

# Worldwide Regulation of the Medical Emergency Kit and First Aid Kit

Abílio Tiago Barros Oliveira

- INTRODUCTION:** On-board medical emergencies are increasing. Different geographies have different legislation and requirements for medical emergency kits and first aid kits. A comprehensive review to compare the contents of both kits was conducted, including the International Air Transport Association, European Union Aviation Safety Agency, and Federal Aviation Administration, as well as some from other geographical areas of the globe to cover continents and regions with the highest air traffic, such as Brazil, Kenya, Australia, and Taiwan.
- METHODS:** On June 10, 2023, a search was conducted using standardized medical terms (medical subject headings) within the PubMed® database. The relevant terms identified were “Aircraft” and “Medical Emergencies”; articles published within the last 10yr were filtered. Subsequently, even articles published before 2013 were consulted if cited by the initial ones. The main regulatory entities’ documentation was found using the Google search engine and consulted.
- CONCLUSIONS:** It is impossible to be prepared for every emergency on board. Still, as doctors, we have a moral and ethical obligation to try to improve the outcomes of those emergencies. Getting a standardized report of every on-board emergency is crucial. That would make optimizing the items to include in the emergency and first aid kits easier. There are many similarities among the compared entities, but essential differences have been found. There is room for improvement, especially for pediatric travelers.
- KEYWORDS:** medical emergency on-board, medical emergency kit, first aid kit.

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Globally, medical emergencies on board commercial flights are estimated to be from 0.5–53.4 per million passengers.<sup>1</sup> On-board medical emergencies (OME) are increasing due to the increase in the number of air passengers and the number of trips each passenger makes, the aging of the populations of developed countries, and the increasing mobility of people with chronic diseases.<sup>2</sup> Other additional factors may contribute to a growing trend of OME, such as the growth of medical tourism, which can lead individuals with severe diseases to travel to get more affordable health care unavailable in their residences.<sup>3</sup>

It is estimated that only 17% of OME are reported.<sup>4</sup> When there is air-ground consultancy (ground-based medical support), these emergencies are reported, but they are only a tiny fraction of the total. Therefore, the exact frequency of OME has yet to be determined.<sup>1</sup> Some airlines will always report when a passenger contacts the crew for health reasons, others only when the emergency medical kit (EMK) is opened.<sup>5</sup>

Standardized reporting would make it easier to develop more robust recommendations for the contents of EMK and first aid kits (FAK); the scope of this paper is to discuss the contents of those kits and their differences worldwide. Flight attendants are estimated to solve more than 50% of OME readily.<sup>6</sup> Flight attendants will ask an on-board doctor who may be traveling in that plane to intervene in 46–86% of the OME.<sup>7–9</sup> The author considers that the predictable increase in OME makes the subject of this review even more relevant.

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## METHODS

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## INTERNATIONAL REGULATION

The leading regulatory organizations in aviation globally are the International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA), the Federal Aviation Administration (FAA), and the European Union Aviation Safety Agency (EASA):

- ICAO develops guidelines that support the regulations of each state. ICAO is a specialized aviation agency that belongs to the United Nations;
- IATA develops guidelines and is an organization that airlines voluntarily join;
- FAA regulates airlines in the United States;
- EASA regulates airlines in most European countries.

FAA and EASA regulate multiple aspects of aviation (hard law), such as aircraft maintenance, flight time limits, and on-board equipment, which includes the EMK, the FAK, and the universal precaution kit. IATA and ICAO develop guidelines (soft law).

## REGULATION OF THE FIRST AID KIT AND THE EMERGENCY MEDICAL KIT

Between ICAO and IATA, the author selected IATA for comparative purposes.<sup>10</sup> Because the regulatory institutions are autonomous, the regulations of the United States (FAA),<sup>11</sup> Europe (EASA),<sup>12,13</sup> Brazil,<sup>14</sup> Kenya,<sup>15</sup> Australia,<sup>16</sup> and Taiwan<sup>17</sup> were chosen for comparison. In this way, the author intended to cover the different geographic areas and different continents where there is intense air traffic. Having defined the regulatory entities, the author thoroughly compared the components of the EMK and the FAK.

Taiwan’s regulations were extracted from a database called the “Laws and Regulations of the Republic of China (Taiwan)”. They will probably be the same for all international flights in the Republic of China.

## COMPARISON OF THE CONTENTS OF THE EMERGENCY MEDICAL KITS AND FIRST AID KITS

The equipment and medications of both kits from the different geographic entities are displayed and compared in **Tables I, II, III, and IV**.

