

**EDUARD MISSONI, D.Sc.**  
**IGOR BOGOVIĆ, Dr.Med.**  
 University of Zagreb,  
 Faculty of Transport and Traffic Sciences  
 Vukelićeva 4, HR-10000 Zagreb, Republic of Croatia  
**NATAŠA VUKOVIĆ DOJČINOVSKI, Dr.Med.**  
 Piran Health Centre  
 Župančičeva 10, SI-6330 Piran, Republic of Slovenia  
**MARIN STANČIĆ, D.Sc.**  
 Klinika za traumatologiju  
 Draškovićeva 19, HR-10000 Zagreb, Republic of Croatia

Traffic Safety

Review

Accepted: Jun. 6, 2005

Approved: May 2, 2006

## MEDICAL EMERGENCIES IN COMMERCIAL AIR TRANSPORTATION

### ABSTRACT

The paper presents medical emergencies during the flight time. The focus is on the most common types and causes of these emergencies. World indicators show an increase in the passenger number and accordingly, an increased number of emergency conditions and interventions. Lately, the larger aircraft have been produced, with larger number of seats and that leads to the increase in emergency medical interventions during long intercontinental flights. A typical sequence of events during medical interventions in aircraft is presented. Elderly passengers and those who have known chronic diseases have to take care about their condition by consulting the physicians, whose main scope of work is aviation medicine.

### KEY WORDS

*injury, chronic diseases, medical intervention, commercial aircraft*

### 1. INTRODUCTION

Newer aircraft are designed to fly farther and faster than ever before. They carry more passengers and flight crew than thought possible several years ago. For example, a Boeing 747-400 holds up to 425 passengers and an Airbus A380 has 550 seats [1].

The rising fuel costs and other challenges are forcing the airlines to carry as many fare-paying passengers as possible at one time. Long-haul flights are becoming increasingly common and are necessary for the airline industry as a whole to ensure its economic survival. But longer flights, combined with our aging population medical concerns, can add up to costly delays and diversions due to medical emergencies onboard.

The topic of handling in-flight medical emergencies are becoming more common as part of risk management and financial concerns with the airlines.

There must be some consideration to the unique flight environment that may make medical emergencies in the airplane more severe. Also, one must be sure there is adequate medical equipment and personnel onboard to handle medical crises.

Presented below are the prognosis of the world passenger transport from Airlines of International Civil Aviation Organization, (ICAO). ICAO currently has 188 Contracting States carried 1 657 million passengers on international and domestic scheduled flights and recorded 2,991.6 billion passenger-kilometres performed (PKPs) in the year 2003, with just 0.9 per cent increase over 2002. [2].

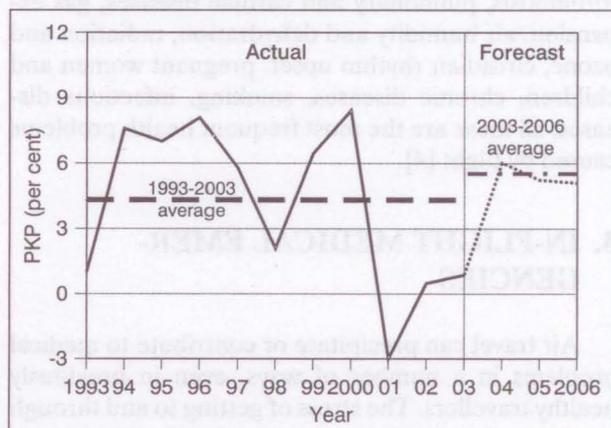


Figure 1 - World passenger traffic (source Lit. 3)

During the first half of 2004 global international passenger traffic of world airlines has shown a remarkable growth compared to the corresponding period of the previous year with the airlines of Asia/Pacific and Middle East regions in particular showing high growth rates.

