



“Is there
a doctor in the plane?” ...In
flight
emergencies

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In Flight Emergencies- Topics

- Incidence
- Pathophysiology
- Resources available
 - Emergency Kit
 - Plane crew and pilot
 - Ground base medical support
 - Can the flight continue?
- Most common in flight emergencies
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- Legal implications US/ International

INCIDENCE

- 1 in 604 flights based on a review of 11 920 requested ground consultations from 5 large domestic and international airlines from 2008 to 2010.
- Other frequency estimates from individual airlines with data from 2009 to 2013 ranged from 24 to 130 per 1 million passengers.
- Given that 4 billion commercial airline passengers travel worldwide annually, it is possible that **260 to 1420 IMEs occur daily worldwide.**

Likely an underrepresentation of all IMEs because many minor incidents do not result in consultations.

Pathophysiology

- Cabin pressures are 11-12 PSI-> volume of gas expands by up to 30%, including in the body (middle ear, sinuses) and non physiologic spaces (GI, pulm, ocular, brain).
- Partial pressure of O₂ decreases (mean arterial O₂ saturation in healthy patients drops 97%-93%).
 - Important if patients have chronic respiratory conditions and checking vitals.
- Increased platelet activation and venous stasis + mild hypoxia-> increased risk for VTE, however weak and small powered studies.

Resources

- Emergency kit
- Plane crew
- Pilot
- Passengers
- Land crew

EMERGENCY KIT

Minimum requirements for emergency medical kit equipment in the United States include:

- an automated external defibrillator
- equipment to obtain a basic assessment (vitals)
- hemorrhage control
- initiation of an intravenous line
- medications to treat basic conditions.

Other countries have different minimum medical kit standards, and individual airlines have expanded the contents of their medical kit.

EMERGENCY KIT

Adhesive bandage compresses, 1-in	16
Antiseptic swabs	20
Ammonia inhalants	10
Bandage compresses, 4-in	8
Triangular bandage compresses, 40-in	5
Arm splint, noninflatable	1
Leg splint, noninflatable	1
Roller bandage, 4-in	4
Adhesive tape, 1-inch standard roll	2
Bandage scissors	1
Sphygmomanometer	1
Stethoscope	1
Airways, oropharyngeal (3 sizes) 1 pediatric, 1 small adult, 1 large adult or equivalent	3
Self-inflating manual resuscitation device + 3 masks (1 pediatric, 1 small adult, 1 large adult or equivalent)	1 3
CPR mask (3 sizes, see above)	3
IV admin set: tubing + 2 Y connectors	1
Alcohol sponges	2
Adhesive tape, 1-inch standard roll	1
Tape scissors	1 pair
Tourniquet	1
Saline solution, 500mL	1
Protective nonpermeable gloves (or equivalent)	1 pair
Needles (2x 18 ga., 2x 20 ga., 2x 22 ga., or sizes necessary to administer required medications)	6 total (various sizes)

Syringes (1x 5mL, 2x 10mL, or sizes necessary to administer required medications)	4 total (various sizes)
Analgesic, non-narcotic tablets, 325 mg (unspecified branding though heavily implied acetaminophen)	4 pills/capsules
Antihistamine tablets, 25mg (unspecified branding though heavily implied diphenhydramine)	4 pills/capsule
Antihistamine injectable, 50mg (single dose ampule or equivalent; unspecified branding though heavily implied diphenhydramine)	2x injectable doses
Atropine, 0.5mg in 5mL ampule (single dose ampule or equivalent)	2x ampule doses
Aspirin tablets, 325mg	4 tablets
Bronchodilator, inhaled (metered dose inhaler or equivalent)	1
Dextrose, 50%/50mL injectable (single dose ampule or equivalent)	1
Epinephrine (1:1000, 1mL)	2
Epinephrine (1:10,000, 2mL)	2
Lidocaine 2% (5mL)	2
Nitroglycerin tablets (0.4mg)	10
Basic instructions for use of drugs in kit	1
Automated external defibrillator	1
Arm and leg splints	* May not fit within the confines of an approved First Aid Kit but may be stowed near the First Aid kit

- FAA Code of Regulations, Title 14, part 121 subpart X Section 121.803
- 1 kit for 0-50 passengers; 2 kits for 51-150 passengers; 3 kits for 151-250 passengers; 4 kits for 250+ passengers

Vitals



Plane crew and pilot

- Flight attendants have CPR and BLS training every 2 years.
- Flight attendants are trained in AED use.
- Flight attendants can keep calling passengers for help.
- Pilot can contact in ground crew.

Ground base medical support

- Trained medical personnel who provide recommendations for in flight emergencies.
- Most airlines contract with third-party entities to provide this service.
- When an emergency occurs on an aircraft:
 - A flight attendant notifies the pilot in command→that pilot establishes radio or satellite telephone communications with the ground-based medical support center and the airline operations center.
 - The flight attendant relays information to and from ground-based support via the pilot or through headsets in the cabin.
 - Communication clarity is often a challenge, including device issues and relaying of information.