From the exhaustive comparison of the kit contents, the author concluded that there are some similarities in different jurisdictions but also significant differences. He also concluded that airlines regulated by EASA are globally better equipped to respond to medical emergencies.

From the comparative analysis, the author considers the following information relevant:

- Of the regulatory entities compared in this document, only FAA and EASA require an automated external defibrillator (AED) in specific aircrafts, with other regulatory entities opting to leave this to the discretion of the airlines;
- Australia and EASA regulate the inclusion of intubation, resuscitation, birth kits, an aspirator, a glucometer, and a scalpel. However, they don’t define the mandatory contents of these kits. FAA does not regulate any of these kits and neither do Brazil, Kenya, and Taiwan;
- In the latest EASA reviews, the oximeter, a pneumothorax kit, and an antibiotic were included in the EMK. No other regulators included those.
- EASA regulated the cards with the basic life support (BLS) algorithm in the FAK to be accessible without opening the EMK; Brazil, Kenya, and Taiwan’s BLS cards are inside the EMK. FAA doesn’t require BLS cards.
- The inclusion of a medication for postpartum hemorrhage is provided for by the regulatory entities of Brazil and Taiwan but not by EASA or FAA. Births on board are rare emergencies, and postpartum hemorrhage is a rare complication of births. However, postpartum hemorrhage is the leading cause of morbidity and maternal mortality, and the inclusion of a drug like oxytocin could prevent an unfavorable outcome.<sup>18</sup>
- FAA is the only one to include ammonia salts, which are discouraged by IATA. FAA is the only one to regulate splints or orthoses for limbs;
- Kenyan regulatory entities do not enforce the need for medication in the EMK for the airlines they regulate.

## CONSIDERATIONS ON PEDIATRIC AGE

Pediatric emergencies account for about 15.5% of all OME.<sup>19</sup> However, only in recent years and only by EASA, the inclusion of some medications in syrup form has been regulated.

The author considers that pediatric passengers are the most unprotected in an OME. The pediatric age requires an approach directed at each phase of development, including the incidence and prevalence of various pathologies; the particularities of gestures or interventions in emergencies, such as the different techniques of chest compression in BLS maneuvers; and the need to dose the administration of medication by weight.

EASA recently regulated the inclusion of an oximeter. However, extra digital sensors are needed to be compatible for travelers of some pediatric ages, such as babies and children. Only airlines regulated by EASA must provide a spacer chamber to facilitate the administration of the bronchodilator, and it is recommended by IATA.

**Table I.** Emergency medical kit equipment.

| EQUIPMENT                                  | IATA | FAA     | EASA                    | BRAZIL | KENYA | AUSTRALIA               | TAIWAN |
|--|------|---------|-------------------------|--------|-------|-------------------------|--------|
| Stethoscope                                | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Digital sphygmomanometer                   | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Oropharyngeal Cannula (3 sizes)            | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Syringes (various sizes)                   | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Needles (various sizes)                    | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Intravenous Catheter (various sizes)       | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Antiseptic wipes                           | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Disposable gloves                          | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Container - sharp piercers                 | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Urinary catheter (with lubricating gel)    | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
|  |      |         | M/F +<br>Anesthetic gel |        |       | M/F +<br>Anesthetic gel |        |
| IV fluid administration system             | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Venous tourniquet                          | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Nonwoven fabric compresses                 | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Adhesive tape                              | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Surgical masks                             | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Tracheal catheter                          | ●    | ●       | ○                       | ●      | ●     | ○                       | ●      |
|  |      |         | Intubation kit          |        |       | Intubation kit          |        |
| Umbilical clamp                            | ●    | ●       | ○                       | ●      | ●     | ○                       | ●      |
|  |      |         | Basic birth kit         |        |       | Basic birth kit         |        |
| Thermometer (mercury-free)                 | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| BLS cards                                  | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Flashlight and batteries                   | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Ambu mask                                  | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
|  |      | 3 sizes | 3 sizes                 |        |       | 2 sizes                 |        |
| Pocket mask (CPR)                          | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Adhesive scissors                          | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Instructions for administering medications | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Basic birth kit                            | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Intubation kit                             | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Aspirator                                  | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Glucometer                                 | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Scalpel                                    | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Oximeter                                   | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |
| Pneumothorax kit                           | ●    | ●       | ●                       | ●      | ●     | ●                       | ●      |

BLS = basic life support; M/F = adequate for both male and female urethras.

