

REPORTS

In-Flight Emergencies at 35,000 Feet

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INTRODUCTION

Medical emergencies that occur in commercial jet aircraft create unique and challenging situations. Providing medical care with limited resources, space, support personnel, and equipment creates a suboptimal environment for those physicians who volunteer to provide care. Furthermore, some physicians may be reluctant to volunteer to assist in such emergencies given the current litigious environment. Emergency physicians often provide emergency care in disorganized situations with limited resources. We describe three cases which highlight several issues related to the provision of emergency care in commercial airlines:

CASE 1

History: An 18 year-old woman developed light-headedness 2-1/2 hours into a flight from California to Hawaii on a 120 passenger Boeing 737. According to her mother, she first felt nauseated, then felt "as though blood drained from her head." She then had her mother assist her to the toilet. Walking down the narrow aisle, she felt faint and dizzy and requested to lie down. The flight crew asked for a physician volunteer to assist, and an emergency physician responded instantly. After a brief syncopal episode, the patient was then assisted to the rear of the plane

by the emergency physician. In the galley area she lay down and blankets were provided for warmth. She was awake, but slow to answer questions. She said she was having moderate to severe menstrual cramps. She also stated she was sensitive to "the sight of blood." She stated that she was otherwise in good health. The patient stated she was not pregnant.

On physical examination, the patient was lethargic but arousable. She appeared quite pale, and her pulse was approximately 120 beats per minute and thready. After some time, the medical kit containing a sphygmomanometer and stethoscope was found by the crew, and her blood pressure was approximately 100 over 70. It was difficult to hear the Korotkoff sounds with the blood pressure cuff due to the jet airplane noise and the crew's conversation in the galley. It was difficult to assess the patient in the cramped space. Her physical examination was unremarkable with the exception of lower abdominal tenderness with guarding. There were no supplies in the provided medical kit for intravenous access or fluids. The initial impression was that her syncope was probably secondary to prolonged stasis and diminished preload. A vaso-vagal component may also have been responsible, as her syncope occurred after "the sight of blood" while using the toilet. She was sitting in a middle seat and stated she had not moved at all since boarding the plane. Other more concerning possibilities included ruptured ectopic pregnancy, appendicitis, ovarian torsion or abscess, and pulmonary embolus.

Course: The patient lay on her back in the galley way with her knees up for approximately one hour. During this time period, her pallor disappeared, and her pulse became stronger with a normal rate. Her blood pressure, however, was unchanged. Her abdominal cramps resolved. Her mother stated she appeared much better, and the patient herself confirmed this. The patient sat up and felt that she could return to her seat, which she did without incident. The possible diagnoses were discussed with both the mother and the patient with recommendations to immediately go to the nearest emergency department should her symptoms return. The rest of the flight was without incident.

CASE 2

An 82 year-old man sitting with his wife beside him became lethargic and started vomiting on a flight from Mexico to California. The emergency physician happened to be sitting directly across the aisle from the patient and responded immediately. His wife stated he had significant coronary artery disease with bypass graft surgery 10 years ago. His medications were in his checked baggage and she was uncertain of their names. The patient could only nod when asked if he had chest pain. Another passenger offered his personal nitroglycerine supply, and he was thanked by the emergency physician but told not to administer it yet.

On physical examination he did not appear to be short of breath. No further history was obtainable from the patient. The flight crew came to assist, and brought a medical kit containing a stethoscope, sphygmomanometer, and supplemental oxygen which was immediately placed on the patient. There was no equipment for intravenous access or an emergency airway. As he was slumped in his seat with poor airway dynamics, a decision was made to lay him down in the aisle with Trendelenburg positioning. This was difficult and required the help of two people, as he weighed approximately 120 kg. Only his carotid pulse was palpable, with a rate of 50. His blood pressure was 80 systolic, and diastolic was not measured. It was nearly impossible to access the patient's sides as his body width exceeded the width of the aisle.

