



Airlines provide too little information for allergy sufferers!

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Summary

Introduction Allergic reactions are reported to account for approximately 2–4% of all medical emergencies on commercial airline flights. In 2016, the International Air Transport Association (IATA) published recommendations on risk prevention in severe allergies.

Methods Using a written questionnaire and an internet search, an investigation was conducted on the extent to which airlines operating in Germany have implemented the IATA recommendations and, e.g., offer peanut/nut allergy sufferers appropriate measures.

Results Only 14 of the 104 airlines contacted responded to the written survey. Of 115 airlines, 72 provided information for allergy sufferers on their

homepage, but mostly in insufficient detail. No results were found for the search term “allergy” (or “Allergie”) on the websites of 43 airlines. The information on the individual airlines has been summarized in table form.

Discussion The information offered by many airlines for passengers with allergies is insufficient. To offer greater guidance, updated information has been formulated in German and English, and its use is recommended.

Keywords Peanut allergy · Nut allergy · Anaphylaxis · Allergy · Air travel

Introduction

Allergic reactions are reported to account for approximately 2–4% of all medical emergencies on commercial airline flights [1]. This number is likely to be higher, since acute asthma attacks are documented as a respiratory problem and not necessarily as a symptom of a severe allergic reaction [2]. In addition, two thirds of passengers do not inform flight crews of their allergic reaction during the flight [3]. When asked, 9% of peanut allergy sufferers reported experiencing an in-flight allergic reaction [4].

Severe allergic reactions on commercial flights are primarily caused by foods (peanuts, tree nuts, or seafood) and medications [1]. Anaphylactic shock is the most extreme form of allergic reaction. Within minutes, hives, swelling in the face and neck region, shortness of breath due to asthma, vomiting, and circulatory failure can develop, with fatal consequences. For some allergy sufferers, the thought of experiencing an allergic reaction of this kind while on a cramped aircraft without medical assistance is extremely frightening. This can also lead to disproportionate anxiety and challenges, particularly if no

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Table 1 Questionnaire sent to the airlines

Questionnaire on how airlines deal with the risk of anaphylaxis in peanut/nut allergy		
Anaphylaxis prevention		
<i>Do you have guidelines for passengers with allergies?</i>		
☐ Yes		☐ No
<i>If so, are these guidelines visible on your website?</i>		
☐ Yes		☐ No
<i>Do you advise passengers that, if they have severe allergies, they should always carry one or more adrenaline pens on them, as well as any other medications they may require?</i>		
☐ Yes		☐ No
<i>Do you advise passengers that allergy sufferers requiring care (e.g., minors, disabled persons) are not permitted to travel alone?</i>		
☐ Yes		☐ No
<i>Do you offer allergic passengers the opportunity to board the aircraft before other passengers and clean the seats in their vicinity themselves in order to remove allergen components?</i>		
☐ Yes, they are permitted to board the aircraft before other passengers and clean		
☐ Yes, they are permitted to clean, but not to board the aircraft before other passengers		
☐ No, they are not permitted to clean other seats		
<i>Do you advise allergic passengers that the airline is not able to guarantee an allergen-free flight?</i>		
☐ Yes		☐ No
<i>Do you offer allergic passengers an appropriate buffer area in which special measures will be taken to minimize their risk of allergic reactions?</i>		
☐ Yes		☐ No
<i>If yes:</i>		
<i>How many rows of seats does the buffer area cover?</i>		
☐ Only the row in which the allergy sufferer is seated		
☐ One row behind and in front		
☐ Additional rows of seats behind and in front, No.: _____		
<i>Are allergy sufferers given the opportunity, e.g., to clean the seats in the buffer area of residual allergens using wet wipes?</i>		
☐ Yes ☐ No		
<i>Are all passengers in the buffer area requested not to consume peanuts/nuts?</i>		
☐ Yes ☐ No		
<i>In addition, are all passengers requested not to consume peanuts/nuts?</i>		<i>If no (no buffer area):</i>
☐ Yes ☐ No		<i>Are all passengers requested not to consume peanuts/nuts?</i>
		☐ Yes, this is requested of all passengers
		☐ No, this is not requested of passengers
<i>Are foods that are labeled as containing the relevant allergen (in the list of ingredients) excluded from sale or distribution to passengers?</i>		
☐ Yes, for all passengers		
☐ Yes, but only for passengers in the buffer area (if offered)		
☐ No		
<i>Are foods that are labeled only as "may contain traces of peanuts/nuts" also excluded from sale or distribution to passengers?</i>		
☐ Yes, for all passengers		
☐ Yes, but only for passengers in the buffer area (if offered)		
☐ No		
<i>Does the allergy sufferer have the option to order a special (peanut-/nut-free) meal for themselves or the person(s) accompanying them?</i>		
☐ Yes		☐ No
<i>If yes:</i>		
☐ With prior notification at least 24 h before boarding		
☐ With prior notification at least 48 h before boarding		
☐ With prior notification at least 72 h before boarding		
☐ With earlier prior notification		
☐ Without prior notification		

