



Perspective

Epinephrine autoinjectors on airplanes

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Many health care providers recall an airline flight during which a page overhead asked, “Is there a doctor on board?” and have responded only to find that all the tools needed for successful treatment were not readily available. The subject of in-flight allergic emergencies has not received the attention it warrants. There is a need to provide appropriate and fundamental measures to prevent and manage these emergencies for the passengers at risk, potential health care providers, fellow passengers, and airline personnel.

More than 2.75 billion passengers are transported worldwide by airlines annually. Although the exact incidence of in-flight allergic emergencies is unknown, many have preexisting, long-term conditions, including allergy, that put them at risk for experiencing an in-flight medical emergency. In some, these conditions may initially present while in flight. Up to 44,000 in-flight medical emergencies occur each year,¹ with approximately 17% of travelers transferred to a hospital on landing and 4% resulting in hospitalization or death. Allergy was reported as the seventh most common cause of in-flight medical problems between 2002 and 2007, ranging from 1.5% to 2.5% of the urgent medical events on board commercial airliners.^{2–5}

According to the Centers for Disease Control and Prevention guidelines, injected epinephrine is the first-line treatment for life-threatening allergic reactions, yet optimal supplies to treat these in flight are often limited. In the United States, the Federal Aviation Administration requires the inclusion of epinephrine in medical kits carried onboard. These emergency medical kits typically contain the following medications: aqueous epinephrine (adrenaline; 1:10,000 and 1:1000 dilution) and antihistamine tablets and injectables (usually diphenhydramine; 25 mg).

Some airlines have protocols to attempt to prevent systemic allergic reactions, such as buffer zones for foods and service animals,

allergen-free meals, preboarding wipe down of seats and tray tables, and training of airline personnel. No standardized or reliably reproducible measures among commercial air carriers have been mandated, taught, or implemented; each airline has its own suggested policies on both domestic and international flights. Currently, some airline carriers stock epinephrine autoinjectors (EAI) on flights, yet there are no standards for a specific brand or number of EAI carried per flight or standardized training among airlines.

A 2017 guideline from the World Allergy Organization expert group for in-flight treatment of allergic reactions recommends a dose of 0.01 mg/kg of up to 0.5 mg of 1:1000 intramuscular epinephrine solutions injected into the anterior lateral thigh, repeated as necessary.⁵ Most airlines stock epinephrine in 1-mL ampules with a 5-mL syringe and a 22-gauge needle based on the Federal Aviation Administration emergency medical kit requirements. Although the syringe and vial are substantially less costly than an EAI, effective use of this form of epinephrine requires reasonably specialized training of the flight personnel, which varies among airlines. The greatest safety concerns focus on the administration of the correct dose when drawn from a vial into a syringe. Unfortunately, variability in this process has led to administration of erroneous amounts and routes up to the full 1-mL dose given intravenously, which could prove harmful or even fatal to certain patients. Furthermore, epinephrine can also be easily damaged by light and heat. The typically clear ampules must be stored carefully in the dark at ambient temperature and replaced more often than an autoinjector to ensure the drug does not lose potency.

Advocates for EAI as part of the emergency kits on all airlines believe that this is a safer option. First, the spring-loaded syringe filled with epinephrine is already widely carried by people with life-threatening allergies and has a rapid learning curve for proper use. Deployment of EAI will help prevent administration of the wrong dose or administration by the wrong route. Second, EAI allow for rapid administration in a measured dose by airline personnel or first responder with minimal training. The strongest argument used against EAI in flight is the cost based on the mean

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wholesale acquisition cost of \$450 per EAI (mean of all generic and branded options) compared with the relatively nominal cost (typically $\leq$ \$25) of the ampule or the needle and syringe option.

The low reported incidence of documented allergic reactions as a cause of adverse medical events during air travel may be because they are rare, not suspected, not properly diagnosed, or not accurately reported. A brief statement during the in-flight safety announcements that describes an allergic reaction or asthma exacerbation could possibly be useful to increase awareness and minimize denial of symptoms and delay in care.^{2,3}

In 2013, member organizations of the Food Allergy and Anaphylaxis Alliance distributed an online survey. Both persons reporting an in-flight reaction, and nonreactors were surveyed to assess details of air travel preparation and any reported reaction. Data were analyzed to determine the association among flying behaviors, reported reactions, and nationality. A total of 349 reactions were reported among 3273 respondents from 11 countries. Passengers who requested accommodation asked for a peanut- or tree nut-free meal, wiped their tray table, avoided airline pillows or blankets, asked for a buffer zone based on food or animal dander sensitivity, asked that other passengers not consume peanut- or tree nut-containing products, and/or refrained from eating airline-provided food. These risk-mitigating behaviors were associated with significantly lower adjusted odds of reporting a reaction.⁴

As more people choose airline travel, the likelihood of episodes of passengers experiencing an in-flight allergic reaction will also increase. Passengers at risk, passengers not known to be at risk, health care providers, and flight personnel need to be educated about the possibility of in-flight reactions, the signs and symptoms, and appropriate administration of treatment. Additional research is needed to determine whether any of the risk-mitigating factors, such as those noted above, are effective. Professional allergy organizations and patient advocacy organizations need to support guidelines and policies that ensure that the simplest and safest protocols should be implemented. If costs can be mitigated, the EAI could prove to be a valuable tool to treat life-threatening allergic reactions in flight.

References

1. Peterson DC, Martin-Gill C, Guyette FX, et al. Outcomes of medical emergencies on commercial airline flights. *N Engl J Med*. 2013;368(22):2075–2083.
2. Dowdall N. "Is there a doctor on the aircraft? top 10 in-flight medical emergencies." *Br Med J*. 2000;321(7272):1336–1337.
3. Brown JC. Epinephrine, auto-injectors, and anaphylaxis: challenges of dose, depth, and device. *Ann Allergy Asthma Immunol*. 2018;121(1):53–60.
4. Sánchez-Borges M, Cardona V, Worm M, et al. In-flight allergic emergencies. *World Allergy Organ J*. 2017;10(1):15.
5. Greenhawt M, Fiona MacGillivray F, Batty G, Said M, Weiss C. International study of risk-mitigating factors and in-flight allergic reactions to peanut and tree nut. *J Allergy Clin Immunol Pract*. 2013;1(2):186–194.