Based on economic assumptions and other considerations, global scheduled passenger traffic is expected

to show a remarkable recovery and grow at 6.2 per cent in 2004, surpassing the year 2000 level and reaching about 3200 billion PKPs. It is forecast to continue to expand at 5.4 per cent and reach over 3300 billion PKPs in 2005 and 5.2 per cent in 2006 and surpass 3500 billion PKPs. The average annual growth rate for the 2004-2006 period is expected to be significantly higher than the growth trend of 1993-2003 when passenger traffic grew at an average annual rate of 4.4 per cent [3].

## 2. FREQUENT FLIGHT-CAUSED HEALTH PROBLEMS

Flying is a condition which is not natural for the human being and the discomfort during air travelling is normal. If the reason for travelling are not holidays, the anxiety can be even increased by the very reason for travelling (business, sport events, separation from the family, etc.). Stress when flying is increased also by the crowds at airports, problems with baggage or flight delays. Noise, vibrations, smoking or prohibition of smoking intensify bad mood and tiredness caused by travelling. The tendencies of designing aircraft with ever increasing number of seats increase the flying discomfort. Although all this sounds familiar on the ground, in the air it is difficult to rationalize all these events and the negative feedback is closed resulting in an increased influence of the mentioned stressors. Fatigue increases and the passengers become irritable, of increased anxiety.

Stress, fear of flying, alcohol, kinetoses, deep vein thrombosis, pulmonary and cardiac diseases, gas expansion, air humidity and dehydration, radiation and ozone, circadian rhythm upset, pregnant women and children, chronic diseases, smoking, infectious diseases, all these are the most frequent health problems caused by flight [4].

## 3. IN-FLIGHT MEDICAL EMERGENCIES

Air travel can precipitate or contribute to medical problems in a number of ways, even in previously healthy travellers. The stress of getting to and through a modern airport may be considerable. In-flight emergencies will also increase as more elderly passengers fly greater distances. Once in the air the drop in pressure (the cabin is kept at the equivalent 1950-2400 m altitude) causes 30% gas expansion, and less oxygen is available. Pain from middle ears and sinuses blocked by catarrh is common, especially on the descent. The reduced partial pressure of oxygen should not affect the healthy passenger, but it may affect those with compromised cardiovascular or respiratory systems or blood disorders. Shortness of breath may be due to

myocardial insufficiency or lung disease, or to hyperventilation, which can be helped by breathing into one of the readily available paper bags [5,6].

### 3.1. Chest pain

Passenger with chest pain presents the same diagnostic challenge as a patient on the ground. A careful history is important, but language barriers and the cabin environment can make this a challenge. The passenger may have a history of angina, for example, but may have packed their drugs in the hold baggage.

On an aircraft carrying a full medical kit, a coronary vasodilator such as glyceryl trinitrate spray will be included. Where pain is persistent and myocardial infarction is suspected, aspirin, an opioid painkiller, and, of course, oxygen will usually be available. If there is diagnostic uncertainty, an antacid may help to confirm dyspepsia; this will usually be found even in a basic first aid kit.

Cardiac monitors are now being introduced by some airlines. Their principal use will be in the field of telemedicine, with transmission of the data to ground-based advisory services. However, they may allow an on-board physician to confirm a diagnosis of myocardial ischaemia or support a decision that a cardiac cause is unlikely.

### 3.2. Collapse

Passengers who suddenly collapse generate considerable concern. Fortunately, most incidents are due to a simple faint. Calm assessment of the passenger by a doctor (checking the pulse and, perhaps, blood pressure) usually allows sufficient time for spontaneous recovery.

Passengers with epilepsy are not at increased risk of a fit when flying. If they do have a fit, cabin crew are usually trained to manage the situation. Where medical intervention is required, parenteral diazepam is usually used; rectal preparations may also be carried.

Life threatening collapse (sudden cardiac arrest, for example) is rare, but all cabin crew should be trained in basic and cardiopulmonary resuscitation. Many of the major international airlines now carry defibrillators, and when they do the crew will be trained to use these and the doctor will not be expected to take over. The role of the doctor might be to establish intravenous access and, where appropriate, to administer drugs such as atropine.