Table 1 (Continued)

Questionnaire on how airlines deal with the risk of anaphylaxis in peanut/nut allergy	
Anaphylaxis treatment	
<i>Do your flight crews receive training in the medical treatment of anaphylactic shock?</i>	
☐ Yes	☐ No
<i>If so, how often do these training courses take place? _____</i>	
<i>Are medications for the treatment of anaphylactic shock kept on board during flights?</i>	
☐ Yes, on all flights	
☐ Yes, on some flights	
☐ No	
<i>Is an adrenaline autoinjector that can also be used by a medical layperson kept on board?</i>	
☐ Yes	☐ No
<i>Do you have experience with anaphylaxis in passengers on your flights?</i>	
☐ Yes	☐ No
<i>Do you have experience with allergic reactions due to peanut/nut allergies in employees of your airline?</i>	
☐ Yes	☐ No
<i>What other measures, in addition to those mentioned above, do you already implement or offer in order to reduce the risk of on-board allergic incidents?</i>	

<i>What other measures do you plan to introduce in the future?</i>	

<i>For further information, please contact:</i>	
Tel./Mail: _____	

training and education on the causes and treatment of anaphylaxis have been provided [5].

People not suffering from allergies, on the other hand, often display no understanding for the potential risk to life posed by even small quantities of certain foods. Still today, individual case reports [6–8] attest to the unreasonable behavior of fellow travelers and considerable uncertainty among flight crews on how to deal with allergy sufferers due to a lack of appropriate information and structured guidelines from the airline. However, the in-flight risk of anaphylaxis could be significantly reduced by just a few simple measures taken by the patient themselves as well as the airline [9]. In 2016, the International Air Transport Association (IATA) published a communication, aimed at both allergy sufferers and airlines, containing recommendations on appropriate measures [10]. Air Canada and a number of other airlines have meanwhile largely adopted these guidelines [11].

To obtain information on the extent to which airlines operating in Germany have implemented the IATA recommendations and are now offering appropriate measures for passengers with severe allergies (e.g., peanut/nut allergy), the authors made a telephone inquiry to the German Federal Aviation Office (*Luftfahrt-Bundesamt*, LBA). They learned that there is no Germany-wide regulation and that those affected need to address their queries directly to the relevant airline. Travel agents and tour operators also need to contact the respective airline, or search through its website, in each individual case. The guidelines vary considerably here. Therefore, we conducted a written

survey on this topic among the airlines operating in Germany.

Methods

In spring 2019, questionnaires (Table 1) were sent to 104 airlines operating in Germany. The questions could be answered quickly and simply by ticking a box. Airlines that failed to reply received two reminders within 3 months, with the questionnaire enclosed once again, both in German and English.

In a second step, the authors searched the airlines' websites for information aimed at allergy sufferers. One cannot rule out the possibility that hidden information was overlooked and that not all airlines operating in Germany were recorded.

Results

The detailed results of the survey and online research are presented in Table 2. Data that came directly from the airlines are shown in normal type, while the information found by the authors is presented in italics. Table 2 provides information on 115 airlines. For 11 airlines, it became apparent only later that they also operate in Germany. These airlines did not receive questionnaires due to time constraints. As such, 104 airlines were contacted in writing up to three times with the questionnaire. Only four airlines returned their completed questionnaires. A total of 10 others responded in writing, albeit incompletely. The remaining airlines did not respond, despite two reminders.