Course: The flight crew asked the emergency physician if the plane should proceed to its destination, which was over an hour away, or divert to the nearest airport. Immediate diversion to the nearest airport in the United States was recommended, which in this case was San Diego. The flight crew, after consulting with the captain, stated this was not possible as the nearest airport was in Mexico and the patient would have to be taken there by international law. As the other passengers witnessed the severity of the situation, there was little dissent about this obvious delay. The patient became less arousable but still maintained his carotid pulse, which remained bradycardic. The emergency physician could do little else but await the possibility

of performing cardiopulmonary resuscitation. The patient was not restrained for landing. Upon landing at the airport in Mexico paramedics boarded and carefully extracted him from the aisle, placed him in the ambulance and left presumably for the nearest emergency facility with his wife on board. The plane refueled and continued onto its final destination, with a total delay of two hours.

CASE 3

A 38 year-old gravida 4, para 3 woman boarded a flight from Texas to Mexico—her native country—with the knowledge she was 39 weeks pregnant. She did not inform the check-in staff or flight crew of her late term pregnancy, instead hiding it with an overflowing dress. Thirty minutes prior to landing she experienced uterine cramps and alerted the flight crew. She was immediately moved up to the first row of the first class section, which happened to be empty. A call was made for a physician volunteer, and an emergency physician responded promptly. On further questioning she stated “her water broke” after which “she delivers fast.” The emergency physician asked the flight crew for latex gloves and towels in preparation for an imminent delivery, but was informed they had neither on board. Blankets were provided instead. The patient was not asked about Human Immunodeficiency Virus or Hepatitis B/C status.

Physical Examination: Although a medical kit was available, vital signs were not taken as the patient appeared in good health and was alert. The situation precluded a vaginal examination to check dilation, station, or presentation.

Course: As the plane began to land her contractions intensified. She was exhorted not to push. Upon arrival at the gate paramedics boarded and brought her to the ambulance, where she was taken immediately to the nearest emergency facility. This time the flight crew did thank the emergency physician, who was given a surplus bottle of champagne.

DISCUSSION

These cases bring forward several issues: 1) The cramped and inadequate seating space provided for

passengers by airlines potentially creates and/or exacerbates medical problems; 2) Most aircraft have inadequate space to provide care for patients; 3) Crews may not be fully trained to deal with medical problems; 4) Medical equipment may be inadequate; and 5) Laws governing the medical emergency care of patients between states or nations are vague.

Medical problems that may develop as a result of air travel include deep venous thrombosis (DVT), pulmonary embolus, seizures, anaphylaxis, dyspnea, myocardial infarction, and musculoskeletal pain.¹⁻⁸ In addition, passengers may be exposed to serious airborne infectious diseases.⁹

Passenger seating arrangements in aircraft are often crowded and cramped.¹⁰ Passenger advocacy organizations have complained to airline companies, but this has not resulted in significant increased seating space on most commercial airlines.

In Case 1, the patient was stationary with pooling of venous blood, which probably resulted in syncope. After two hours of confinement in her middle seat, this pooling may have led to inadequate preload. As mentioned previously, other serious causes could be an abdominal catastrophe such as ruptured ectopic pregnancy, or pulmonary embolus, seizure, or arrhythmia. Documentation of DVT, known to the public as "Economy Class Syndrome," has occurred as a result of long airline flights.^{4,8} Syncope in young adults in flight from diminished preload due to stasis, however, has largely gone unreported in the literature.

Awkward and cramped seating positions can lead to several problems in flight. Patients with chronic back or other musculoskeletal pain may have exacerbations of pain related to suboptimal seating arrangements. Patients with pulmonary disease who need to reposition themselves to improve breathing may find this nearly impossible. One author noted that his exit seat was unable to recline. When the passenger seated in front of this author reclined, it was basically in his face and he could not move. Cabin pressure is slightly lower than atmospheric pressure at sea level, and the partial pressure of oxygen is diminished as well. Most passengers tolerate this decrease well, but those with

cardiopulmonary diseases may not. This may have been the situation in Case 2, in which the relative hypoxia potentially resulted in myocardial ischemia. Airlines have faced litigation related to cramped seating and the poor quality of cabin air, but this has not resulted in providing more physiologically adaptable seating or better air quality.