## CONCLUSIONS & RECOMMENDATIONS

It is estimated that only 17% of OME are reported globally.<sup>4</sup> The low percentage of reported OME makes choosing the most critical equipment and medications on board difficult. OME are a daily reality of aviation, of varying severity, and the majority do not pose an immediate threat to the lives of passengers.<sup>7</sup>

Through the exhaustive comparison between different regulatory entities from different geographic areas, the author has concluded that airlines regulated by EASA are, globally, the best equipped to respond to medical emergencies. The author also concluded that there are many similarities between the contents of EMK and FAK, as can be deduced by analyzing Tables I–IV.

In the author's opinion, planes should not be considered air ambulances, and passengers with chronic illnesses should use the internationally implemented MEDA systems before traveling. Through them, passengers will be evaluated, potential special needs will be considered, and the trip may even be refused. This evaluation could prevent multiple OME.<sup>20</sup> Still, the aircraft should be equipped to stabilize the passenger until the plane can land and safely transfer the passenger to ground care and,

in some cases, to treat or evaluate the severity. In addition to the particularities of the aeronautical environment, during air travel, passengers and crew are confined inside the plane and, at best, 20 min from land. However, in most cases, it will take more time. Even if the plane's commander intends to divert, it may not be possible due to various factors, such as the lack of adequate medical care facilities in the nearest areas and time to treatment benefit. Depending on the emergency, the quick response with intervention or drug administration could impact potential comorbidities or fatalities.<sup>21</sup> Assuming the priority of protecting health, the author considers that everything should be done within what is reasonably possible to provide the best chance of survival and reduce potential sequelae for passengers and crew members. It is in this context that the recommendations made should be interpreted in order to stimulate improvements in current regulations. In this way, the author suggests some measures that would be improvements in his perspective:

- Regulatory entities should require the same contents for the EMK and FAK on any commercial aviation flight that is 120 min long or more; for shorter flights, if, throughout the

**Table II.** Emergency medical kit medications.

| MEDICATIONS                 | IATA         | FAA          | EASA                  | BRAZIL      | KENYA | AUSTRALIA             | TAIWAN      |
|-----------------------------|--------------|--------------|-----------------------|-------------|-------|-----------------------|-------------|
| Adrenaline 1:1,000/10,000   | ●            | ●            | ●                     | ●           |       | ●                     | ●           |
| Antihistamine               | ●<br>INJ     | ●<br>O + INJ | ●<br>O + INJ + P      | ●<br>INJ    |       | ●<br>O + INJ          | ●<br>INJ    |
| Injectable 50% dextrose     | ●            | ●            | ●                     | ●           |       | ●                     | ●           |
| Nitroglycerin               | ●            | ●            | ●                     | ●           |       | ●                     | ●           |
| Strong analgesic            | ●            | ●            | ●                     | ●           |       | ●                     | ●           |
| Anticonvulsant sedative     | ●<br>INJ     |              | ●<br>INJ + rectal + O | ●<br>INJ    |       | ●<br>INJ + rectal + O | ●<br>INJ    |
| Antiemetic                  | ●            |              | ●<br>INJ              | ●           |       | ●                     | ●           |
| Bronchodilator              | ●<br>+SC     | ●            | ●<br>+SC              | ●           |       | ●                     | ●           |
| Atropine (injectable)       | ●            | ●            |                       | ●           |       | ●                     | ●           |
| Systemic corticosteroid     | ●<br>INJ + O |              | ●                     | ●<br>INJ    |       | ●<br>INJ              | ●<br>INJ    |
| Diuretic (injectable)       | ●            |              | ●                     | ●           |       | ●                     | ●           |
| Postpartum hemorrhage       |              |              |                       | ●           |       |                       | ●           |
| NaCl 0.9%                   | ●<br>1 L     | ●<br>0.5 L   | ●<br>250 mL           | ●<br>250 mL |       | ●<br>250 mL           | ●<br>250 mL |
| Acetylsalicylic acid        | ●            | ●            | ●                     | ●           |       | ●                     | ●           |
| Oral beta blocker           | ●            |              |                       | ●           |       | ●                     | ●           |
| Antipsychotic (haloperidol) | ●            |              |                       |             |       |                       |             |
| Lidocaine (injectable)      |              | ●            |                       |             |       |                       |             |
| Antispasmodic               |              |              | ●                     |             |       | ●                     |             |
| Antiarrhythmic              |              |              |                       |             |       | ●                     |             |
| Antihypertensive            |              |              |                       |             |       | ●                     |             |
| Antibiotic                  |              |              | ●<br>INJ              |             |       |                       |             |

