale particularly for time-sensitive conditions and cases requiring advanced levels of care is not sustainable without effective referral pathways and robust coordination mechanisms (6). The country's geographic diversity, disparities in rural-urban healthcare distribution, and the concentration of specialized centers in specific regions have rendered aeromedical patient transfer a strategic, rather than merely complementary, instrument within the Turkish health system (7).

This review aims to briefly outline the global development and core organizational principles of aeromedical patient transfer systems and to examine the centrally coordinated air ambulance governance model implemented in Türkiye, a middle-income country with a high-volume health system. The review adopts a comprehensive approach to analyzing the structural framework, governance, and decision-making processes, team composition, clinical indications, resource prioritization, and safety and risk management mechanisms of Türkiye's aeromedical system. Drawing on the Turkish experience, the study seeks to present adaptable policy lessons for global health systems on how to organize aeromedical services at the national level in a rational, safe, and sustainable manner (Table 1).

Materials and Methods

This study is a narrative review that adopts a policy-informed health systems analysis approach. The review summarizes the core organizational framework of the global literature on aeromedical patient transfer and focuses analytically on the organizational structure, team composition, and coordination mechanisms of the centrally coordinated air ambulance system implemented in Türkiye.

The literature search was conducted to include publications addressing the organizational, governance, and coordination roles of aeromedical services within health systems. Key concepts,

Table 1. Comparison of aeromedical system models: international patterns and the centralized model in Türkiye

Domain	Common International/fragmented models	Centralized Model in Türkiye
Coordination structure	Aeromedical transfers are often coordinated by regional, local, or multiple dispatch centers	Transfer requests are evaluated through a centrally operated national coordination structure
Dispatch decision-making	Decisions may vary across regions depending on local practice, available resources, and institutional preferences	Decisions are made through a centralized mechanism using nationally standardized criteria
Resource allocation	Allocation may differ between regions and may be influenced by local capacity and operational variability	Aeromedical resources are managed as nationally coordinated, limited, high-value assets
Clinical indication control	Indications may be broader or less standardized across systems	Transfers are prioritized according to clinical benefit, time sensitivity, and system-level need
Risk of over-triage/ inappropriate use	Systems lacking central prioritization may be more vulnerable to overuse or inefficient deployment	Central filtering aims to reduce inappropriate utilization and preserve resource efficiency
Medical leadership	Team composition and physician involvement vary across countries and services	Aeromedical transfers are conducted by physician-led teams supported by paramedics
Integration with the health system	Integration with emergency medical services and referral systems may be partial or variable	Air ambulance services are integrated into the national emergency medical services system.
Governance model	Governance structures are often heterogeneous and may involve regional or mixed administrative approaches	Governance is centrally coordinated under the Ministry of Health with standardized oversight
Safety and risk management	Safety practices vary depending on local operational structures and aviation oversight	Dispatch decisions explicitly incorporate both clinical appropriateness and aviation safety considerations
Operational logic	Aeromedical use may be influenced primarily by transport speed or regional accessibility	Deployment is guided by clinical appropriateness, operational safety, and rational resource prioritization rather than speed alone

EMS: Emergency medical services

including aeromedical patient transfer, aeromedical services, patient transfer models, organization, coordination, and clinical indications, were utilized individually and in combination. This approach aimed to prioritize studies reflecting system- and policy-level dimensions, rather than detailed clinical or technical aspects.

The literature search was conducted using a concept-based strategy focusing on system-level and policy-oriented aspects of aeromedical patient transfer. Rather than applying a formal systematic search protocol, the review prioritized studies addressing organizational structure, governance models, coordination mechanisms, and resource allocation. This approach was chosen to align with the review's narrative and policy-informed nature. No formal language restrictions were applied during the literature selection process. Official documents and national regulatory sources were identified through institutional databases and government publications relevant to the Turkish aeromedical system.

Priority was given to studies examining the historical development of aeromedical transfers, organizational models used across countries, and the role of air ambulance services in high-volume health systems. In selecting the literature, particular emphasis was placed on recent publications that provide system-level insights into health system design, governance, resource utilization, and coordination mechanisms. Clinical case series, studies focusing primarily on technical flight characteristics, and publications lacking organizational or managerial evaluation were excluded from the review.