These cases also illustrate the difficulty of providing in-flight emergency care. In Case 1, the galley where the patient lay supine was narrow and made it difficult to attend to the patient either on her left or right side. Furthermore, several crew members stood in the area as the aisle was congested with passengers walking to the toilet and back. Although not a possibility in this case due to the lack of necessary equipment, starting an intravenous line or providing other procedures in the cramped galley would have been extremely difficult. The alternative of the aisle of the plane, as demonstrated in Case 2, may be worse, as it was nearly impossible to attend to the patient on either side; full access was available only at the head or feet. Ideally, galley areas in planes should be made larger in order to provide for possible medical emergencies.

Some flight crew may not be appropriately trained. There was delay in locating the medical kit, and no provision of any other useful equipment. In Case 1, crew members had to be asked specifically for blankets to insulate the patient from the cold floor and to cover her. These crew members appeared unsure of what procedures to follow.

The equipment bag in Case 1 consisted of a disposable stethoscope, sphygmomanometer, and a portable defibrillator. The operational state of this equipment was unclear, and there was no means of quality assurance as to when this equipment was last inspected and checked even though regulations exist.¹¹ In Cases 2 and 3 there was also an epinephrine pen and oral diphenhydramine. Additional supplies which would have been a welcome sight for the exasperated volunteer emergency physician would, in the authors' opinion, include basic airway devices such as a bag-valve mask with different sized mouthpieces, intravenous equipment and at least two liters of

crystalloid, latex gloves, and perhaps an emergency cricothyrotomy kit. Additional useful pharmaceuticals would include nitroglycerine, and perhaps an injectable benzodiazepine.

As illustrated by Case 3, late trimester pregnancy is a high risk situation during air travel that an emergency physician may encounter. What is confusing is that rules regarding travel during pregnancy vary by airline, length of flight, and country of travel. In general, most airlines prohibit travel within 30 days of delivery or 36 weeks gestation, unless a letter from a physician clearing the patient for travel is provided. Some airlines have no regulations. Airlines assume emergency obstetrical care will be provided by volunteers on board, preferably a physician or nurse. Latex gloves are often not available to comply with universal blood and body fluid precautions, as in this case. Poor neonatal outcome is always a possibility even in the best of circumstances, especially since no appropriate resuscitation tools are available in flight. The relative hypoxia in flight may also cause problems.

The medico-legal implications for the emergency physician who volunteers to assist in an in-flight medical crisis deserves careful analysis. Even though airline crews often rely on medical personnel volunteering to provide care, the laws governing medical care on commercial flights are vague.¹² This throws into question the issue of jurisdiction for the state that is being flown over, the deportation state, or the destination. Furthermore, on international flights the protection afforded medical personnel is unclear. Given these constraints it is possible that some physicians may be hesitant to volunteer to assist when called by flight crew. This is especially true in the era of medical subspecialization, as some physicians may feel uncomfortable in providing general emergency care. Therefore, the emergency physician, if available, usually becomes the most qualified person to provide medical care. Although Good Samaritan laws may apply in this type of situation, they do not completely guarantee the emergency physician will not be named in a civil or criminal suit for battery. In Case 1, the volunteer physician could have been charged with battery for unconsented "touching" during the measurement of pulse, blood pressure, and brief physical examination. In Case 2, the patient was still

awake and had not actually consented to the volunteer physician's care of him. Regarding Case 3, some lawyers may consider the act of giving birth to be a natural process and not a true medical emergency. Thus, the physician who assists in such a situation may have voluntarily entered into a physician-patient relationship with all the pursuant medicolegal implications.

Each in-flight medical situation must be carefully assessed by the emergency physician to define its true "emergency" potential, with the Hippocratic doctrine *Primum non nocere* ("First do no harm") clearly in mind. Furthermore, the issue of diverting a flight for an emergency landing has important implications. Flight crew who are asked by physicians to direct an aircraft for an emergency landing might face pressure from airlines because of the costs and delays involved.¹³

CONCLUSION

These three cases demonstrate several issues related to the provision of emergency care in commercial aircraft. Although vexing problems exist as discussed above, the emergency physician should be prepared to step forward and assist. In addition, emergency medicine organizations need to work with commercial airlines to ensure that appropriate equipment, training, and space are available in airlines to provide care.