Table 2 Results of the survey and online search

	On-board sale of foods containing peanuts/nuts	On-board sale of foods that may contain traces of peanuts/nuts	On-board sale of foods that may contain traces of peanuts/nuts	Buffer area	Announcements requesting passengers to refrain from eating nuts	Priority boarding to clean adjacent seats	Special meals for peanut-/nut-allergy sufferers	Training for flight crews on the medical management of anaphylaxis	Medications	Adrenaline autoinjectors on board	Other information
Aegean Airlines [20]	No sale of peanuts/peanut products on AEGEAN and Olympic Air flights	N/A	N/A	N/A	No Passengers nearby are informed	N/A	No	N/A	N/A	N/A	–
Aer Lingus [21]	No peanuts in snacks/meals	Yes, traces in meals/snacks possible	N/A	N/A	No	N/A	No	N/A	N/A ^b	N/A ^b	Cabin crew must be informed at the time of boarding
Aeroflot Russian Airlines [22]	N/A	N/A	N/A	N/A	N/A	N/A	Fasting menu without nuts (but no further information on allergen components), possibly only for some flights (³⁶)	N/A	N/A	N/A	–
Air Astana [23]	Yes	Yes	N/A	N/A	N/A	N/A	N/A ^c	N/A	N/A	N/A	–
Air Baltic [24, 25]	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A ^b Including prescription (English)	N/A ^b	–
Air Canada [26]	Many products replaced with peanut-free alternatives. No guarantee of nut-free foods	No guarantee that food does not contain traces of peanut	Yes (⁴⁸). No nut-containing food offered there	N/A	No, only passengers in puffer area are informed	Yes, using own wet wipes	No	N/A	N/A ^b	N/A ^a	Children with severe nut/peanut allergy not allowed to travel unaccompanied
Air China [27, 28]	N/A	N/A	N/A	N/A	N/A	N/A	Website: "mild menu" without nuts for passengers with gastric and digestive problems	N/A	Adrenaline injectors	Yes	–
Air Dolomiti [29]	No sale of peanuts. If an allergy sufferer is on board: no sale of snacks containing peanuts	No guarantee that foods do not contain traces of peanut	N/A	N/A	Yes	N/A	N/A	N/A	N/A ^b	N/A ^b	Cabin crew should be informed at the time of boarding in order that no nuts are sold and passengers are informed
Air Europa [30]	No	Yes	Yes	Yes	Yes Online: passengers nearby are informed	Yes	Yes (⁴⁸)	No	Yes ^b	No ^a	Children with severe allergies not allowed to fly unaccompanied

Table 2 (Continued)

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Air France [31–34]	N/A	Meals may contain allergen traces	N/A	N/A	N/A	Yes ⁽⁴⁸⁾ , on some flights. Other meals may contain allergen traces	First aid training. Telephone contact with a doctor possible. Flights attendants not allowed to administer medications	N/A ^b Injections: medical prescription required	N/A ^b	–
Air India [35, 36]	Yes, on international flights	See column 2	N/A	N/A	N/A	N/A ^c	N/A	N/A	N/A	–
Air Malta [37]	No guarantee that products are nut-free	No guarantee that products are nut-free	N/A	Yes	N/A	N/A ^c	N/A	N/A	N/A ^a	–
Air New Zealand [121]	No sale of peanuts	No guarantee of an environment free of peanut traces	N/A	N/A	N/A	No ^c	First aid training. Flight crew not authorized to administer medications	N/A ^b	Yes. Can be used if a doctor is on board	Contact to medical personnel possible
Air Serbia [38, 39]	Yes	Yes	N/A Advice: Inform neighboring passengers	N/A	N/A	N/A	N/A	N/A	N/A ^a	–
Alaska Airlines [121]	Meals may contain nuts	Meals may contain nuts	N/A	N/A	N/A	N/A ^c	N/A	N/A	N/A	–
Alitalia [40]	N/A. No guarantee that meals/snacks are free of peanuts/peanut products	Yes	N/A	N/A	N/A	Yes, peanut-free meals (not on domestic flights)	N/A	N/A ^b	N/A ^a	–
All Nippon Airways (ANA) [41–44]	Yes	Yes	N/A	N/A	Special seat-cleaning service (for international flights) ⁽⁹⁶⁾	Yes, (peanut-, walnut-, cashew-free) for international flights. No guarantee that food is completely free of allergens ^c ^{*24} For flights from Japan ^{*48} For flights to Japan	First aid training. Personnel not allowed to administer medical care/injections	N/A ^b	N/A ^a Security check personnel should be informed	Currently: efforts underway to eliminate peanut products on board

Table 2 (Continued)

