REVIEW

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Prevention of Medical Events During Air Travel: A Narrative Review

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ABSTRACT

Prior to traveling, and when seeking medical pretravel advice, patients consult their personal physicians. Inflight medical issues are estimated to occur up to 350 times per day worldwide (1/14,000-40,000 passengers). Specific characteristics of the air cabin environment are associated with hypoxia and the expansion of trapped gases into body cavities, which can lead to harm. The most frequent medical events during air travel include abdominal pain; ear, nose, and throat pathologies; psychiatric disorders; and life-threatening events such as acute respiratory failure or cardiac arrest. Physicians need to be aware of the management of these conditions in this unusual setting. Chronic respiratory and cardiovascular diseases are common and are at increased risk of acute exacerbation. Physicians must be trained in these conditions and inform their patients about their prevention.

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International tourism is one of the leading points of the world economy.[1] In 2009, more than 59% of travel was by air,[1] and according to the World Tourism Organization, tourism represents up to 50% of air travel, before business travel (15%) and travel to visit friends and relatives (27%). Since the establishment in 1919 of the first airline company, air traffic continues to increase, with an estimated average annual growth of 4%.[1] In 2008, almost 2 billion people traveled by commercial airlines.[2] With the increased number of passengers per year, the number of miles flown and passengers boarding is also increasing. In 2013, the maximum number of passengers authorized to board the airbus A380 was 853 per flight.[3]

Medical issues during air travel are estimated at about 350 per day worldwide, corresponding to 1/14,000-40,000 passengers.[4] Because of the specific characteristics of air cabin environment, air travel can exacerbate passengers' underlying conditions, for increased risk of medical emergencies. However, unlike ground travel, air travel raises the question of the availability of advanced care in case of medical issues and their management.

Health care providers and travelers need to be aware of the potential medical issues associated with air travel and their prevention. Among all medical problems on board, some might be life threatening, such as cardiac issues.[5] Some others are predictable and therefore preventable, such as pulmonary issues,[6,7] which suggests that prevention of medical issues related to air travel is highly important in primary and secondary care.

General practitioners often provide pretravel medical advice, most commonly for immunizations and malaria

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chemoprophylaxis.[8] They also frequently advise certain patient groups such as cardiovascular patients and pregnant women.[8] General practitioners are often the first physicians consulted prior to departure.[9-11] However, other sources for travel health advice include travel clinics, travel agents, pharmacists, family and friends, the Internet, books, brochures, and newspapers.[9,10] This clearly illustrates the variety of sources consulted, and the fact that travelers are aware of the need to obtain information and be prepared prior to traveling.

Several studies have investigated the determinants of consulting a general practitioner prior to departure. Male sex,[12,13] age <50 years,[12-14] travel to a nonmalarial region,[13] foreign nationality, and previous travel experience[12,14-16] are negatively associated with the likelihood to consult. Frequency of pretravel consultations with specialized physicians other than general practitioners remains poorly documented.

In this context, 3 issues are currently debated: in-flight emergencies and their management, common underlying conditions at risk of exacerbation during the flight and their prevention, and the main situations justifying a priori specific care. In this paper, we review these 3 issues.

CLINICAL SIGNIFICANCE

- The most common in-flight medical issues are gastrointestinal pathologies (mainly abdominal pain), psychiatric disorders, and ear, nose, and throat pathologies (mainly barotitis). Most could be prevented with appropriate pretravel advice or medical treatment.
- Some underlying conditions are at higher exacerbation risk during air travel and require an assessment of ability to fly. Respiratory and cardiovascular exacerbations are predictable in most cases, and can be avoided with appropriate prevention.

PATHOPHYSIOLOGY

The earth's atmosphere is defined by its pressure, composition, and temperature. Air pressure and temperature depend on the altitude. When the altitude increases, barometric pressure and temperature decrease according to an exponential curve (**Figure**). At cruising altitude (10,000 to 13,000 m above sea level), temperature outside the aircraft is about −54°C and the atmospheric pressure is about 240 hPa. With decreasing barometric pressure, oxygen partial pressure also decreases (according to Dalton's law), and gases trapped within body cavities expand (according to the Boyle-Mariotte law). Thus, aviation regulation requires that all aircraft carrying passengers must be pressurized and maintain a cabin altitude of about 2438 m. Moreover, cabin air is first drawn from outside the aircraft and then heated, filtered, and recirculated, which results in very low humidity, about 10% to 20%.

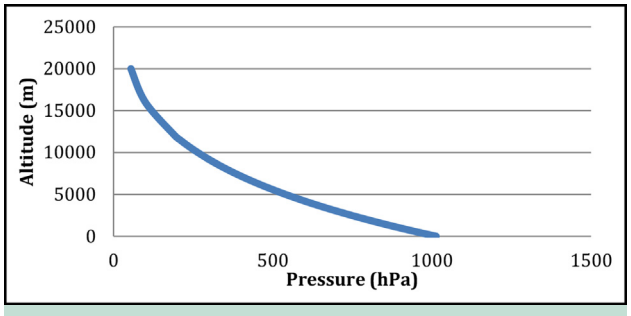

Figure Change in air pressure with altitude.

MEDICAL EVENTS IN AIRCRAFT

In 1998, the US Aviation Medical Assistance Act was passed. Its goal was to protect physicians who respond to medical emergencies on board against liability, except in cases of gross negligence or willful misconduct.[17] In emergency cases, the care provided and treatments delivered should be documented. Because of probable underreporting, the exact number of medical issues during air travel is difficult to assess. Most in-flight medical events may be minor, because diversions may occur in 7% to 13% of cases,[18] and deaths are estimated at about 0.3 to 1 per million passengers per year.[19]

Medical advice is obtained on board in 69% of cases from physicians (40%), nurses (25%), or paramedics (4%).[4] The most common causes of medical events on board are gastrointestinal diseases or troubles (25%).[4,5] Among all medical events, cardiac arrest is rare, about 1000 cases per year, but is responsible for 86% of deaths on board.[20] Here, we focus on cardiac arrest and the most common causes of medical events on board.

Cardiac Arrest

It is no longer debated that early defibrillation is related to survival after cardiac arrest[21]; therefore, the presence on board of automated external defibrillators appears necessary. Qantas (Mascot, NSW, Australia) was the first airline to equip their aircraft with automated external defibrillators, in 1992.[22] During a 65-month period, 27 cardiac arrests were reported, with 2 cases of long-term survival.[22] A study estimated that deploying automated external defibrillators on all aircraft would save approximately 33 lives per year, and automated external defibrillator deployment on large- and medium-capacity aircraft would cost <$50,000 per quality-adjusted life-year gained.[23] Since then, most airlines have equipped their aircraft with automated external defibrillators and trained staff in basic cardiopulmonary resuscitation.

Gastrointestinal Pathologies

Gastrointestinal pathologies are mainly due to the expansion of bowel gas. In most cases, this situation is responsible for