Country-specific analyses for Türkiye were based on the Regulation on the Operation of Air Ambulance Aircraft issued by the Ministry of Health of the Republic of Türkiye, as well as the national air ambulance implementation framework developed in accordance with this regulation. This national framework was examined through a comparative lens alongside aeromedical transfer models described in the international literature, and similarities, differences, and context-specific characteristics were analyzed methodologically.

Findings derived from the analytical process were synthesized under the following thematic domains:

1. The global development and organizational models of aeromedical transfer,
2. The structural and governance characteristics of Türkiye's air ambulance system, and
3. The effects of organization and coordination on patient safety, resource utilization, and service sustainability.

Within this framework, the review assessed whether the centralized coordination model implemented in Türkiye offers adaptable policy implications for countries with comparable socioeconomic and geographic characteristics.

Türkiye's Centralized Aeromedical Coordination Model in a High-volume Health System

In Türkiye, aeromedical patient transfer has been structured not as a service model driven by individual requests or regional initiatives, but as a strategic component integrated into the national health system's central planning and governance. This approach positions aeromedical services not merely as a technical transport capacity, but as a managerial instrument that ensures continuity of time-sensitive care within a high-volume health system.

Under the coordination of the Ministry of Health of the Republic of Türkiye, air ambulance services are centrally dispatched and managed, with clinical appropriateness, operational safety, and resource prioritization evaluated in accordance with nationally standardized criteria (7). This structure aims to ensure that aeromedical resources are utilized rationally and transparently, even under conditions of high demand.

Structural and Governance Framework

The legal and administrative foundation of Türkiye's air ambulance system is defined by national regulations governing the operation of ambulance helicopters and fixed-wing ambulance aircraft. While the Ministry of Health assumes medical and managerial responsibility for the service, the operational management of aircraft is conducted through a public-private partnership model. This hybrid structure preserves the regulatory and supervisory role of public authority while supporting operational capacity through private-sector resources.

Flight safety and technical oversight processes are carried out by the Directorate General of Civil Aviation, thereby establishing an institutional division of responsibility between medical requirements and aviation safety (7). This dual-layered governance model enables the simultaneous safeguarding of patient safety and flight safety within aeromedical services.

Centralized Dispatch and Decision-making Mechanism

In Türkiye, aeromedical transfer requests are assessed by a centrally operated coordination unit within the Ministry of Health that operates 24/7 (7). This unit consolidates requests from across the country into a single operational pool, coordinates dispatch decisions, and prioritizes cases when multiple concurrent requests arise.

During the decision-making process, multiple factors are considered, including the patient's clinical condition, time sensitivity of the transfer, availability of ground ambulance alternatives, geographic distance, meteorological conditions, and flight safety considerations. This multidimensional approach aims to ensure that air ambulances are deployed not solely for speed advantage, but in situations where they provide a clear clinical and system-level benefit (8).

The centralized dispatch mechanism serves as a filter that limits inappropriate or excessive use of aeromedical resources, particularly during periods of high demand. International literature indicates that in systems lacking central prioritization mechanisms, air ambulances are more vulnerable to over-triage and inefficient resource use (9). The Turkish model offers a structural response to these risks.

Clinical Indications and Resource Prioritization

In Türkiye, aeromedical patient transfers are considered a scarce and high-cost healthcare resource and are prioritized based on clinical benefit. Time-sensitive trauma, acute cardiovascular and neurological emergencies, and patients requiring advanced intensive care constitute the primary clinical scenarios in which air ambulance utilization is emphasized.

Conversely, the restriction of aeromedical use in cases where ground transfer can be performed within a comparable timeframe and with adequate safety has been adopted as a fundamental principle. This approach seeks to preserve aeromedical services as a "rare and high-value" resource and to maximize overall system-level benefit. In this respect, the Turkish practice aligns with rational utilization principles recommended in the literature (8,10).

Team Structure and Medical Leadership

Aeromedical transfers in Türkiye are conducted by physician-led teams. While the medical team assumes clinical responsibility throughout the transfer process, the flight crew is responsible for the safe operation of the aircraft. This role distribution enables independent yet coordinated management of medical decision-making processes and aviation safety.