	On-board sale of foods containing peanuts/nuts	On-board sale of foods that may contain traces of peanuts/nuts	Buffer area	Announcements requesting passengers to refrain from eating nuts	Priority boarding to clean adjacent seats	Special meals for peanut-/nut-allergy sufferers	Training for flight crews on the medical management of anaphylaxis	Medications	Adrenaline autoinjectors on board	Other information
American Airlines [45–47]	No peanuts, but other nut products are served	Yes	No	N/A	N/A (see Other Information)	N/A	N/A	N/A ^b	N/A ^b	According to press reports: in 2018, sale of peanuts stopped and priority boarding to enable seat cleaning introduced
Asiana Airlines [48, 49]	Yes, meals may contain, e.g., peanut oil	Yes	N/A	N/A	N/A	N/A	N/A	N/A ^b	N/A ^b	–
Austrian Airlines [50, 51]	Yes	Yes	No	No	No	Yes (⁴⁸)	Annual first aid training	Yes	No	–
Azores Airlines [52]	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A ^b	N/A ^a	–
British Airways [53, 54]	No, not in the relevant cabin (if allergy sufferers are on board: no snacks with nuts in the relevant cabin. Meals may contain other nuts)	No (not in the relevant cabin)	No	Yes	Yes (on presentation of a doctor's letter; with own cleaning products)	No	Yes, once a year	Yes	Yes ^d	–
Brussels Airlines [55, 56]	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	–
Cathay Pacific [57, 58]	Yes. After submitting a medical declaration, a request can be made that peanut-free snacks be served in the cabin (*72). However, these snacks may also contain traces of nuts, and meals containing nuts will still be served	Yes	No	No	Yes (with own cleaning products)	No ^c	N/A	N/A ^b	N/A ^a	–
China Eastern Airlines [59, 60]	N/A	N/A	N/A	N/A	N/A	Non-strict nut-free meals	N/A	N/A	N/A	–

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Condor Flugdienst GmbH	Yes	Yes	No	No	No	No ^c	First aid training	No	N/A ^a	—
Croatia Airlines [61]	No meals containing peanuts. Food may contain peanut traces	Yes	N/A	Yes	N/A	N/A	No training on how to handle adrenaline autoinjectors	N/A ^b	N/A ^b	Minors should travel accompanied by a person capable of using an adrenaline autoinjector
Czech Airlines [62]	Yes (according to online catalog)	Yes (according to online catalog)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—
Delta Air Lines [63, 64]	If allergy is indicated at time of booking: nut-free snacks served instead of peanut products	N/A	N/A	Yes	Yes, with own cleaning products	N/A ^c	N/A	N/A ^b	N/A ^a	—
EasyJet [65]	No sale of peanuts. Meals may contain nuts. If an allergy is declared: sale of products that may contain traces of nut stopped	If an allergy sufferer is on board: no	No	Yes	No	No	Yes. If the allergy sufferer is traveling in company, these persons are expected to provide assistance in the first instance	N/A	No ^a Cabin manager must be informed at the time of boarding	—
Egypt Air [66]	N/A	Yes, traces of nuts not ruled out	N/A	No	N/A	N/A ^c	N/A	N/A	N/A	—
Etihad Airways [67]	N/A	N/A	N/A	N/A	N/A	N/A ^c	N/A	N/A ^a	N/A ^a	—
Emirates [68, 69]	Yes	Yes	N/A	No	N/A	No ^c	N/A. Flight crew not permitted to provide medical services (administer injections)	N/A ^b	N/A ^a	—
Eurowings	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A ^b	N/A	—

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Finnair [70–72]	N/A	No guarantee of meals without traces of nuts	N/A	No	N/A	Yes (nut-free), but not for very severe allergies	N/A Flight crew not authorized to administer medications	N/A	N/A ^a	–
Flybe [73–76]	From July 2019: no sale of peanuts and nut-based products (on Flybe and Eastern Airways flights)	N/A	N/A	Yes	N/A	N/A	N/A Flight crew not permitted to assist with medication	N/A	N/A ^a	–
Hawaiian Airlines [121]	Meals/snacks may contain nuts	Meals/snacks may contain nuts	No	No	The passenger is permitted to clean seats, but no explicit information on priority boarding	No ^c	N/A	N/A ^b	N/A ^b	–
Iberia [77]	N/A	N/A	N/A	N/A	N/A	N/A. A nut-free meal may be available on personal request	N/A	N/A	N/A	–
Icelandair [78]	Meals: no peanuts/peanut products, possibly other nuts	Yes	N/A	Yes, on weekdays (medical certificate required ⁴⁶)	N/A	N/A	N/A	N/A ^b	N/A ^a	–
Japan Airlines (JAL) [79, 80]	Meals: no peanuts/peanut products; nevertheless, peanut products in cabins	No guarantee of products without traces of nuts	N/A	N/A	N/A Only for peanut-allergy sufferers. Seat cleaning service (² weeks)	Meals without the 27 most common allergens on many flights	N/A	N/A ^b	N/A ^a	Recommendation: protective mask
JetBlue [121]	No nuts/peanuts in the snack selection	N/A	Yes, one row behind and in front of the allergy sufferer	No	N/A	N/A	N/A	N/A	N/A	–
Jet2 [121]	Yes, but not if an allergy has been declared	N/A	N/A	Yes	N/A	N/A	N/A	N/A ^b	N/A ^a	Flight may be denied without medication