INJ = injectable; O = oral; P = pediatric; SC = spacer chamber.

programmed route, the plane may be at a distance of 30 min or more from a possible diversion to a place with adequate medical care facilities;

- Early defibrillation effectively saves lives, and thus, the AED is one of the most critical devices to consider having on board airplanes;<sup>22</sup>
- It would be helpful to consider the provision of glucagon, in addition to the existing dextrose, in injectable or nasal form for the reversal of potential severe hypoglycemia in patients on therapeutics with insulin or oral hypoglycemic antidiabetics potentiated by circadian rhythm alteration or altered meal schedules;
- Although births on board are rare and, mostly, there is no postpartum hemorrhage, this complication is the leading cause of morbidity and maternal mortality worldwide.<sup>18</sup> Because of that, the author thinks including a drug like oxytocin could be helpful;
- The pediatric age has multiple specificities, which include potential unexpected emergencies in healthy or seemingly healthy children. For example, from a respiratory infection that may be asymptomatic, a child can develop acute bronchiolitis with dyspnea, decompensate a stable asthma, or even develop a food allergy. The pediatric age, in the author's opinion, deserves the following reflections:
  - For adequate health care at the pediatric age, medication should be available in dose-adjustable formulas, such as syrup. EASA included an analgesic, an antiemetic, and an

antihistamine. An example of a drug that should also be considered would be a systemic corticosteroid in syrup, which could be helpful as an adjunct in managing a more severe allergy or asthma exacerbation. Asthma exacerbation is a common cause of flight diversion in pediatric emergencies and is more common in pediatrics than in adult age.<sup>23</sup>

- Although recommended by IATA, only EASA regulates the space chamber to facilitate the administration of the bronchodilator. The absence of the space chamber may render therapy ineffective at this age;
- Only pediatricians and primary care physicians routinely medicate pediatric patients, which makes it valuable and necessary to prepare a guide with pediatric dosing for the medication available on board;
- EASA recently regulated the need to include an oximeter, but conventional oximeters are not helpful in infancy and early childhood. A specific oximeter model compatible with extra digital sensors for children and infants should be regulated, and the respective sensors in the kits. In bronchiolitis, as in asthma decompensations, digital oximetry will allow the doctor on board to more efficiently and more reliably determine the severity of the condition, complementing the observation of clinical signs such as intercostal retractions, and it may even guide the doctor in the administration of drugs or the recommendation on diversion of the plane;

**Table III.** First aid kit equipment.

| EQUIPMENT                    | IATA | FAA | EASA               | BRAZIL            | KENYA | AUSTRALIA          | TAIWAN |
|------------------------------|------|-----|--------------------|-------------------|-------|--------------------|--------|
| Antiseptic for wounds        | ●    | ●   | ●                  | ●                 | ●     | ●                  | ●      |
| Dressings                    | ●    | ●   | ●                  |                   | ●     | ●                  | ●      |
| Bandage gauze                | ●    | ●   | ●                  |                   | ●     |                    | ●      |
| Triangular bandage with pins | ●    | ●   |                    | ●                 | ●     |                    | ●      |
| Burn dressings               | ●    |     | ●                  | ●                 | ●     | ●                  | ●      |
| Sterile absorbent dressings  | ●    |     | ●                  | ●                 | ●     | ●                  | ●      |
| Sterile gauze                | ●    |     |                    | ●                 |       |                    | ●      |
| Adhesive tape                | ●    |     | ●                  | ●                 | ●     | ●                  | ●      |
| Steri-Strips                 | ●    |     | ●                  | ●                 | ●     | ●                  | ●      |
| Disinfectant wipes           | ●    |     |                    | ●                 | ●     |                    | ●      |
| Gauze / eye protection pad   | ●    |     |                    | ●                 | ●     |                    | ●      |
| Scissors                     | ●    | ●   | ●                  | ●                 | ●     | ●                  | ●      |
|                              |      |     | With rounded tips  | With rounded tips |       | With rounded tips  |        |
| Surgical adhesive tape       | ●    |     | ●                  | ●                 | ●     |                    | ●      |
| Tweezers                     | ●    |     | ●                  | ●                 | ●     | ●                  | ●      |
| Disposable gloves            | ●    |     | ●                  | ●                 | ●     | ●                  | ●      |
| Mercury-free thermometer     | ●    |     | ●                  | ●                 | ●     | ●                  | ●      |
| Surgical masks               |      |     | ●                  |                   |       |                    |        |
| Pocket mask                  | ●    |     | ○                  | ●                 | ●     | ○                  | ●      |
|                              |      |     | Resuscitation pack |                   |       | Resuscitation pack |        |
| First aid manual             | ●    |     | ●                  | ●                 | ●     | ●                  | ●      |
| Event registration form      | ●    |     | ●                  | ●                 | ●     | ●                  | ●      |
| Arm splint                   |      | ●   |                    |                   |       |                    |        |
| Leg splint                   |      | ●   |                    |                   |       |                    |        |
| Rolled bandage               |      | ●   |                    |                   |       |                    |        |
| Pins                         |      |     | ●                  |                   |       | ●                  |        |
| Resuscitation pack           |      |     | ●                  |                   |       | ●                  |        |
| Ambu                         |      |     | ●                  | ●                 |       |                    |        |
|                              |      |     | 3 sizes            |                   |       |                    |        |
| BLS cards                    |      |     | ●                  |                   |       |                    |        |
| AED                          |      | ●   | ●                  |                   |       |                    |        |
| Eye irrigation device        |      |     | ●                  |                   |       |                    |        |