Medical leadership encompasses not only in-flight care but also pre-transfer assessment and determination of transfer appropriateness. This structure enables aeromedical transfers to be conceptualized as a process of mobile advanced care, rather than merely a logistical transport solution. The literature reports more rational utilization of aeromedical resources in systems characterized by strong physician leadership (1).

Safety, Risk Management, and Decision-Support Approach

Aeromedical patient transfers are high-risk operations requiring a continuous balance between patient benefit and flight safety. In Türkiye, dispatch and tasking decisions take into account not only clinical requirements but also aviation safety factors such as weather conditions, visibility, and crew availability.

Deferral or cancellation of transfers that are clinically appropriate but operationally unsafe is considered a natural outcome of a risk-based decision-making approach (10). The centralized operational structure also facilitates systematic monitoring of incidents and near-miss events, enabling their transformation into institutional learning processes.

System-level Evaluation

The Turkish experience demonstrates that the success of aeromedical patient transfer depends less on flight capacity than on centralized coordination, standardized clinical indications, medical leadership, and safety-oriented governance components. This model provides a context-sensitive example of how limited aeromedical resources can be managed equitably, safely, and sustainably within high-volume health systems.

Operational Capacity and Human Resources Structure

Air ambulance services in Türkiye are structured according to an operational capacity aligned with the centralized coordination model. Within the system operated by the Ministry of Health, 17 helicopters and 2 fixed-wing ambulance aircraft are currently in service (6,7). To ensure optimal benefits in terms of geographic characteristics and service accessibility, the country is divided into 17 operational regions, each operating under national central coordination (7). All aeromedical transfer requests are submitted to the central operations unit, and dispatch decisions are implemented following central approval.

Air ambulance aircraft are operated under a leasing model, whereas physicians and paramedics assigned to aeromedical missions are employed by the Ministry of Health (7). This structure enhances operational flexibility while ensuring that medical responsibility and clinical oversight remain under public authority. The joint deployment of physicians and paramedics within aeromedical teams supports the delivery of care according to a mobile advanced life support approach. In addition, healthcare personnel assigned to these aircraft are required to hold internationally recognized certifications, such as Advanced Trauma Life Support and Advanced Cardiac Life Support, thereby helping ensure standards of clinical competence and patient safety (7).

Discussion

This review examined the Turkish experience of aeromedical patient transfer in a high-volume health system, focusing on organizational structure, governance, clinical decision-making, and safety. The findings indicate that the effectiveness of aeromedical services is closely associated not only with flight capacity or technological infrastructure, but also with centralized decision-making, standardized clinical indications, and safety-oriented governance components (1,2). These observations are consistent with findings from the international literature, which emphasize the importance of coordinated dispatch systems, appropriate patient selection, and governance structures in optimizing aeromedical resource utilization.

The Role of Centralized Coordination in the Literature

International literature indicates that a substantial proportion of aeromedical systems are organized through regional, fragmented, or locally driven initiatives. In such structures, dispatch decisions made by multiple centers can complicate the standardization of clinical indications and lead to resource concentration in specific regions (2). In particular, systems lacking central prioritization mechanisms have been reported to carry an increased risk of overuse or inappropriate utilization of air ambulances (9).

The centralized coordination model implemented in Türkiye diverges from these fragmented structures by enabling national-level management of aeromedical resources through a single operational center. This approach represents a structural response to the problems of over-triage and resource waste that are frequently highlighted in the literature (8).

Clinical Indications and Resource Prioritization

In many countries, air ambulance utilization is applied across a broad range of indications on the assumption of time savings. However, studies published in recent years have demonstrated that air ambulances do not consistently confer the expected patient benefit across all clinical scenarios, underscoring the critical importance of appropriate patient selection (5). In the Turkish model, the centralized evaluation of aeromedical transfers based on clinical indications aligns with these findings.

In practice, limiting air ambulance use for patients who can be safely transferred by ground transport within a comparable timeframe reflects treating aeromedical resources as a “rare and high-value” service. This principle is consistent with rational utilization strategies recommended in the literature (8).

Physician Leadership and Medical Decision-making Processes

The perspective that aeromedical transfers constitute a process of mobile advanced care rather than a purely logistical activity has gained increasing prominence. Physician-led team models have been reported to provide important advantages in managing clinical risk and improving the quality of dispatch decisions (1). In Türkiye, the explicit definition of medical leadership in transfer processes is a key strength, aligning closely with international evidence.