Table 2 (Continued)

	On-board sale of foods containing peanuts/nuts	On-board sale of foods that may contain traces of peanuts/nuts	Buffer area	Announcements requesting passengers to refrain from eating nuts	Priority boarding to clean adjacent seats	Special meals for peanut-/nut-allergy sufferers	Training for flight crews on the medical management of anaphylaxis	Medications	Adrenaline autoinjectors on board	Other information
KLM Royal Dutch Airlines [81, 82]	Meals do not contain peanuts/peanut spread. Intercontinental flights/business class: nut snack	N/A	N/A	N/A	N/A	N/A ^c	N/A	N/A ^b	N/A ^a	Note: an accompanying person/safety assistant may be needed
Korean Air [83]	No snacks/meals with peanut products	Yes	N/A	N/A	Yes	No	N/A	N/A ^b	N/A ^b	A seat away from other passengers if necessary
Kuwait Airways [84]	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A	–
Laudamotion GmbH [85]	If an allergy sufferer is on board: no sale of peanuts	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	–
LOT Polish Airlines [86, 87]	N/A	N/A	N/A	N/A	N/A	Yes, without nuts and nut-containing products (²⁴)	Cabin crew not authorized to administer injections	N/A	N/A	–
Lufthansa [88]	Yes, but no peanuts as such	Yes	No	No	No	Yes (²⁴) No explicit information on special nut-free meals	No, but annual first aid training	Yes Medication for emergency management	No	Contact with a doctor possible
Malaysia Airlines [121]	Yes	Yes	No	No	Passengers allowed to clean seats. No explicit information on priority booking	Yes, but with no guarantee that special meals do not contain traces of nut ^c	N/A	N/A ^b	N/A ^a	Allergy sufferers aged under 16 years must be accompanied by an adult capable of administering medication
Norwegian Air Shuttle [89]	If an allergy sufferer is on board: no sale of peanut-containing products	No guarantee that products do not contain traces of peanut	N/A	Yes (flight attendant to be informed)	N/A	N/A	N/A	N/A ^b	N/A ^b	–
Oman Air [90]	No guarantee of nut-free meals	No guarantee of nut-free meals	N/A	N/A	N/A	N/A	N/A	N/A	N/A	–

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Pegasus Airlines [91]	No sale if the airline is informed	N/A	N/A	N/A	N/A	N/A	N/A	N/A ^b	N/A ^b	—
Qantas Airways [92, 93]	No sale of peanuts. Peanuts may be an ingredient in meals. Other nuts offered as snacks	Yes	N/A	N/A	N/A	N/A	N/A	N/A ^b	N/A ^a	—
Qatar Airways [94, 95]	N/A	N/A	N/A	N/A	N/A	N/A ^c	N/A	N/A ^b	N/A ^b	—
Royal Jordanian [96]	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A ^b	N/A ^b	—
Ryanair [97]	If an allergy sufferer is on board: no sale of nut products	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	—
Singapore Airlines [98]	Yes, but no peanuts served as snacks in economy class. Meals/snacks contain peanut products	Yes	N/A	N/A	N/A	"Non-strict nut-free meals" without almonds, peanuts, Brazil nuts, cashew nuts, hazelnuts, pecan nuts, macadamia nuts, pistachio nuts, or their derivatives (⁴⁸)	N/A	N/A	N/A	—
SAS Scandinavian Airlines [99, 100]	No peanuts as snacks/ingredient in meals. Other nuts/seeds/legumes are sold	Yes	N/A	Yes	N/A	N/A	N/A	N/A ^b	N/A ^b	Other passengers are requested not to bring peanuts on board
South African Airways (SAA) [101, 102]	Yes	Yes	No	No	No	Yes (²⁴), online information: (⁴⁸)	N/A	N/A	Yes	—
Spirit Airlines [121]	Yes	Yes	Yes, including the row behind and in front of the allergy sufferer	N/A	N/A	N/A	N/A	N/A ^b	N/A ^b	—

