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Review Article / Преглед литературе

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Is there a doctor on the plane? The Distinctive Conditions of Cardiopulmonary Resuscitation on Commercial Flights

Има ли лекара у авиону? Специфичности кардиопулмоналне реанимације током комерцијалних летова

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Is there a doctor on the plane? The Distinctive Conditions of Cardiopulmonary Resuscitation on Commercial Flights

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SUMMARY

Even today, when over 3.5 billion passengers travel on commercial flights each year, there is confusion about the duties and role of doctors and other licensed medical professionals volunteering to provide assistance to a passenger whose life is in jeopardy, especially when it comes to measures of cardiopulmonary resuscitation in the distinctive conditions of an airborne commercial aircraft. There are still no international, standardized guidelines, rulebooks or instructions applying for all airlines when it comes to training and organizing the cabin crew, equipping emergency medical kits and covering the role of medical professionals volunteering their services in medical emergency situations.

The aim of this work was to attempt to solve a common quandary among medical professionals when it comes to airplane travel.

Based on the available literature, national and regional guidelines and rulebooks of airlines, in accordance with the ethical and legal principles binding medical professionals, we have attempted to answer the major questions related to cardiopulmonary resuscitation on commercial flights. All aspects are covered – from a doctor volunteering to provide emergency medical care, through the marshalling of the cabin attendants, the availability of equipment, interaction with the flight captain and the captain's decision whether to perform an emergency landing, to the possibility of obtaining additional information from medical call centers on the ground and calling medical crews to the nearest airport.

Keywords: first aid; cardiopulmonary resuscitation; Aircraft

САЖЕТАК

Годишње се комерцијалним летовима превезе 3,5 милијарде путника, али још увек постоји конфузија око обавеза лекара и других лиценцираних медицинских радника у добровољном пружању помоћи путнику коме је живот угрожен, посебно мера кардиопулмоналне реанимације у специфичним условима, током лета авионом. Још увек нема интернационалних стандардизованих водича, правилника и упутстава који би важили за све авиокомпаније у погледу обуке и организације летачког особља, опремљености комплета за хитну медицинску помоћ и улоге добровољаца медицинских радника који би они могли да следе у акцидентним ситуацијама.

Циљ овога рада је да покуша да реши честе недоумице код медицинских радника при путовању авионом.

На основу доступне литературе, националних и регионалних водича и правилника авиокомпанија, у складу са етичким и законским начелима за медицинске професионалце, покушавамо да дамо одговоре на најважнија питања кардиопулмоналне реанимације у авиону током комерцијалних летова. Изнети су сви аспекти, од добровољног јављања лекара за пружање хитне медицинске помоћи, преко организације кабинског особља, доступности опреме, контакта са капетаном лета и одлуке за принудним слетањем, као и могућностима добијања дотатних информација од медицинских центара на земљи и медицинских екипа на најбилжем аеродрому.

Кључне речи: прва помоћ; кардиопулмонална реанимација; авион

INTRODUCTION

The data of the International Transport Association (IATA) show that a total of approximately 3.5 billion passengers take commercial flights each year. In addition to the personal attitudes, perceptions and discomfort that may affect all flight passengers, air travel presents an additional dilemma for doctors and other medical professionals. Entering the passenger cabin of an aircraft, every doctor has asked him or herself at least once what his or her role would be if an acute medical condition requiring emergency medical care (EMC) were to appear in a fellow passenger during the flight.

In this paper, based on the available literature, national and regional guidelines and airline rules and regulations, and in accordance with the ethical and legal principles binding medical professionals,

we want to answer the most pressing issues surrounding the execution of cardiopulmonary resuscitation (CPR) measures during commercial flights from every aspect: a doctor volunteering to provide EMC, organizing the cabin crew, the availability of CPR equipment, contact with the flight captain (which drives the decision on an emergency landing) and information from medical call centers on the ground and medical teams waiting at the nearest airport.

EPIDEMIOLOGICAL DATA

The absence of standardized protocols, international regulations or central registers greatly hinders the reviewability and availability of information on EMC on commercial airline flights. Therefore, the rate of occurence of such incidents is difficult to ascertain, which impedes epidemiological research on the topic [1]. Only serious processing of said data by international air travel organizations would pave the way for adopting international standards on the equipment necessary in an EMC kit, training for the cabin crew in providing medical assistance and protocols to assess the health of the passenger patient. In view of the current absence of these standards, airlines are at liberty to issue internal guidelines whose foundation in the expert administering of EMC often leaves something to be desired [2].

