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In-flight emergency medical intervention: physicians' legal responsibilities

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ABSTRACT

Medical emergencies occurring during commercial flights raise the issue of physicians' responsibility to provide in-flight medical assistance. The increasing number of passengers, the prevalence of long-haul flights, and the rising proportion of elderly individuals traveling by air contribute to the growing frequency of in-flight medical emergencies. However, the physical constraints of the flight environment, limited medical equipment, and restricted communication capabilities complicate the intervention process. This study evaluates the management of in-flight medical emergencies, intervention procedures, and the legal responsibilities of physicians. First, the most common medical conditions encountered during flights and their management strategies are discussed. Subsequently, physicians' duty to intervene, ethical responsibilities, and legal obligations according to national and international regulations are examined. Legal frameworks such as "Good Samaritan Laws," jurisdictional ambiguities, and potential legal risks are analyzed in different countries. Standardizing in-flight medical interventions, strengthening legal protections for physicians, and enhancing the capacity for emergency medical response on aircraft are of critical importance. In particular, developing pre-flight risk assessment mechanisms, regulating flight restrictions based on medical conditions, and reinforcing collaboration between airline companies and health authorities are essential. Additionally, expanding educational programs to raise physicians' awareness of aviation medicine and integrating technological solutions to support in-flight medical interventions are among the strategies that could enhance patient safety and intervention efficacy.

Keywords: Air travel, emergency, medical, first aid, physicians, legal liability

INTRODUCTION

A call for a doctor at high altitude can be an anxiety-inducing situation for any physician. The growing airline industry in an increasingly globalized world, coupled with rising flight numbers, an increasing proportion of elderly passengers, and the prevalence of long-haul flights, has led to a higher frequency of medical emergencies requiring urgent intervention during air travel.[1,2] Due to the severity of these cases, timely intervention and effective management are crucial. Therefore, physicians providing medical assistance on board must carefully consider the ethical and legal responsibilities they may encounter.

Determining the true incidence of in-flight medical emergencies is challenging due to the lack of standardized identification, classification, mandatory reporting, and a reliable database.[3] A North American study based on data from a ground-based medical consultancy company estimated that an in-flight medical emergency occurs once in every 604 flights (or 16 incidents per million passengers).[1] Another study conducted in Europe analyzed medical records from a single airline over a two-year period and reported 1.312 incidents among 10.1 million passengers (approximately one incident per 7.700 passengers).[4] Meanwhile, the United Kingdom government, using data from various organizations, estimated that a medical incident occurs in one out of every 14.000 passengers but emphasized that inconsistencies across datasets make it difficult to determine the actual incidence.[5]

Although in-flight medical emergencies vary in nature, some conditions are more frequently encountered than others. These include loss of consciousness, seizures and other neurological conditions, allergic reactions and anaphylaxis that can cause respiratory distress, acute cardiovascular events such as heart attack and angina pectoris, gastrointestinal issues such as nausea, vomiting, and diarrhea, complications related to diabetes, and systemic problems like deep vein thrombosis. Pre-existing medical conditions, the physiological stress of air travel, dehydration, and the use of alcohol or medication are contributing factors that may increase the risk of these emergencies.[1,6,7]

The flight environment presents multiple challenges that complicate diagnosis, intervention, and treatment for physicians.[8] Aerospace medicine serves as a fundamental discipline offering guidance on the physiological, environmental, and psychological effects encountered during flight, as well as the limitations associated with in-flight emergency medical interventions.[9] The management of in-flight medical emergencies is not solely the responsibility of aerospace medicine specialists; other physicians on board may also be required to take critical actions. Physicians without specialized training in aerospace medicine may have to rely on their general medical knowledge and experience in such situations. However, these interventions become more complex due to the physical and operational constraints of the flight environment. Limited cabin space, inadequate medical equipment, variations in cabin pressure, and communication barriers necessitate rapid and critical decision-making.[6,10]

Additionally, reduced cabin pressure during flight can lead to hypobaric hypoxia, while high-altitude stress factors may impair both the passenger's and the physician's decision-making abilities.[11] Under these constrained conditions, physicians must possess extensive medical knowledge and experience while maintaining composure. The standards published by the International Civil Aviation Organization (ICAO) provide essential guidelines shaping physicians' capabilities in in-flight medical interventions and aim to minimize inadequacies in medical assistance.[9] Physicians providing medical support during flights must stay informed about national and international aviation regulations and ensure legal protection for themselves.