Safety and Risk Management: Balancing Clinical Benefit and Flight Safety

Air ambulance operations inherently require a delicate balance between patient benefit and flight safety. International studies have reported higher rates of serious incidents and accidents in systems where safety-oriented risk assessment mechanisms are insufficiently structured (10). In Türkiye, the postponement or cancellation of clinically appropriate transfers when flight safety conditions are not acceptable reflects the adoption of a risk-based decision-making approach.

This approach is consistent with the literature emphasizing that aeromedical services should not operate under an “always fly” paradigm, but rather in accordance with principles of system safety and long-term sustainability (10).

System Effects of the Hybrid (Public-Private) Model

The delivery of air ambulance services through a public-private partnership model in Türkiye enables the expansion of operational capacity while maintaining medical and managerial control under public authority. Although similar hybrid models exist in several Organization for Economic Co-operation and Development countries, the literature suggests that dispatch mechanisms as centralized and standardized as those implemented in Türkiye remain relatively uncommon (2). This feature distinguishes the Turkish model from an organizational perspective.

Implications for Global Health Systems

The Turkish experience offers important lessons regarding the organization of aeromedical services in middle-income countries with high patient volumes. Centralized coordination, standardized clinical indications, physician leadership, and safety-oriented risk management may be regarded as core principles adaptable across diverse health system contexts. However, rather than direct replication, adapting these principles to countries’ specific geographic, economic, and governance conditions represents a more realistic and effective approach (8).

Study Limitations

This review has several limitations that should be acknowledged. First, the number of peer-reviewed scientific studies focusing specifically on aeromedical patient transfer in Türkiye remains limited. This reflects the relative scarcity of system-level academic analyses rather than deficiencies in operational capacity or institutional development. Consequently, several aspects of the Turkish aeromedical system are informed by grey literature and official policy documents.

Second, this review examines the experience of a single country. The findings are therefore not intended to be directly generalizable. Instead, the organizational structures and governance principles discussed should be interpreted as context-specific approaches that may offer adaptable insights for health systems operating under similar demographic, geographic, and service-volume conditions.

Third, the review adopts a narrative, organizational, and policy-oriented perspective, with a deliberate focus on governance, coordination, and decision-making mechanisms. As such, it does not provide a quantitative evaluation of patient-level outcomes, cost-effectiveness, or comparative clinical effectiveness of aeromedical versus ground transport modalities.

Finally, Türkiye's geographic diversity, population distribution, nationally integrated ground emergency medical services, and frequent exposure to large-scale disasters represent important contextual factors shaping the organization and utilization of aeromedical services. These system-level characteristics may influence both the necessity and functioning of the centralized coordination model described and should be considered when interpreting the broader policy implications.

Conclusion

The effective delivery of aeromedical patient transfer services in high-volume health systems appears to depend not only on aircraft availability or technological capacity, but also on how these services are organized, governed, and integrated into the broader health system. This review demonstrates that the aeromedical system in Türkiye is structured around a centralized coordination model that positions air ambulance services as a strategic component of the national health system, rather than a standalone transport modality.

The Turkish experience highlights the importance of centralized decision-making, standardized clinical indications, strong medical leadership within aeromedical teams, and the systematic incorporation of safety-oriented risk management into operational processes. Together, these elements support the rational use of limited and high-cost aeromedical resources, particularly in settings characterized by high patient volumes, geographic diversity, and time-sensitive care needs.

From a global health perspective, the Turkish model should not be viewed as a template for direct replication. Instead, it offers a set of adaptable organizational and governance principles that may inform the design of aeromedical services in other middle-income countries facing similar systemic pressures. When appropriately contextualized, aeromedical patient transfer can function not merely as an emergency transport solution but also as a policy instrument that contributes to health system resilience, equity, and coordinated access to specialized care.

Ethics

Ethics Committee Approval: This study is a narrative review based on previously published literature and publicly available data. Therefore, ethical approval and informed consent were not required.

Footnotes

Author Contributions

Concept: B.A., Y.E., Design: B.A., Data Collection or Processing: B.A., Y.E., Analysis or Interpretation: B.A., Literature Search: B.A., Writing: B.A., Y.E.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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