Letter to the Editor re: In-Flight Medical Emergencies Management by Anesthetist-Intensivists and Emergency Physicians

Dear Editor:

We read Diop et al.'s[2] article with great interest since we have worked on this issue for many years. The authors may be interested to read the article by Chatfield et al. on 'Cross-Sectional Survey of Physicians on Providing Volunteer Care for In-Flight Medical Events' which found similar results as their survey.[1]

We fully agree with the authors' statement that "It would, therefore, be helpful for any physician to understand the physiological changes induced by altitude, be aware of the main IME encountered during a commercial flight, and also which medical and human resources are available on board to deal with those." The Aerospace Medical Association (AsMA) has written to several medical colleges encouraging the inclusion of basic aviation medicine training in medical curricula, but with little apparent effect. In April 2020, the President of the Aerospace Medical Association wrote "Most clinicians remain woefully underprepared to advise or even discuss these potential impacts with their traveling patients."[4] Since more and more people are flying, the great majority of physicians will be asked by some of their patients whether they are fit to fly or not. Since most physicians travel by airplane from time to time, the chance of them being involved in an in-flight medical event is indeed significant, as indicated in your paper.

Allow us to make a few suggestions for clarification. As there is no internationally agreed definition of an 'in-flight medical emergency' as opposed to an 'in-flight medical event', we believe that, for consistency, it is better to refer to 'in-flight medical events', which can be more easily compared from paper to paper regardless of the severity of the event.

In Table I, the question starting 'At cruising altitude…', should be replaced by 'At cabin altitude during the cruise phase of the flight'. Cabin altitude is the critical factor as far as passengers are concerned regardless of the aircraft cruising altitude. For the same reason, the word 'cabins' in the sentence 'Commercial aircraft cabins cruise at an altitude….' in the second paragraph of page 635 should be removed because the cabin is not cruising at those altitudes (as is explained later in the paragraph).

Also in Table I, the answer that dehydration is higher than at sea level maybe misleading. While it is true that the air is generally dry in an aircraft cabin, with effects such as dry skin and dry mucosa, there is little supporting data that there is a core dehydration. The only article we are aware of addressing this issue scientifically concludes that there is no core dehydration if the passenger maintains a normal intake of fluid.[5]

In Table II, the statement that 'A ground medical assistant is available 24 h a day' is incorrect. While it is true that many airlines have medical ground support available, not all commercial airlines provide that service.

In the third paragraph, page 635, regarding an increase in the volume of gases with decreased pressure, the authors state 'It may be responsible for specific benign symptoms such as abdominal, ear, or sinus pain.' While this is true, we believe it should also be mentioned that some symptoms could be severe, e.g., if a patient was to fly with a bowel occlusion or semi-occlusion (which are contraindications to travel by aircraft). From personal experience, not all physicians—including some gastroenterologists—are familiar with this.

In the fourth paragraph, the authors state '…high altitude exposure leads to a decreased stroke volume,…'. The author of the chapter on hypoxia and hyperventilation in the latest edition of "Ernsting's Aviation and Space Medicine"[3] states (in the section on general cardiovascular changes with increased altitude) 'Since stroke volume remains essentially unchanged as the heart rate increases,…'.

In the sixth paragraph, the statement 'The U.S. Federal Aviation Administration requires that all planes traveling to or from the United States carry an AED on board,….' is incorrect. The authors reference Hinkelbein, who had referenced

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Mahony, who had misinterpreted the regulation. That regulation only applies to U.S. registered aircraft.[7] The authors may be interested to read our paper, 'Medical Events on Board Aircraft: Reducing Confusion and Misinterpretation in the Scientific Literature,'[6] where we described many cases of mis-references, misinterpretation, or misunderstanding of aviation medicine principles, with the same aim as the authors' paper—to support improved basic training in altitude physiology and management of medical events on board commercial aircraft.