Data on the frequency of urgent medical conditions on commercial flights vary. Though thought to be the safest way to travel, the specific environment of an airplane cabin leads to physical and psychological stress in some passengers, which can act as a trigger for various emergency medical conditions, especially if the passenger is also chronically ill [3].

From 2002 to 2007, there was an anonymous survey among 32 European airlines about the rate of occurrence of medical incidents on commercial flights [3]. Of the total number of incidents, 10,189, syncope was found to have been the most frequent (53.5%). Sudden gastrointestinal distress was the second most frequent (8.9% of cases), as pointed out by Baltsezack et al. in their research. Cardiovascular issues were present in 4.9% of cases, followed by fear of flying (4.3%) and generalized pain (4.1%) [3,4]. In contrast, Qureshi et al. point out that the exacerbation of existing conditions (usually respiratory) is the most common medical event emerging in-flight [4]. Acute events requiring surgical care are rare on commercial flights. Thrombosis appeared in 0.5% of cases in the noted study, appendicitis in 0.25%, while GI hemorrhage occurred in under 0.1% of cases [3].

By the year 2030, projections show, half of all passengers on commercial flights will be over the age of 50. The rising age of air travelers (often indicative of comorbidity), the stress due to fear of flying, environmental changes in the passenger cabin (temperature, humidity and pressure), the tight quarters for sitting, the ingestion of alcohol and some medication, and flight delays may also be triggers for emergency medical conditions onboard an aircraft [5].

Though urgent medical states are relatively infrequent during flights, they have a deep impact on the other passengers and the cabin crew, and may also have an operational impact on the flight itself, resulting in high economic cost.

The incidence of a passenger needing a medical intervention in-flight is one in 10,000 to 40,000 [6]. Cardiac arrest (CA) occurs in one in five to ten million passengers in-flight. Annually, around 1,000 passengers die during commercial flights [7,8].

EQUIPMENT AND MEDICATION AVAILABLE ONBOARD

There is still no international standardization of the equipment and medication necessary for in-flight EMC. In the United States, the US Federal Aviation Administration (FAA) requires every plane with over 12 seats used for commercial flights to have CPR equipment which includes: an automated external defibrillator (AED), advanced airway management equipment and IV drugs. In Europe, there is still no legal regulation – most European airlines have AEDs, some only carry them on intercontinental flights, but there are those with no CPR equipment onboard. Unfortunately, there is no law obligating air carriers in Europe to include an AED in their emergency medical kits, though AEDs have become a part of basic life support measures (BLS – CPR) [3]. If the AED has an ECG monitor, it can be used to monitor cardiac rhythm, for example in patients with syncope, chest pain or arrhythmia. The use of AEDs on commercial flights has proven safe and efficient. Ventricular fibrillation (VF) is the most common ECG-registered CA rhythm and it can be successfully treated only with early defibrillation [9].

Also, there is vast divergence between the contents of EMC equipment in European national airlines and in low-cost air carriers. The IATA, the Aerospace Medical Association (AsMA) and the International Civil Aviation Organization (ICAO) have an agreement about the need to standardize medical equipment in all air carriers, but it is yet to be put into practice, and the kits display a miscellany of equipment and drugs. There should be separate first-aid kits for minor medical interventions, distinct from emergency medical kits [2]. The European Aviation Safety Agency (EASA) recommends in its "unofficial courtesy document" an itemized first-aid (table 1) and emergency

Table 1. Content of first-aid kits.

1.	Equipment	bandages (assorted sizes); burns dressings (unspecified); wound dressings (large and small); adhesive dressings (assorted sizes); adhesive tape; adhesive wound closures; safety pins; safety scissors; antiseptic wound cleaner; disposable resuscitation aid; disposable gloves; tweezers: splinter; thermometers (non-mercury).
2.	Medications	simple analgesic (may include liquid form); antiemetic; nasal decongestant; gastrointestinal antacid, in the case of aeroplanes carrying more than 9 passengers; anti-diarrhoeal medication, in the case of aeroplanes carrying more than 9 passengers; antihistamine.
3.	Other	a list of contents in at least two languages (English and one other). This should include information on the effects and side effects of medications carried; first-aid handbook, current edition; medical incident report form; biohazard disposal bags.
4.	An eye irrigator, whilst not required to be carried in the first-aid kit, should, where possible, be available for use on the ground.	