- Pediatric passengers could benefit from the inclusion of an oral rehydration solution;
- In an emergency where life support maneuvers are necessary, the current BLS cards are suitable for adults, and the need to have cards with instructions on chest compression techniques at pediatric ages should also be regulated.

When an emergency arises, under stress and outside of their typical work environment, sometimes forced to address health

problems outside of their area of specialization and usual practice, the “Good Samaritan Doctor” could benefit from having protocols and algorithms to diagnose and treat common emergencies, minimizing errors, improving assistance, and reassuring doctors who are not familiar with the ongoing OME. The airRX application, available for iOS® and Android® mobile devices, includes guidelines for 23 forms of OME presentation and can be installed by doctors. The application is free, works offline, and is helpful and quick to consult, but it may not be

**Table IV.** First aid kit medications.

| MEDICATIONS                                       | IATA | FAA | EASA                              | BRAZIL | KENYA | AUSTRALIA | TAIWAN |
|---|------|-----|-----------------------------------|--------|-------|-----------|--------|
| Mild to moderate analgesic                        | ●    |     | ●<br>P                            | ●      | ●     | ●         | ●      |
| Antiemetic  | ●    |     | ●<br>P                            | ●      | ●     | ●         | ●      |
| Nasal decongestant                                | ●    |     | ●                                 | ●      | ●     | ●         | ●      |
| Antacid (gastric)                                 | ●    |     | ●                                 | ●      | ●     | ●         | ●      |
| Antidiarrheal                                     | ●    |     | ●                                 |        |       | ●         |        |
| Antihistamine                                     | ●    |     | ●<br>P                            | ●      | ●     | ●         | ●      |
| List of contents with information on side-effects |      |     | ●<br>2 languages<br>(English + 1) |        |       | ●         |        |
| Bags for contaminated products                    |      |     | ●                                 |        |       |           |        |
| Ammonia   | ⊕    | ●   |                                   |        |       |           |        |

⊕ = discouraged by IATA; P = Pediatric.



compatible with the doctor's phone, the device may have a low battery, or the app may even be discontinued. Therefore, the author believes that paper cards with critical points and algorithms for addressing the most common OME could be helpful. In the author's opinion, a good example of possible algorithms to print that may be useful in addressing OME can be found on pages 2585–2586 of Martin-Gill et al.<sup>24</sup>

In addition to regulating the inclusion of intubation, resuscitation, pneumothorax, and delivery kits, the author thinks that EASA and Australia should define the contents of those kits. Cards with critical information on the execution of technical gestures or interventions that impact the provision of care in emergencies should also be included for refreshing. For example, it is possible that in the approach to a tension pneumothorax, the doctor does not remember the location of the neurovascular bundles or the ideal angle of the needle for a cricothyroidotomy.

Whenever possible, prevention of OME is the best approach. In the pretravel assessment of passengers with chronic obstructive pulmonary disease, the 50-m test is considered a quick and accessible way to predict the need for supplemental oxygen in flight, currently one of the possible tests recommended for this evaluation. Its easy execution and accessibility make it appealing. However, its predictive capacity can be improved by replacing the distance of 50m with the distance of 330m in less than 6min, which best correlates with the results of the gold standard test TSHA.<sup>25–27</sup> Standardized reporting of every on-board emergency would help regulators determine the contents of EMK and FAK.

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