Some defibrillators incorporate a rhythm display and, although they are not intended (or licensed) for diagnostic purposes, this may help in making decisions. The introduction of cardiac monitors may allow

additional interventions, as full medical kits often include other drugs such as lignocaine and digoxin.

### 3.3. Asthma

The most common potentially life-threatening condition reported on the British Airways aircraft is asthma. Fortunately, most of these episodes are minor, and they are often induced by the realization that the passenger's inhalers are in the baggage hold. Oxygen is invariably available, and an injectable bronchodilator and adrenaline should also be available.

Inhaled bronchodilators may be carried, but nebulisers are seldom found because most aircraft oxygen systems cannot deliver flow rates sufficiently high to power oxygen-powered nebulisers and the available battery-powered devices are bulky and heavy for routine inclusion as part of the medical equipment.

### 3.4. Head injury

Items falling from the overhead storage bins are not an infrequent cause of head injury. Heavy items, such as laptop computers and duty-free bottles of spirits can cause serious injuries. There is little an on-board doctor can do in such situations, but advice on the need for diversion may need to be given, on the basis of the history of the accident and clinical assessment.

### 3.5 Psychiatric problems

Psychiatrists often register concern that their rusty resuscitation skills may be called upon on board an aircraft. However, passengers with anxiety, phobias, or, more rarely, major psychiatric illness are seen much more frequently than those requiring resuscitation. Confirmation of the diagnosis and reassurance are often all that is required.

Where medication is judged necessary, oral anxiolytics, such as lorazepam, may be available, as may a parenteral sedative, typically diazepam. Some caution should be exercised in using these drugs, as passengers may have already consumed considerable amounts of alcohol. Cases of disturbed behaviour arising as a consequence of illicit drug use (including smuggling of swallowed drugs) may result in dangerous interactions.

### 3.6. Abdominal problems

Diarrhoea and vomiting are common and usually managed using oral antiemetics, rehydration solutions, and antidiarrhoeal agents. The doctor's role is again principally one of providing a diagnosis and advising on the need for urgent medical care, which might require the aircraft to divert. A parenteral

antiemetic such as metoclopramide may help in cases of persistent vomiting.

Some airlines include intravenous fluids as part of their medical kit. Although the amount of fluid carried will be small, it would be sufficient to maintain venous access pending diversion.

### 3.7. Diabetes

Hypoglycaemic episodes are seen fairly frequently, often where the passenger has injected insulin before boarding in the expectation of a meal soon after take-off. Glucose injections are normally available, and several airlines include glucagon injection and oral glucose gel in their medical kits.

### 3.8. Allergic reactions

Serious allergic reactions, including anaphylaxis, occur rarely, but timely intervention is crucial. A full medical kit will include adrenaline and an antihistamine (usually in injectable form) and may include parenteral corticosteroids. Passengers with known allergies may carry an EpiPen, and some airlines now include these in their kits.

### 3.9. Obstetric and gynaecological emergencies

Each year several babies are born in international airspace, although the publicity they attract is out of all proportion to the number of births. Doctors seldom have an important role, except perhaps to provide reassurance, but they may need to administer a uterine contractant such as ergometrine.

Threatened miscarriages or other causes of vaginal bleeding do occur occasionally and are often a cause of considerable alarm to the passenger. Facilities for examination are inevitably limited and it is unlikely that a doctor would wish to do more than monitor the passenger's general condition and provide reassurance.

Data from the research done by Nigel Dowdall, showed that in the year ending 31 March 1999 British Airways carried 36.8 million passengers and there were 3386 reported in-flight medical incidents: about 1 per 11,000 passengers. Though 70% were managed by cabin crew without the assistance of an on-board health professional, in almost 1000 incidents doctors and nurses were asked to help in the handling of ill passengers.

The health of passengers is generally unknown to the flight crew.