Finally, regarding complementary help and/or training for those involved in an in-flight medical event, we would like to recommend the application 'AirRx', which is available free of charge in the Apple Store. It provides basic information on altitude physiology, most frequent diagnoses, medications, and equipment, medical legal aspects, and documentation. We would also recommend the publication 'Managing in-flight medical events' on the AsMA website at http://www.asma.org/publications/medical-publications-for-airline-travel/managing-in-flight-medical-events.

The authors suggest didactic online training courses. As they are writing from France, they may be interested to know that La Fédération des Médecins Spécialistes du Québec (FMSQ) offers such a program to its members (en Français).

One of the challenges of management of in-flight medical events is to combine the expertise of specialists working in different fields (such as that of the group surveyed in this paper) to that of medical specialists involved in aerospace medicine. Should the authors wish to develop their ideas on promotion of aeromedical principles to the general medical community, we can suggest contacts in aeromedicine that could assist in this goal (which we fully support).

Claude Thibeault, M.D., and Anthony Evans, M.B.Ch.B.

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In Response:

We read with great interest the comments of Dr. Thibeault and Dr. Evans regarding our recent article[3] published in *Aerospace Medicine and Human Performance* and we thank them for the quality of their remarks. However, we want to clarify some issues raised in their letter.

We used the terminology of in-flight medical emergency because we primarily addressed the questionnaire to emergency and anesthetist-intensivist physicians. As the goal of our study was to question physicians about their knowledge when potential life-threatening situations arise and not to report the incidence of in-flight medical events or emergency, we believe that the terminology we used was accurate.

As pointed out in the letter, objective data on hydration state during commercial flight are scarce. Some studies found that air travel is associated with an increase of blood osmolality (reflecting pure water losses) and a reduction of plasma volume.[2,10] Equally, prolonged immobilization during air travel is associated with edema formation in the lower limbs, demonstrating fluid shift from the plasma to the interstitium and leading to plasma volume depletion.[6,9] Furthermore, in this environment people are exposed to low humidity and hypobaric hypoxia. To some extent, this is a similar state to that found at high altitude (e.g., during mountain ascent), where physiological changes have been extensively studied. Acute hypobaric hypoxia increases renal water and sodium ion excretion rates through a decrease of aldosterone and an increase of atrial natriuretic peptide release.[1,5,7] After days, total body water and plasma volume significantly decrease due to several mechanisms (lower humidity, decrease in vasopressin sensitivity to plasma osmolarity change, increase of respiratory and urine losses, and decrease of water intake linked to thirst dysregulation).[1,7] Although these findings concern people exposed to the high altitude environment and not specifically people traveling on a commercial flight, we could reasonably assume that the exposure to hypobaric hypoxia during long-haul flight increases the risk of dehydration. In their letter the authors state: "there is no core dehydration if the passenger maintains a normal intake of fluid." It emphasizes the importance of ensuring an adequate fluid intake during commercial air travel, even more so in vulnerable populations (e.g., elderly people), who are more at risk of thirst dysregulation and specific data are lacking to presume

that all passengers maintain a normal fluid intake.[8] So it seems necessary to focus on dehydration risk during commercial flight and to adopt all necessary mean to prevent it (free water access during the flight, limits on the consumption of diuretic beverages, passenger information). Incidentally, aircrew members are more prone to renal stone disease compared to the general population, probably due to dehydration related to lower fluid intake.[4]

Regarding the necessity of carrying an AED on board, the U.S. Code of Federal Regulations title 14, part 121, states in the section "Emergency Medical Equipment and Training", sub section "Applicability": "this subpart prescribes medical equipment and training requirement applicable to all certificate holders operating passenger-carrying airplanes…".[11] As there is no explicit mention that this part concerns only U.S. registered planes, it led us to misinterpret the regulation. Fortunately, it does not alter the main message, which is an automatic external defibrillator is not mandatory on all commercial air flights.

We express our gratitude to Dr. Thibeault and Dr. Evans for their comments and their advice. We share the common objective of promoting knowledge and basic training in aviation medicine to the whole medical community. We wish to develop short didactic training course for all physicians interested, as is already proposed in Quebec, and, in the future, we will be glad to benefit from their expertise and contact in the field of aerospace medicine.

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