Table 2 (Continued)

	On-board sale of foods containing peanuts/nuts	On-board sale of foods that may contain traces of peanuts/nuts	Buffer area	Announcements requesting passengers to refrain from eating nuts	Priority boarding to clean adjacent seats	Special meals for peanut-/nut-allergy sufferers	Training for flight crews on the medical management of anaphylaxis	Medications	Adrenaline autoinjectors on board	Other information
Sundair [103]	Yes (according to online catalog)	Yes (according to online catalog)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	The airline is not obliged to carry a passenger that has an allergy to certain foods or ingredients that could significantly endanger their health, and the absence of which on board (in food or ambient air) cannot be guaranteed
SunExpress [104–106]	Yes (according to online catalog)	Yes (according to online catalog)	N/A	N/A	N/A	No	Flight crew does not provide assistance with medications	N/A	N/A	–
Swiss International Air Lines (SWISS) [107–109]	No sale of peanuts, but of nut products/products with traces of peanut	Yes	N/A	N/A	N/A	No ^c	First aid training once a year	Antihistamine tablets ^b	N/A ^a	Passengers should carry an emergency ID card Contact with a doctor possible Other passengers are requested not to bring peanuts on board
Sylt Air GmbH	Yes	Yes	No	No	N/A	No	No	No	No	–
TAP Air Portugal [110]	N/A	N/A	N/A	N/A	N/A	Yes (²⁴)	N/A	N/A	N/A	–
Thai Airways International [111, 112]	N/A	N/A	N/A	N/A	N/A	N/A	Regular first aid training	N/A ^b	N/A ^b	–
TUIfly [113]	Yes (according to online catalog)	Yes (according to online catalog)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	–

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Turkish Airlines [114, 115]	Yes	Yes	N/A	N/A	N/A	Allergy can be declared when selecting a special meal (medical certificate required)	First aid training	N/A	N/A	The medical certificate must contain the following sentence: "There is no particular reason why the patient should not travel by air"
United Airlines [116–118]	No sale of peanuts, but meals/snacks may contain allergens	Yes	No	Yes, but only for nearby passengers	N/A	No	Flight crew unable to provide assistance with medical matters	N/A	N/A ^b	–
Vueling Airlines SA [119]	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A ^b	N/A ^a	The airline accepts no responsibility if the passenger does not carry a syringe
Westjet Airlines [121]	Yes	Yes	N/A	Yes	N/A	N/A ^c	N/A	N/A ^b	Yes ^a	–
Wizz Air [120]	N/A	N/A	N/A	N/A	N/A	N/A ^c	N/A Cabin crew does not provide assistance with medications	N/A ^b	N/A ^a	Cabin crew should be informed

All information has been compiled to the best of the authors' knowledge, with no guarantee of completeness or accuracy

Normal type: airlines' responses to the authors' inquiries

Italics: information on the airlines' websites

Airlines that did not provide any information on allergies on their website: Adria Airways, Air Algérie, Air Arabia, Air Cairo, Air Moldova, Air Namibia, Alba Star S.A., Belavia Belarusian Airlines, Blue Air, Bulgaria Air, Bulgarian Air Charter, Corendon Airlines, Ethiopian Airlines, Fly Egypt, Freebird Airlines, Gulf Air, HOP!, Iran Air, Iraqi Airways, LATAM Airlines, Luxair, Miat Mongolian Airlines, Middle East Airlines (MEA), Montenegro Airlines, Nesma Airlines, Nouvelair Tunisie, Onur Air, Qeshm Airlines, Orange2Fly, Rhein-Neckar Air, Rossiya, Royal Air Maroc, S7 Airlines, Somon Air, Sun Air of Scandinavia, Tailwind Airlines, TAROM, Tunisair, Turkmenistan Airlines, Ukraine International Airlines (UIA), Uzbekistan Airways, Vietnam Airlines, Widerøe's Flyveselskap

N/A not available

^a24/48/72/96 if advance notification is given at the latest 24, 48, 72, or 96 h before the flight

^bAllergy sufferers should carry at least one adrenaline autoinjector (usually in the original packaging) with them (generally, medical certificate/prescription required, possibly with reason the autoinjector is needed and dosage).