REFERENCES

1. DeHart RL. Health issues of air travel. *Annu Rev Public Health* 2003;24:133-51. Epub 2002 Oct 23.
2. Adi Y, Bayliss S, Rouse A, Taylor RS. The association between air travel and deep vein thrombosis: systematic review & meta-analysis. *BMC Cardiovasc Discord* 2004;19:4(1):7.
3. Brady WJ Jr., Bright HL. Occurrence of multiphasic anaphylaxis during a transcontinental air flight. *Am J Emerg Med* 1999;17(7):695-6.
4. Jacobson BF, Munster M, Smith A, Burnand KG, Carter A, Abdool-Carrim AT, Marcos E, Becker PJ, Rogers T, le Roux D, Calvert-Evers JL, Nel MJ, Brackin R, Veller M. The BEST study – a prospective study to compare business class versus economy class air travel as a cause of thrombosis. *S Afr Med J* 2003;93(7):522-8.

5. Rayman RB. Passenger safety, health, and comfort: a review. *Aviat Space Environ Med* 1997;68(5):432-40.
6. Brown TP, Shuker LK, Rushton L, Warren F, Stevens J. The possible effects on health, comfort and safety of aircraft cabin environments. *J R Soc Health* 2001;121(3):177-84.
7. Belcaro G, Geroulakos G, Nicolaidis AN, Myers KA, Winford M. Venous thromboembolism from air travel: the LONFLIT study. *Angiology* 2001;52(6):369-74.
8. Paganin F, Bourde A, Yvin JL, Genin R, Guijarro JL, Bourdin A, Lassalle C. Venous thromboembolism in passengers following a 12-h flight: a case-control study. *Aviat Space Environ Med* 2003;74(12):1277-80.
9. Exposure of passengers and flight crew to Mycobacterium tuberculosis on commercial aircraft, 1992-1995. *MMWR Morb Mortal Wkly Rep* 1995;44(8):137-40.
10. Brundrett G. Comfort and health in commercial aircraft: a literature review. *J R Soc Health* 2001;121(1):29-37.
11. Thibeault C. Emergency medical kit for commercial airlines: an update. *Aviat Space Environ Med* 2002;73(6):612-3.
12. Sirven JJ, Claypool DW, Sahs KL, Wingerchuk DM, Bortz JJ, Draskowski J, Caselli R, Zanick D. Is there a neurologist on this flight? *Neurology* 2002;58(12):1739-44.
13. Delaune EF 3rd, Lucas RH, Illig P. In flight medical events and aircraft diversions: one airline's experience. *Aviat Space Environ Med* 2003;74(1):62-8.

LEGISLATIVE UPDATE

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CAL/AAEM Board and Representative to the CAL/ACEP Government Affairs Committee

Major political high focus issues include the following:

Proposition 67: As you have by now heard, Proposition 67 was defeated in the November 2nd elections. While this is a disappointing result to all of the efforts of the CPEC coalition (consisting of CMA, Cal/ACEP, Cal/AAEM, the Emergency Nurses Association of California, California Professional Firefighters, and the California Primary Care Association) and all of the individual efforts of emergency physicians across the state, we should not lose sight of what was accomplished during this effort to help save the "safety net" for our state's Emergency Medical Services:

First, we demonstrated to the Governor, the legislators, and the public, that we emergency physicians can get organized (with other emergency groups) to try to save California's EMS system, when no one else seems to be willing to make the hard decisions and efforts to do so.

Second, like President George Bush said, we "earned some political capital" with our efforts. Many legislators became much better educated about the problems facing the hospitals, trauma centers, and emergency departments across the state. They hopefully are ashamed that we have had to do the work that they have been unable to do. Our failure to be successful means that the ball is now back in their court, since they can't deny that California's emergency services are nearing a crisis point. Based on our efforts, we have found many legislators' doors opening to us, and many dialogues have begun that will carry on in 2005.

Third, we found out that our Governor is as much a politician as all the other legislators: he did not step up to support our effort since he did not want to be "tainted" by supporting any new taxes or fees. He did demonstrate that most of the Propositions he publicly supported passed, and those he took a public stance against failed. He "kept mum" about our Proposition 67—too bad, because had our effort succeeded, he could have shown he was a "non-politician" who was more concerned about saving California's safety net than he was to save face on the tax/fee issue, and the