Table 2. Content of emergency medical kit.

Equipment	sphygmomanometer — non-mercury; stethoscope; syringes and needles; intravenous cannulae (if intravenous fluids are carried in the first-aid kit, a sufficient supply of intravenous cannulae should be stored there as well); oropharyngeal airways (three sizes); tourniquet; disposable gloves; needle disposal box; one or more urinary catheter(s), appropriate for either sex, and anaesthetic gel; basic delivery kit; bag-valve masks (masks two sizes: one for adults, one for children); intubation set; aspirator; blood glucose testing equipment; and scalpel.
Medications	coronary vasodilator e.g. glyceriltrinitrate-oral; antispasmodic epinephrine/adrenaline 1:1 000 (if a cardiac monitor is carried); adrenocorticoid — injectable; major analgesic; diuretic — injectable; antihistamine — oral and injectable; sedative/anticonvulsant — injectable, rectal and oral sedative; medication for hypoglycaemia (e.g. hypertonic glucose); antiemetic; atropine — injectable; bronchial dilator — injectable or inhaled; IV fluids in appropriate quantity e.g. sodiumchloride 0.9 % (minimum 250 ml); acetylsalicylic acid 300 mg — oral and/or injectable; antiarrhythmic — if a cardiac monitor is carried; antihypertensive medication; beta-blocker — oral.
AED	Automated external defibrillator (AED) should be carried on the aircraft, though not necessarily in the emergency medical kit.

medical kit (table 2) to all countries in Europe [10,11].

In the United States, per FAA regulations, there may be no commercial flight if the aircraft lacks an emergency medical kit or AED. A doctor may ask the cabin crew for additional equipment (e.g. a glucometer) or drugs, and they may procure them from the passengers [2].

A rulebook on public air transport and non-commercial flight published in the Official Gazette of the Republic of Serbia mentions first-aid and emergency kits, but does not list what they should contain. Every aircraft must have one first-aid kit for every 100 installed passenger seats. Aircraft with Maximum Operational Passenger Seating Configurations (MOPSC) exceeding 30 seats must have an emergency medical kit if any point on the planned travel route is more than 60 minutes' flight, at normal cruising speed, from an airport that can be expected to have adequate expert assistance available. Only a properly trained individual may administer medication. The emergency medical kit must be protected from dust, humidity and unauthorized access, and must be replenished regularly [12].

LEGAL AND ETHICAL ASPECTS OF THE ROLE OF MEDICAL PROFESSIONALS VOLUNTEERING TO PERFORM CPR MEASURES

Even though medical professionals most often volunteer to help and treat airplane passengers in distress, there are no recommendations or good practice guidelines for them to follow in these

situations. Research by Sand et al. found that, in 86% of cases, a doctor or other medical professional was involved in the treatment of passengers in distress during a flight [3]. In the case of a CA onboard, the health professional passenger (doctor) should come forward immediately and introduce him or herself to the flight crew, including his or her professional qualifications. In many countries, this is not legally required, but is morally and ethically. Ethic principles obligate every doctor to extend assistance to the best of his or her knowledge and ability. Only some countries legally require doctors to provide EMC. In the US, Canada and United Kingdom, doctors aboard a flight are not legally bound to respond when the flight crew asks for assistance for a passenger in distress. In contrast, all member countries of the European Union and Australia legally require doctors on an aircraft to provide emergency medical care to a passenger in distress [3,13].

Federal laws set forth in the Aviation Medical Assistance Act of 1998 ensure limited protections and guidelines for doctors and other medical professionals volunteering their assistance to passengers in distress during a flight. There has been no information released to date of a physician being sued for malpractice over assistance to a passenger in distress aboard a flight [14]. On the other hand, many countries have so-called Good Samaritan laws that protect people of good faith, even medical workers acting outside their workplace, in the case of any omissions while providing EMC [15]. In our country, the Code of Professional Ethics of the Serbian Medical Chamber regulates the role of physicians in extending EMC outside their workplace. Article 6, which deals with urgent medical assistance, reads: "If the patient's life is threatened, the doctor is duty bound to provide EMC without delay, within his ability and expert knowledge. A doctor may not decline to provide EMC which is in line with his expert training regardless of whether he is on duty or not and regardless of whether he has been expressly asked to help" [16].