There is limited literature regarding the legal obligations and protective measures available to physicians responding to medical emergencies in-flight. This review aims to analyze the legal responsibilities physicians may face during air travel-related medical emergencies and to provide an analytical assessment from the perspective of both national and international regulations. Datat sources fort this study include peer-reviewed journal articles, aviation regulatory guidelines, and legal statutes from multiple jurisdictions. The review focuses on research reported in the literature over the last 20 years.

IN-FLIGHT MEDICAL EMERGENCIES: INCIDENCE, CHARACTERISTICS, AND INTERVENTION REQUIREMENTS

Extensive research in the field of aviation has demonstrated that medical emergencies during flights are a common occurrence. A meta-analysis of 18 different studies covering approximately 1.5 billion passengers found that an average of 18.2 medical incidents occur per million passengers. Additionally, the overall mortality rate due to all causes was reported as 0.21 per million passengers.[12] Furthermore, approximately 11.1 out of every 100.000 flights are forced to divert due to medical reasons, with the cost of these unexpected diversions ranging from $15.000 to $893.000.[12]

Over a one-year period, data from 131,890 domestic and international flights documented that more than 27 million passengers traveled. During this time, an average of 296 medical incidents occurred per month, totaling 3.555 cases annually. The probability of encountering a medical event during a flight was estimated at approximately 1:40, corresponding to an incidence rate of 2.7%. The most frequently reported in-flight medical emergencies were loss of consciousness (37%) and suspected cardiovascular events (12%).[13] Among the 915 emergency cases recorded throughout the year, six resulted in death. However, the proportion of flights requiring diversion due to medical emergencies was less than 0.016% of total flights. Suspicion of a cardiac event was identified as the primary cause in 52% of cases requiring flight diversion.[13]

Studies have shown that the most common in-flight medical emergencies include syncope, respiratory distress, cardiac issues, and neurological disorders. Fainting and syncope rank among the most prevalent medical emergencies during air travel.[14,15] Life-threatening conditions such as deep vein thrombosis, anaphylactic shock, myocardial infarction, and hemorrhagic or ischemic stroke are also frequently reported.[1,14] Alongside these, gastrointestinal emergencies such as diarrhea, nausea, and vomiting, as well as conditions like hypertension and headaches, are commonly observed.[14] These findings highlight that in-flight medical interventions are common but often under-documented.[16]

Several factors, including the confined space within aircraft, limited availability of essential medical equipment, pressure variations, and communication challenges, significantly hinder physicians' ability to intervene and manage medical conditions effectively.[6,14] These restrictive conditions and high-stress environments necessitate composure, rapid decision-making, and a high level of professional expertise from physicians. Under these demanding circumstances, it is crucial for physicians to apply their comprehensive medical knowledge and experience, utilize effective communication skills, and maintain a calm demeanor. The limited resources available on board and the urgent need for rapid intervention require physicians to maximize their clinical competence.

EMERGENCY MEDICAL EQUIPMENT AND INTERVENTION CAPACITIES ON AIRCRAFT

The availability of emergency medical equipment and intervention capabilities on aircraft significantly impacts physicians' ability to manage in-flight medical emergencies. International civil aviation authorities, such as ICAO and the International Air Transport Association (IATA), have established regulations regarding the standard emergency medical kits required on aircraft.[14] Essential equipment typically includes oxygen systems, manual resuscitation devices, automated external defibrillators (AEDs), medications, intravenous fluids, consumables, and other medical supplies.[6,14]

However, the unique conditions of the flight environment can influence both the use of medical equipment and the effectiveness of medical interventions. Cabin pressure is typically maintained at an altitude equivalent of 6.000 to 8.000 feet, which may reduce passengers' blood oxygen levels below normal. This physiological change poses a significant risk, particularly for individuals with pre-existing respiratory or cardiovascular conditions.[17] Additionally, factors such as low humidity levels, confined spaces, and high ambient noise within the aircraft can complicate medical interventions. For example, auscultation using a stethoscope may be ineffective due to background noise, and basic assessments such as blood

pressure measurement may become challenging. Similarly, although in-flight oxygen supplementation is available, its flow rate may be insufficient to ensure adequate oxygenation for some patients.[17]