Can the flight continue?

- Touch base with the pilot/crew to determine if the flight can continue or should be diverted.
- Ground aviation medical team to assist with decision making regarding diversion
- Pilot makes final decision.

Most common in flight Emergencies

- Types of in-flight emergencies when a single cause could be identified:
 - Syncope/near syncope (32.7-37.4%)
 - GI including nausea/vomiting (9.5-14.8%)
 - Respiratory including asthma exacerbations (10.1-12.1%)
 - Cardiovascular (7.0%) including cardiac arrest (0.2%)
 - Other (Psych/intox, allergy, ob/gyn, other/unknown)

 **SYNCOPE / NEAR-SYNCOPE**
— 30% of all in-flight emergencies —

Initial assessment-suspect

- Vasovagal:** Pale, diaphoretic, improves with simple measures in 15-30 min.
- Cardiac cause (eg, myocardial infarction):** Chest pain, dyspnea, arm or jaw pain, persistent bradycardia.
- Pulmonary:** Dyspnea, pleuritic chest pain.
- Stroke:** Slurred speech, facial droop, or arm weakness.
- Hypoglycemia:** Diaphoretic, cool skin; assess with glucometer if available.

Management and expected course

- If unconscious** ▶ Lie flat, elevate legs, apply oxygen. If no pulse or signs of life, follow cardiac arrest card.
- If transient syncope** ▶ Supine position, elevate legs. Oral fluids with head raised if nausea absent. If improves in 15-30 min, slowly sit up and return to seat if tolerated.
- If hypoglycemia** ▶ Oral glucose or 25 g of dextrose 50% intravenously.
- If other conditions suspected** ▶ Refer to relevant card.
- If no improvement or not progressing as expected** ▶ Contact ground-based medical support for additional recommendations.

 **CARDIOVASCULAR SYMPTOMS**
— 7% of all in-flight emergencies —

Initial assessment

- Identify if any prior myocardial infarction or other cardiovascular history.
- In some settings, a 12-lead electrocardiogram may be obtained and transmitted for ground review (and/or volunteer review if qualified to read).
- Suspected acute coronary syndrome:** Chest pain, dyspnea, arm or jaw pain.
- Suspected arrhythmia:** Persistent bradycardia, tachycardia, or irregular heartbeat.
- Suspected dyspepsia:** Isolated epigastric burning with no associated symptoms. This is a consideration of exclusion, supported by history of similar symptoms.

Management and expected course

- If suspected acute coronary syndrome** ▶ Aspirin, 325 mg orally; nitroglycerin, 0.4 mg sublingually every 5-10 min (if systolic blood pressure is \geq 100 mm Hg).
- If any dyspnea or respiratory distress** ▶ Give oxygen, unless saturations are known to be near or at normal levels.
- If dyspepsia suspected** ▶ Antacids or other analgesics can be given after appropriate risk stratification. Alternative causes should first be considered.
- If persistent or additional symptoms** ▶ Contact ground-based medical support for additional recommendations.

 **GASTROINTESTINAL ILLNESS**
— 15% of all in-flight emergencies —

Initial assessment

- Identify extent and timing of symptoms, including nausea, vomiting, diarrhea, bleeding, and specifics of any abdominal pain (location, quality, and severity).

Management and expected course

- If nausea/emesis** ▶ Use an oral antiemetic if available; if not tolerated, consider a parenteral antiemetic.
 - Provide oral hydration if tolerated.
 - Use sugar-containing liquids if symptoms of hypoglycemia.
 - If oral intake not tolerated, consider intravenous fluids.
- If dyspepsia** ▶ Use an antacid if available in the emergency medical kit.
- If diarrhea** ▶ Use an antidiarrheal if available in the emergency medical kit.
 - If patient has fever and persistent diarrhea ($>$ 14 d), contact ground-based medical support, as local public health authorities may need to be contacted at the destination.
- If severe abdominal pain, tenderness on examination, rigid abdomen, or blood in bodily fluid** ▶ Contact ground-based medical support for additional recommendations.

 **STROKE LIKE SYMPTOMS**
— Up to 5% of all in-flight emergencies —

Initial assessment

- A focused history should include the time of symptom onset, specific motor and sensory components, and any other associated symptoms including headache or sensorium changes.
- Screening for stroke:** Speech disturbance, facial droop, or arm weakness.

Management and expected course

- Administer oxygen, unless saturations are known to be near or at normal levels.
- If patient has ongoing neurological deficits suggestive of a stroke** ▶ Contact ground-based medical support.
 - Recommendation may include diversion, which may not be to the closest airport if stroke care is not present at that airport.
 - Ground-based team should have information on capabilities for medical care near most major airports.