If the passenger in distress needs to be monitored during the flight and if treatment must be administered, the volunteering doctor should stay by the patient's side throughout the flight. A doctor may note his or her activities and the administered treatment on a special form provided in the aircraft or, if this is not available, on any piece of paper. When the aircraft lands, the volunteering doctor hands over the patient to medical staff on the ground, who will transport the patient to a suitable medical facility [2].

PERFORMING CPR IN-FLIGHT

Performing CPR measures onboard a plane during a commercial flight has its peculiarities due to the specific environment, organizational structure and decisions that will have repercussions on the flight path itself and the landing. The European Resuscitation Council (ERC) proposes guidelines for in-flight CPR in its latest recommendations, released in October 2015 [7,8].

The factors that contribute to the success of CA patient survival rates during commercial flights are: witnessed event, an expected occurrence in the confined space of an airplane; cabin crew trained in BLS – CPR; use of an AED in CPR in-flight, which secures the return of spontaneous circulation

(ROSC) until arrival in hospital in 30 to 50% of cases; presence of medical professionals/doctors among the passengers and proficient and timely execution of CPR measures.

If a CA occurs in-flight, the physician passenger should immediately identify him or herself to the cabin crew and state his or her professional medical qualifications, following the moral, ethical and legal principles mentioned earlier. If there are multiple health care worker volunteers, a team approach should be used. The volunteers should exchange information to assess everyone's level of expertise and specialization so that a leader can be chosen.

Unfortunately, experience shows that, in Serbia, doctors of many specializations who do not frequently encounter this type of pathology often have scant knowledge of CPR. Anesthesiologists, cardiologists and emergency medicine specialists are the most qualified to perform CPR measures. Luckily, in recent years, thanks to the introduction of the Bologna system and changes to the curriculum of university medical studies, first-year medical students gain knowledge in BLS – CPR, which they later build on with advance life support (ALS – CPR) training in later years of studying, in the subjects of Surgery, Anesthesiology, Internal Medicine, Emergency Medicine and Pediatrics. Also, ongoing medical education mandatory for all health care workers in the Republic of Serbia gives many doctors the opportunity to gain new and refresh old theoretical knowledge and manual skills in CPR. CPR is thus slowly gaining its merited position in medicine. In the modern world, BLS – CPR is part of every individual's basic education.

Performing CPR on a plane is constrained due to the confined space. The recipient should therefore immediately be moved to the widest area of the aircraft which permits the execution of CPR measures. This is most often the area around exits, the galley or the official cabin crew area. Coordinating with the cabin crew, organize the most qualified crew members to assist in the CPR measures directly. The figures are that cabin staff is trained in BLS – CPR in 73 to 88% of cases. The cabin and flight crew must renew their CPR and AED licenses every two years [9].

Begin chest compressions without delay. Ask for all available CPR equipment from cabin crew. Provide oxygen with a resuscitation bag mask. Continue chest compressions and artificial ventilation (ratio 30 to 2) throughout, even while placing AED electrodes [17,18]. Turn on AED and follow the visual/voice instructions. If there is equipment for endotracheal intubation, manage the airway using the endotracheal tube only if you are fully trained in this manual skill, minimizing interruption of chest compressions [19,20]. Otherwise, continue artificial respiration using resuscitation bag mask. If the EMC kit contains drugs, administer epinephrine and amiodarone, based on ERC recommendations from 2015. Consider the 4H and 4T causes of CA and if any are present, try to counter them during CPR measures, as these causes are potentially reversible [21,22].

ROSC during CPR is indicated by a returning pulse in the large blood vessels (carotid arteries) and "signs of life" – attempting to breathe and coughing, opening of the eyes, bodily movements [23, 24]. If these "signs of life" fade with the cessation of chest compression, it is a false ROSC caused by sound performance of CPR measures and the resuscitation should be continued immediately. Only a

doctor may declare CPR unsuccessful, and then only if: certain signs of death are present; asystole has been present for over 20 min despite ALS measures and there are no reversible causes; an assessment has been made that all further CPR would be futile and useless [25,26].

Airlines are increasingly using the services of remote CPR centers like Medair or The First Call, which provide round-the-clock physician consultations in their call centers [2]. If the volunteering medical professional on the flight asks for this kind of support, the cabin crew can provide it via satellite phone.