Regulations in the United States mandate that airlines permit passengers to use personal portable oxygen concentrators, but there is no standardized policy governing the provision of in-flight medical oxygen.[18] Cabin crew members are responsible for initiating first aid, but the assistance of healthcare professionals on board is crucial. Physicians must be well-prepared to handle in-flight medical emergencies to ensure patient safety. Familiarity with the available medical equipment on aircraft is essential for physicians to perform effective and appropriate interventions during emergencies.[14]

To enhance collaboration and coordination between physicians and airlines, specialized training programs should be developed. These programs should cover basic life support, the use of in-flight medical equipment, aviation physiology, and crisis communication skills. Simulation-based training can be particularly beneficial in improving emergency response capabilities. Additionally, the integration of telemedicine systems would allow in-flight physicians to consult ground-based specialists, facilitating better medical decision-making. The incorporation of telemedicine technology could play a critical role in optimizing the use of onboard medical resources and improving patient outcomes in critical cases.

LEGAL RESPONSIBILITIES OF PHYSICIANS: NATIONAL AND INTERNATIONAL REGULATIONS

Physicians' willingness, confidence, and concerns regarding providing medical assistance on board may be influenced by various factors. These include the physician's specialty not being relevant to the emergency, a retired or elderly physician having lost clinical practice, flight anxiety, or a lack of self-confidence. Additionally, the limited availability of medical equipment on board and the restrictive transport conditions of certain medications can further complicate the process. Moreover, the ambiguity of legal liabilities and ethical responsibilities may contribute to physicians' reluctance to intervene. A study has shown that concerns over medical malpractice lawsuits significantly reduce physicians' willingness to provide medical assistance, with 50% of them expressing hesitation due to potential legal repercussions.[19]

Physicians who provide medical assistance during flights are subject to legal obligations under both their national aviation laws and international regulations.[20] Organizations such as ICAO and the IATA have established guidelines defining the responsibilities and authority of physicians in in-flight medical emergencies. However, the scope of legal protections varies significantly from country to country, and existing legal gaps may pose substantial risks for physicians.[15] In this context, it is crucial for physicians to carefully assess not only their legal obligations regarding medical assistance but also the ethical and legal risks they may encounter when intervening during a flight.

Various countries, such as the United States America and Canada have enacted "Good Samaritan Laws" and similar regulations to provide certain legal protections for physicians who voluntarily render medical aid.[20] These laws aim to shield physicians from liability for interventions performed in good faith.

On the other hand, physicians who refuse to provide medical assistance in an emergency may, under certain conditions, be held legally accountable.[20] For instance, in the European Union and Australia, physicians are legally required to assist in emergency medical situations.[21] However, international law does not provide a consistent legal framework on this matter. Therefore, it is essential for physicians to carefully evaluate their decision not to intervene in in-flight emergencies and to act with consideration of all possible scenarios. Medical interventions in emergency situations hold a unique legal position, particularly concerning exceptions to the requirement of obtaining patient consent.

In Turkiye, the legal obligations of physicians regarding emergency interventions outside hospital settings are defined by various regulations. Article 5 of the Turkish Medical Association Code of Professional Ethics for Physicians emphasizes that a physician's primary duty is to protect human life. Article 10 states that, regardless of their field of expertise, physicians must provide first aid in emergency situations where necessary medical interventions are unavailable.[22]

Similarly, article 3 of the Medical Deontology Regulation mandates that physicians provide first aid in cases where adequate care is unavailable, unless exceptional circumstances prevent them from doing so.[23] According to Supplementary Article 11/2 of the Fundamental Law on Health Services (Law No 3359), emergency healthcare services must be delivered by authorized personnel. Unauthorized medical interventions in such situations are subject to legal sanctions.[24]

Additionally, articles 83 and 98 of the Turkish Penal Code state that failing to provide necessary assistance in emergencies can lead to serious legal consequences. If such negligence results in death or severe harm, it may be punishable by imprisonment.[25]