The allergy sufferer or accompanying persons should generally be capable of administering the autoinjector themselves. With many airlines, the flight crew is not authorized to administer medications or injections

^cAllergy sufferers should take charge of their medical care and carry all necessary medications (usually in the original packaging) in their hand luggage (generally, medical certificate/prescription required, possibly with reason the autoinjector is needed and dosage). The allergy sufferer or accompanying persons should generally be capable of administering the autoinjector themselves. With many airlines, the flight crew is not authorized to administer medications or injections

^dThe airline recommends that allergy sufferers bring their own food on board (generally, only foods that do not require cooling/heating)

Considerable variance was seen on the airlines' websites. In all, 72/115 airlines provided information for allergy sufferers on their homepage, but mostly in insufficient detail. For 43 airlines, not even the search term "allergy" (or "Allergie") produced any results on their websites.

Almost all airlines that make reference to allergies emphasize that they are unable to guarantee an allergen-free environment or a completely "nut-free flight" and therefore do not accept responsibility for in-flight allergic reactions. Nevertheless, 26 airlines do not serve snacks containing peanuts or offer to refrain from doing so for passengers with allergies. A total of 31 airlines continue to sell snacks containing peanuts or nuts. No data is available for the remaining airlines. Four airlines said that they provided a buffer area where necessary, while 12 do not. There are no data for the other airlines. Six airlines reported operating priority boarding for allergy sufferers, enabling these passengers to wipe down their seating area with their own wet wipes. Interestingly, two Japanese airlines offer their own special seat-cleaning service on request. Most airlines explicitly require affected passengers to inform them in advance of any allergies. However, how and when this should be done varies widely. Many airlines require a medical clearance certificate or a preprinted form to be filled out. Sometimes, these certificates are only accepted if preformulated sentences are used and time limits are observed. Medications carried in hand luggage need to be declared and approved in some cases, and information is also requested when boarding. Documents often also need to be provided in English.

A total of 15 airlines state that they offer varying degrees of strictly allergen-free meals for peanut/nut allergy sufferers. However, it is often not clear from this internet-based information whether meals may also contain traces of allergens. If an airline does offer special nut-free meals, these need to be ordered between 24 and 48 h before the flight. Cabin announcements are only allowed with the cabin manager's authorization. Only five airlines carry adrenaline autoinjectors.

In summary, there are major differences between the airlines in terms of their approach to allergy sufferers. On a positive note, a small number of airlines are now addressing this problem in a targeted manner and have introduced risk-reduction measures. Some airlines make reference to the IATA communication. However, several airlines that are IATA members provide no information for allergy sufferers on their websites.

Discussion

The results of this survey clearly show that more information and action is needed in order to minimize the risk of life-threatening in-flight anaphylaxis for severe allergy sufferers. This is a task not only for the many airlines and their staff, but also for passen-

gers with allergies, who should likewise be encouraged to make appropriate preparations to ensure low-risk travel. The best way to ensure that these preparations are made is if the airline requests them prior to the flight. To this end, all airlines should make relevant information available on their websites.

However, the IATA recommendations issued in 2016 need to be updated. For example, the European Medicines Agency (EMA) has recommended since 2015 that patients carry two adrenaline autoinjectors [12]. One rationale behind this is that the effect of adrenaline can significantly diminish within as little as 1 h, and a persistent anaphylactic reaction requires a further adrenaline dose to be administered. In addition, there have been recent reports of autoinjector malfunction, hence, the recommendation to carry two autoinjectors.

Moreover, several studies show that the risk of anaphylaxis due to inhalation of an allergen-containing aerosol, e.g., when opening a pack of nuts at some distance, is extremely low, thereby calling into question the need for all passengers on an aircraft to avoid peanuts outside a small buffer area [13]. However, up to 25-fold higher amounts of peanut protein were detected on aircraft tray tables when peanuts were served as a snack [14]. Another investigation detected peanut particles in aircraft air conditioning systems [15]. Therefore, dispensing with peanut-/nut-containing snacks on commercial flights remains desirable when allergy sufferers are traveling; however, decontamination measures are taking the foreground, e.g., priority boarding for allergy sufferers to enable them to clean the seat upholstery, armrests, and table surfaces in the row with their booked seats using their own wet wipes. Of apparent importance is the information that soap-based commercial wipes are better for peanut allergen removal than alcohol-based disinfection [16]. In the particular context of air travel, the allergic patient needs the acceptance, cooperation, and support of the airline and its flight attendants.