DECISION TO DIVERT AND LAND

The decision to change course and land the plane at the nearest airport belongs to the pilot, who makes it based on the advice of the medical professional, depending on the state of the patient and the need for urgent medical treatment that cannot be provided onboard (acute coronary syndrome, stroke, sudden and protracted change in mental status), available resources (equipment, medication, medical staff), the distance to the nearest airport, weather, etc. If a passenger is discovered to have died (e.g. in their sleep) or the CPR is declared unsuccessful, diversion of the flight is not recommended [7].

If the patient is unstable and needs EMC, the doctor may suggest an emergency landing at the nearest airport in order to secure expert medical assistance. Landing is considered in consultation with medical experts on the ground, and the pilot makes the final call. An urgent change in flight path and setting the aircraft down at the nearest airport is necessary in 2.4 to 7.3% of all incidents of this kind, most often due to anginal distress (22%), stroke (11.3%) or seizure (9.4%), while only one in four patients require additional treatment in a hospital [3]. Ruskin et al. suggest landing in case of persistent chest pain, difficulty breathing and strong abdominal pain [27]. Grendreau et al. add to the list stroke, protracted persistent loss of consciousness, multiple seizures and serious agitation [28].

When the aircraft is on an intercontinental overseas flight or when flying over vast uninhabited areas, landing is not possible until the area is cleared.

Only a doctor can confirm the death of a passenger onboard. If there is no doctor onboard and the cabin crew performs the resuscitation, even with the assistance of a nurse/medical technician, and the resuscitation fails, the aircraft should land as soon as possible so a medical team at the nearest airport can either continue resuscitation measures or declare death [7].

The emergency landing itself can be very expensive, costing from USD 3,000 to 100,000 depending on the size of the plane, the extra fuel used and compensation to passengers for the delay, and may entail long-term consequences [29].

Additional information about the role of the physician in CPR is available in the Doctor on Board brochure, published in 2006 by Lufthansa and Austria Airlines [7].

CONCLUSION

The presence and expert assistance of a doctor in providing CPR in-flight raises survival rates, even though there currently exist no international standardized protocols, equipment, drugs or cabin crew training. Based on the available literature and the varying national recommendations, the authors of this paper have tried to highlight the importance of introducing standards in this area which would fully cover the ethical and legal circumstances faced by the medical professional passenger and, on the other hand, enhance the safety of the passenger in a life-threatening state.