The patient rights regulation (dated 01.08.1998 and numbered 23420), in article 24, explicitly states that in life-threatening emergencies or situations where an organ is at risk, patient consent is not required.[26] However, in such cases, healthcare professionals must assess the patient's level of consciousness and the urgency of the situation before proceeding with an intervention. Moreover, for unconscious patients, the principle of presumed consent is generally applicable. Legally, the conditions for intervention may be relaxed to accommodate the urgency of the situation.[20]

JURISDICTIONAL CONFLICTS AND UNCERTAINTIES IN PRACTICE

One of the most complex aspects of international law is determining which country's legal framework governs a physician's medical intervention during a flight.[15] Multiple factors, including the country in which the aircraft is registered, the nationality of the airline, the airspace where the incident occurs, and the citizenship of both the patient and the physician, play a role in establishing the competent jurisdiction.[15] This ambiguity may lead to confusion regarding which country's medical standards and legal responsibilities the physician must adhere to. For instance, a medical intervention that is legally permissible in a

physician's home country may not be lawful in the country where the aircraft is registered.[20] Such discrepancies can expose physicians to legal risks and cause hesitation in providing medical assistance.[10]

In international flights, variations between different legal systems further complicate jurisdictional issues. As a result, a physician's legal responsibility for an in-flight medical intervention should be assessed based on the specific circumstances of the case. Physicians who provide medical assistance during a flight must also consider legal protections against allegations of negligence. In the United States, the Aviation Medical Assistance Act of 1998 grants legal immunity to physicians assisting in in-flight medical emergencies, except in cases of gross negligence or willful misconduct. Similarly, some airlines provide legal protection for physicians who intervene in medical emergencies; however, these assurances are not universally applicable.[7]

Providing emergency medical assistance during a flight presents a range of ethical and professional dilemmas for physicians.[10] Although Good Samaritan Laws are designed to protect physicians who provide medical aid in good faith, their scope and enforcement vary significantly across different jurisdictions.[10,14] The constraints of in-flight medical equipment, the limited ability to establish a definitive diagnosis, and the necessity to make rapid decisions under stressful conditions may challenge physicians' ability to uphold professional medical standards.[6,14]

Moreover, the potential consequences of the intervention and concerns about legal liability can influence a physician's decision-making process.[10] Physicians may feel morally obligated to assist patients in accordance with the Hippocratic Oath, yet they may hesitate to intervene due to inadequate medical resources and potential legal risks. This creates an ethical dilemma, requiring physicians to make swift and well-considered decisions under pressure.

CONCLUSION

The establishment of standardized international protocols, guidelines, and legal frameworks for in-flight medical emergencies is essential for ensuring the protection of both physicians and passengers. Such frameworks should eliminate jurisdictional ambiguities, clearly define physicians' responsibilities and rights, and promote consistency in the application of Good Samaritan Laws. Additionally, the medical equipment required on aircraft should be reviewed and updated to align with evolving standards. These protocols and guidelines should be integrated into training programs for both physicians and cabin crew members.

Physicians' preparedness for in-flight medical emergencies is crucial for passenger safety. Given the unique challenges of in-flight medical interventions, including resource limitations and high-stress conditions, physicians should receive specialized training. These training programs should cover basic life support, emergency protocols, the use of onboard medical equipment, and coordination with airline personnel. Furthermore, regular refresher courses should be implemented to ensure physicians remain updated on in-flight emergency procedures.

To enhance communication and coordination between physicians and cabin crew, simulation-based training and joint emergency drills should be conducted. Additionally, telemedicine systems can be integrated to provide real-time consultation between in-flight physicians and ground-based specialists. Such technologies could significantly enhance medical decision-making and optimize the use of onboard medical resources during critical incidents.

Considering these factors, it is evident that aviation authorities must introduce comprehensive regulatory frameworks, and airlines should assume greater responsibility for in-flight medical emergencies.

In summary, the effective management of in-flight medical emergencies is critical for passenger safety, and a thorough understanding of physicians' legal and ethical responsibilities is essential. Physicians must be well-informed about their national and international legal obligations, demonstrate composure and professionalism, make rapid and informed decisions, and efficiently utilize onboard medical resources. This approach is fundamental to ensuring flight safety and preventing potential legal complications.

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All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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