Typical sequence of events during an onboard medical crisis is:

- the passenger calls the flight attendant;
- the flight attendant notifies the captain about the medical problem;

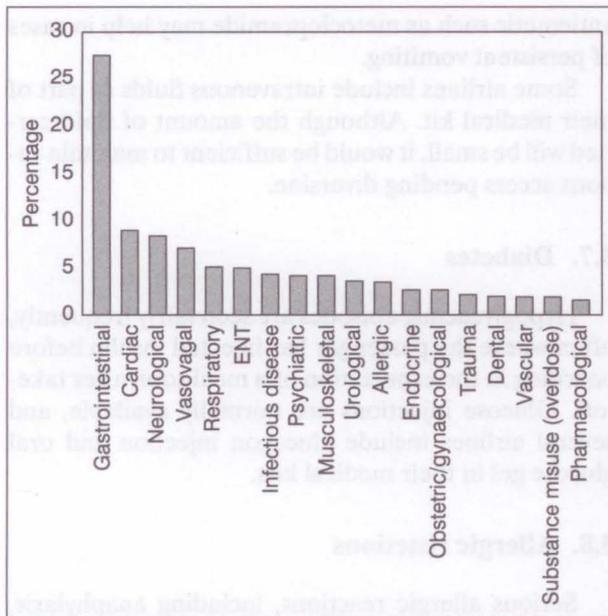


Figure 2 - Most common causes of medical incidents (source Lit. 5)

- the emergency medical system is activated;
- an emergency room physician is consulted through a ground to air communication system (Medlink);
- if medical assessment is needed, the flight attendant will ask for a medically trained individual to identify themselves to the crew. There is a physician passenger onboard a commercial flight 40-90% of the time;
- the medical provider will consult the captain and the Medlink physician, if available. Together, they will advise the captain about the necessity to divert to a closer airport for medical help.

Diversions are also decided by weather and pilot/airline familiarity with the divert airfields. It should be recognized that regardless of the opinions of the physicians onboard or on the ground, the captain determines when and where to divert. Rarely will the captain challenge a physician's recommendation to divert but will determine the destination airfield. The smaller, regional aircraft may be more likely to divert/land because they can get to the ground much faster and are less likely to have qualified medical personnel aboard. The nature of the medical condition may also be considered as a factor of determining which airport is the most appropriate [1].

#### 4. CONCLUSION

In-flight medical emergencies are attracting increasing interest from the media, travelling public, aviation industry, and medical profession. Medical

emergencies are likely to increase as air travel continues to expand and life expectancy lengthens. Provisions made by the airlines continue to improve in response to this demand and to changing medical technology and practices, but commercial, financial, and practical considerations have to be taken into account.

Aviation medicine will include more recommendations regarding air travel. Perhaps one day there will be a need for a small onboard emergency treatment and possible medical certifications and standards for passengers as well as the flight crew.

Dr. sc. **EDUARD MISSONI**

**IGOR BOGOVIĆ**, dr. med.

Sveučilište u Zagrebu, Fakultet prometnih znanosti

Vukelićeva 4, 10000 Zagreb, Republika Hrvatska

**NATAŠA VUKOVIĆ DOJČINOVSKI**, dr.med.

Zdravstveni dom Piran

Župančičeva 10, 6330 Piran, Republika Slovenija

Dr. sc. **MARIN STANČIĆ**

Klinika za traumatologiju

Draškovićeva 19, 10000 Zagreb, Republika Hrvatska

#### SAŽETAK

U članku se prikazuju hitna medicinska stanja za vrijeme leta. Posebno su prikazani najčešći uzroci i vrste takvih hitnih stanja. Svjetski pokazatelji upućuju na povećanje broja putnika, a sukladno tome i porast broja hitnih medicinskih stanja i intervencija. U zadnje vrijeme proizvode se sve veći zrakoplovi, s većim brojem sjedala što dovodi do porasta pružanja hitne medicinske pomoći tijekom dugih interkontinentalnih letova. Navodi se tipičan slijed događaja prilikom medicinske intervencije u zrakoplovu. Putnici starije dobi i oni koji od prije imaju poznate kronične bolesti moraju voditi računa o svom stanju i savjetovati se s liječnicima koji se bave zrakoplovnim medicinom.

#### KLJUČNE RIJEČI

ozljeda, kronične bolesti, medicinske intervencije, putnički zrakoplov

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