REFERENCES

1. Goodwin T. In-flight medical emergencies. BMJ. 2000; 321: 1338–41.
2. Amit C, Shauna C. In-flight Medical Emergiencies. West J Emerg Med. 2013; 14(5): 499–504.
3. Sand M, Bechara FG, Sand D, Mann B. Surgical and medical emergencies on board European aircraft: a retrospective study of 10189 cases. Crit Care. 2009; 13(1): R3.
4. Qureshi A, Porter KM. Emergencies in the air. Emerg Med J. 2005; 22: 658–9.
5. Buehrle E, Gabler A. Notfallmedizin im Flugzeug: Erste Hilfe über den Wolken. Dtsch Arztebl. 2005; 102: 338–42.
6. Lyznicki JM, Williams MA, Deitchman SD, Howe JP. 3rd, Council on Sceientific Affairs, American Medical Association Inflight medical emergencies. Aviat Space Environ Med. 2000; 71: 832–8.
7. Truhlar A, Deakin D, Soar J, Khalifa A, Alfonzo A, Bierens J, et al. European Resuscitation Council Guidelines for Resuscitation 2015. Section 4. Cardiac arrest in special circumstances. Resuscitation 2015; 95: 148–201.
8. Trpković VS, Pavlović PA, Anđelić LJS, Sekulić DA. Nove preporuke za kardiopulmonalnu reanimaciju u posebnim stanjima. Naučni časopis urgentne medicine HALO 194. 2015; 21(3): 199–211.
9. Page RL, Jogler JA, Kowal RC, Zagrodzky JD, Nelson LL, Ramaswamy K, et al. Use of automated external defibrillators by a U.S. airline. N Engl J Med. 2000; 343: 1210–6.
10. Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Annex IV Commercial Air Transport Operations[Part-CAT] of Commission Regulation (EU) 965/2012 on air operations; Consolidated version including Issue 2, Amendment 8. 2016. p. 283-286. Available from: https://webmail.ptt.rs/uwc/webmail/attach/Consolidated_unofficial__AMC-GM_Annex_IV_PartCAT_Oct_2016.pdf?sid=&mbox=INBOX&uid=9503&number=4&filename=Consolidated%20unofficial%20%20AMC-GM_Annex%20IV%20Part-CAT%20Oct%202016.pdf
11. James JB, editor. United States Federal Aviation Administration. Advisory circular: Emergency Medical Equipment AC121-33B. Jan 12, 2006. (Last accessed on February 14, 2017). Available from: http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/list/AC%20121-33B/$FILE/AC121-33B.pdf
12. Official Gazette of the Republic of Serbia (2015). Pravilnik o obavljanju javnog avio prevoza i nekomercijalnog letenja. No. 73/10, 57/11, 93/12, 45/15 and 66/15.
13. Ruskin KJ, Hernandez KA, Barash PG. Management of in-flight medical emergencies. Anesthesiology. 2008; 108: 749–55.
14. Valani R, Cornacchia M, Kube D. Flight diversions due to onboard medical emergencies on an international commercial airline. Aviat Space Environ Med. 2010; 81(11):1037–1040.
15. DAN Legal Network, National Coodinators Committee: The Good Samaritan Law across Europe; c2017 [cited 2017 Feb 17]. Available from: https://www.daneurope.org/c/document_library/get_file?uuid=c09228f3-a745-480b-9549-d9fc8bbbd535&groupId=10103
16. Official Gazette of the Republic of Serbia (2016). Kodeks profesionalne etike Lekarske Komore Srbije , član 8: No. 104/2016.
17. Pavlović PA, Trpković VS, Anđelić LJS, Marinković MO. Kardiopulmonalna reanimacija - nove preporuke 2015-2020. Naučni časopis urgentne medicine HALO 194. 2015;21(3):181-198.
18. Pavlovic PA. Savremeni stavovi u primeni kardiopulmonalne reanimacije, Zdravstvena Zastita. 2009; 21: 53–65.
19. Trpković VS, Pavlović PA, Videnović DN, Jovanović P, Bojović P. Značaj uspostavljanja disajnog puta i rane defibrilacije na preživljavanje pacijenata koji su doživeli vanbolnički akutni zastoj srca. Praxis medica. 2010; 38 (3-4): 33–38.

20. Trpković VS, Pavlović PA, Bumbaširević V, Sekulić A, Miličić B. Uspeh reanimacije osoba s akutnim zastojem srca u bolničkim uslovima; Srp Arh Celok Lek. 2014; 142(3-4): 170–7.
21. Pavlović PA, Trpković VS, Videnović DN. Primena novih preporuka za kardiopulmonalno cerebralnu reanimaciju u svakodnevnoj anesteziološkoj praksi. Serbian Journal of Anesthesia and Intensive Therapy. 2013; 35(1–2): 51–60
22. Pavlović PA. Kardiopulmonalna reanimacija. In: Pavlović PA editor. Prva pomoć. Beograd: Obeležja; 2011. p. 85–119.
23. Pavlović PA. Kardiopulmonalno cerebralna reanimacija. 3rd ed. Beograd; Obeležja; Beograd; 2011.
24. Pavlović PA. KPCR kod odraslih. In: Kalezić N. editor. Inicijalni tretman urgentnih stanja u medicini. Beograd: Medicinski fakultet u Beogradu, 2016. p. 225–77.
25. Perkins GD, Handlez AJ, Koster RW, Castrén MC, Smyth MA, Olasveengen T, et al. European Resuscitation Council Guidelines for Resuscitation 2015. Section 2. Adult basic life support. Resuscitation. 2015; 95: 1–80.
26. Soar J, Nolan JP, Bottiger BW, Perkins GD, Lott C, Carli P, et al. European Resuscitation Council Guidelines for Resuscitation 2015. Section 3. Adult advanced life support. Resuscitation. 2015; 95:100–47.
27. Ruskin KJ, Hernandez KA, Barash PA. Management of in-flight medical emergencies. Anesthesiology. 2008; 108: 749–55.
28. Gendreau MA, DeJohn C. Responding to medical events during commercial airline flights. N Engl J Med. 2002; 346: 1067–73.
29. Rosenberg CA, Pak F. Emergencies in the air: problems, management, and prevention. J Emerg Med. 1997; 15: 159–64.