 **RESPIRATORY DISTRESS**
— 10% of all in-flight emergencies —

Initial assessment

- Identify history of respiratory disease, scuba diving, extremity swelling, or infectious symptoms.
- If available, check pulse oximetry.

Management and expected course

- If ongoing dyspnea or known oxygen saturation is $<$ 95%** ▶ Administer oxygen.
 - If passenger's portable oxygen concentrator fails or is not used for a patient with preexisting lung disease, consider trial of oxygen therapy.
 - If passenger uses \geq 4 L/min on the ground, the onboard oxygen supply may not be enough to reverse hypoxia.
 - Monitor flow rate of oxygen administered; canister consumption is variable and aircraft may not have sufficient oxygen for continuous use for the duration of the flight.
- If bronchospasm** ▶ Administer albuterol, 2.5 mg inhaled.
- If allergic reaction** ▶ Refer to allergic reaction card.
- If passenger does not improve** ▶ Contact ground-based medical support for additional recommendations.

 **SEIZURE**
— Up to 5% of all in-flight emergencies —

Initial assessment

- Identify the symptoms the passenger exhibited during the event:** including onset, duration of movement activity, quality of movements (eg, tonic-clonic), and loss of bowel or bladder function.

Management and expected course

- If unresponsive** ▶ Lay passenger on floor on side, monitor airway, and assess vital signs with ongoing neurological examination as above.
- If ongoing seizure** ▶ Administer parenteral benzodiazepines if available in the emergency medical kit (not usually available on US commercial airlines).
- If alert following a prolonged or recurrent seizure** ▶ Ground-based medical support may recommend an added dose of the patient's own antiepileptic medication (if history of seizures and available) or an oral benzodiazepine (if available in the emergency medical kit).
- If seizure resolves and patient regains normal mental status** ▶ Diversion is not commonly necessary.



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STROKELIKE SYMPTOMS

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► Initial assessment

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- Screening for stroke:** Speech disturbance, facial droop, or arm weakness.

► Management and expected course

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Contact ground-based medical support.
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SEIZURE

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- Identify the symptoms the passenger exhibited during the event:** Including onset, duration of movement activity, quality of movements (eg, tonic-clonic), and loss of bowel or bladder function.

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- If seizure resolves and patient regains normal mental status ▶** Diversion is not commonly necessary.

Other emergencies

- No OB kit
 - Limited number of sterile gloves.
 - No clamp cord kit (some exceptions)
 - Scissors in kit
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- In case of allergic reaction, no Epi pen.

[How to Administer Epinephrine From a Vial or Ampule - YouTube](#)

PREVENTION

- The risk of syncope increases with dehydration: scheduled meals and snacks during travel, especially with connecting or extended flights.
- A patient with diabetes should carry a glucometer, glucose supplements, and diabetes medications on board.
- Passengers at risk of symptomatic hypoxia need to have a portable oxygen concentrator for the flight.
 - Important if patients have chronic respiratory conditions and checking vitals.
 - Hypoxia altitude simulation test - if the patient needs O₂ and how much oxygen the person needs prior to the flight. \
 - A reasonable estimate of need for in-flight oxygen can use published equations and a passenger's ground-level P_aO₂ and P_aCO₂ measurements
 - Use of a portable oxygen concentrator during flight needs approval by the airline, a physician's certification of need, and sufficient battery life (150% of flight time), all typically coordinated at least 48 hours prior to the flight.
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Legal implications- U S

Medical volunteers are not generally required to carry proof of their medical license, although this varies by individual airline policy.

Good Samaritan Law:

- In the US, physicians are under no legal obligation to assist in in - flight medical emergencies
- The Aviation Medical Assistance Act (1998) provides Good Samaritans with protection from lawsuits alleging negligence “unless the individual, while rendering such assistance, is guilty of gross negligence or willful misconduct”
- Providers should not be under the influence of alcohol or drugs.
- Only 1 case has occurred in the United States involving a physician being sued for assisting in an emergency and that case was dismissed without hearing

Legal implications- International

- Complex combination of public and private international laws, including the Warsaw Convention, Montreal Convention, and Tokyo Convention.
- In addition to differences in “Good Samaritan” volunteer protections, which are not present in many other countries, the duty to respond also varies by country.

-For example, in the United States, Canada, England, and Singapore, there is no legal duty for an off-duty medical professional to assist during an in flight emergency.

-Australia and many European countries require physicians to render assistance during in flight emergencies as defined by case law and civil law codes

“Considering existing legal protections and international requirements, medical assistance rendered by a capable physician is of little personal legal risk and is supported by experts in aviation medicine”

- **Do not make legal pronouncement of death.**

References

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Thank you and have a safe flight!