In coordination with the Anaphylaxis Scientific Working Group of the Society for Pediatric Allergy and Environmental Medicine GPA e.V., the authors recommend that all airlines operating in Germany provide readily accessible information for allergy sufferers on their websites or provide information upon request. Flight and travel agencies should inform passengers about this in good time. In order to make a constructive contribution in this regard, the authors have updated the IATA recommendations and made them available in English (see below) and in German (see German version: *Allergo Journal* 8/2020, www.springermedizin.de/allergo-journal). Not all of the following recommendations have been validated by extensive studies and, thus, merely represent the best possible evidence at the present time.

One element of the IATA recommendations that has not been adopted is the advice on aircraft emer-

gency kits, since flight crew are not authorized to administer adrenaline in the form of an injectable solution. Although supplementing aircraft kits with adrenaline autoinjectors is evaluated positively [17], these are generally not available and the personnel are not trained in their use. Thus, the authors deem it all the more important to make passengers aware that they themselves need to ensure that they have sufficient emergency medication and are also able to use it accordingly. Children up to the age of 12–14 years need to be accompanied by a trained person [18]. It is also absolutely essential to provide information on the type and severity of the allergy in good time prior to booking a flight. The European Union air passenger rights stipulate that a passenger can be denied boarding if the airline has not been informed in advance of any severe allergies [19]. The following is the authors' recommendation for an information sheet for passengers:

Information for passengers with severe allergies

To avoid in-flight medical emergencies, passengers are advised to fully comply with the following instructions.

Before travel

1. You should inform your physician of your intention to travel; he/she should check that your emergency kit is complete and has sufficient dose(s). An emergency kit consists of two adrenaline autoinjectors, one second-generation histamine- H_1 receptor antagonist, a systemic glucocorticoid, and, for asthmatics, also an emergency asthma spray. None of these medications should reach their expiry date before the return journey. Your physician needs to issue you with an emergency plan with instructions on allergy diagnosis, dose and route of administration of medications, as well as the need to take these on board; for travelling abroad, this plan should also be in English. Your physician should check whether you (as well as accompanying persons in the case of allergic children) are currently able to use the adrenaline autoinjector. Allergic children should never travel unaccompanied by a trained adult unless they have reached the age of 12–14 years and have demonstrated their ability to self-administer emergency treatment.
2. Taking out travel cancellation and travel interruption insurance, as well as travel health insurance, is recommended.
3. You must inform the airline of the risk of a severe allergic reaction in good time before booking. You should express the wish that, in order to reduce your risk on the flight:
 - For food allergies: you be granted priority boarding in order to clean seat upholstery, arm rests,

and table surfaces in your row of seats with your own wipes (soap-based cleansing wipes are better for removing, e.g., residual nut than alcohol-based disinfectant wipes).

- For peanut/nut allergies: no peanut-/nut-containing products should be sold or served.
 - The flight crew request that passengers in your immediate vicinity (a buffer area of at least one row of seats in front of and behind your seat) do not open or consume products containing peanuts/nuts (or the specific allergen). Since the risk of a severe allergic reaction from inhaling nut powder alone is very low, it does not appear necessary to inform all passengers unless such a reaction has occurred in the past.
4. If available, the person traveling should order allergen-free meals in good time. The airline cannot guarantee that these foods, or foods brought onto the aircraft by other passengers, are allergen-free. It is safer to bring your own food, whereby you need to check whether this is also permissible on connecting flights.
 5. The airline should issue you with confirmation of the above-mentioned arrangements for presentation at check-in. If you do not inform the airline of your allergy until you are at the check-in, you may be denied boarding for safety reasons.

On the day of travel

1. Allow yourself plenty of time to go over your medications and special arrangements with security staff at the check-in. Although medications, including adrenaline autoinjectors, can be put through the scanner, they should always remain close to you and not stored, e.g., in the hand luggage compartment.
2. Ideally, those accompanying the allergy sufferer should clean arm rests, seats, and seat backs with wet wipes. Seat-back pockets should not be used, since food remnants that collect here are difficult to remove. You should also avoid using airline blankets or pillows.
3. You should request the flight crew to ask other passengers in the buffer area not to consume foods containing the relevant allergen. If no buffer area has been set up, you yourself can ask—but not demand—fellow passengers in your immediate vicinity to do so. You may need to ask to swap seats.
4. The flight crew should be immediately informed of any allergic reactions in order to request medical assistance and make other on-board emergency medications or oxygen available.

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