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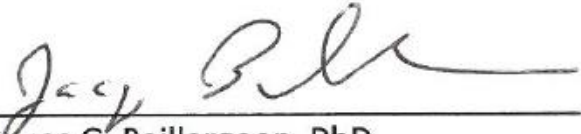
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approved version of the following capstone:

**FIRST AID KIT AND EMERGENCY MEDICAL KIT ONBOARD COMMERCIAL
AIRCRAFT: A COMPARATIVE STUDY OF AMERICAN, EUROPEAN, INDIAN,
INDONESIAN, EMIRATI, AND CANADIAN CIVIL AVIATION REGULATIONS**

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Capstone

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of the Requirements
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Dedication

To cabin crew members and good Samaritans that have selflessly helped others during
in-flight medical events.

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There were 3.696 billion air passengers worldwide in the year 2016, and that number is expected to increase in the foreseeable future. As more passengers travel by air for both leisure and business, more in-flight medical incidents can expect to occur. The frequency of in-flight medical events is difficult to appraise due to differences in methodology in the aviation medicine literature. It is estimated that the rate of in-flight medical events can be as high as 1 event per 6,250 air passengers, to as low as 1 in-flight medical event per 190,000 air passengers. Some of the most common in-flight medical events are related to syncope, digestive system, or cardiovascular system problems. To deal with in-flight medical events, commercial airlines have resources ranging from CPR-trained cabin crew to access to ground-based medical consultants. In addition, first-aid kits and emergency medical kits can be found on some commercial flights. To increase awareness of the components of the first-aid kit and emergency medical kit, this study

reviews and compares regulations concerning those components as dictated by American, European, Indian, Indonesian, Emirati, and Canadian civil aviation regulations.

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List of Abbreviations

AED	Automated External Defibrillator
AMC	Acceptable Means of Compliance
CAR	Canadian Aviation Regulations
CAR	Civil Aviation Regulations
CAR-OPS	Civil Aviation Regulations- Operations
CASR	Civil Aviation Safety Regulation
CAT	Commercial Air Transport
CFR	Code of Federal Regulations
EASA	European Aviation Safety Agency
IATA	International Air Transport Association
JAR	Joint Aviation Requirements
MBBS	Medicinae Baccalaureus, Baccalaureus Chirurgiae (degree)
MOPSC	Maximum Operational Passenger Seating Configuration
UAE	United Arab Emirates
USA	United States of America

CHAPTER 1: INTRODUCTION

Specific aim

The specific aim of this study is to familiarize healthcare providers with the components of the first aid kit and emergency medical kit onboard commercial aircrafts according to the appropriate civilian aviation regulations. The regulations to be analyzed include the following countries and regulatory organizations: United States of America, member states of the European Aviation Safety Agency (EASA), India, Indonesia, United Arab Emirates (UAE), and Canada. EASA member states are listed on Table 1.

Table 1. EASA member states

Austria	Latvia
Belgium	Liechtenstein
Bulgaria	Lithuania
Croatia	Luxembourg
Cyprus	Malta
Czech Republic	Netherlands
Denmark	Norway
Estonia	Poland
Finland	Portugal
France	Romania
Germany	Slovakia
Greece	Slovenia
Hungary	Spain
Iceland	Sweden
Ireland	Switzerland
Italy	United Kingdom

Background

According to data from the World Bank, there were 3.696 billion air passengers worldwide in the year 2016. Table 2 displays the number of passengers among the countries to be analyzed in the present study.

The number of air passengers transported is expected to increase. On a forecast by the International Air Transport Association (IATA), 7.2 billion passengers will travel by air in the year 2035 (IATA, 2016). As more passengers travel by air for both leisure and business, more in-flights medical incidents can expect to occur, particularly with an aging population.

Table 2. Number of air passengers transported in 2016 (unless otherwise noted)

Country	Number of air passengers	Country	Number of air passengers
United States of America	822,949,000	Belgium	12,545,320
United Kingdom	145,120,980	Czech Republic	5,968,790
Ireland	125,648,740	Poland	5,457,530
Germany	124,743,940	Iceland	5,431,540
India	119,577,840	Romania	3,686,940
Indonesia	96,529,130	Latvia	2,884,090
United Arab Emirates	92,160,690	Sweden	2,550,000
Canada	85,406,430	Norway	2,412,300
Spain	66,674,870	Croatia	1,875,430
France	65,362,740	Luxembourg	1,845,730
Netherlands	37,652,450	Denmark	1,775,300
Italy	28,861,320	Malta	1,500,820
Switzerland	25,859,920	Bulgaria	1,092,330
Hungary	21,399,960	Lithuania	1,038,300
Austria	14,724,770	Slovenia	1,009,560
Finland	13,754,230	Estonia	346,280
Greece	13,150,290	Cyprus	224,750
Portugal	13,105,120	Slovakia	12,930

Notes: The data from Denmark, Norway, and Sweden corresponds to 1970. No data available from Liechtenstein. Source: The World Bank

Estimating the exact frequency of in-flight medical events can be difficult. The reporting mechanisms are not standardized or uniform. For example, some airlines only report in-flight medical emergencies if they result in diversion of the flight (Donner, 2017). When it comes to the frequency of in-flight medical events, great variability exists in the aviation medicine literature. Just to name a few examples, one study (Cocks and Liew, 2007) found that there was 1 in-flight medical event per 6,250 air passenger; another study (Szmajer et al, 2001) found that the rate was 1 in-flight medical event per 20,000 air passengers; and yet another study (Jung et al, 2016) found that the rate of in-flight medical events was approximately 1 per 190,000 passengers. The variations among studies are likely due to different methodologies employed. For example, some studies document in-flight medical events severe enough to contact air-to-ground medical consultants, while other studies include minor events that are not necessarily reported to the ground, but are reported to the cabin crew. Table 3 highlights the in-flight medical events among different studies in the aviation and travel medicine literature.

Table 3. Rates of in-flight medical emergencies

Study	Country/Organization	In-flight medical events
Cocks and Liew, 2007	Cathay Pacific	There were 2,503 cases of illness among 15.34 million passengers; for a rate of 1 medical event per 6,250 passengers
Cummins et al, 1989	Seattle-Tacoma International Airport	There was 1 in-flight emergency call per 39,600 passengers; stated differently, 1 in-flight emergency call per 753 inbound flights
DeJohn et al, 2000	Five US domestic air carriers (Part 121)	In-flight medical events: 1,132. Incidence rate: 8 medical events per million enplanements
Delaune et al, 2003	One major US airline	There were 2,279 in-flight medical events. Passengers during this period 100,760,117. Rate: 8.1 calls per day; 247 calls each month. 1 event/44,212 passengers

		1 event/378 flights 22.6 events/million passengers
Donaldson and Pearn, 1996	QANTAS	There were 454 significant in-flight medical incidents requiring the attention of a doctor
Dowdall, 2000	British Airways	There were 3,386 in-flight medical incidents; for a rate of about 1 per 11,000 passengers
Jung et al, 2016	Asian airline	Incidence of in-flight medical emergencies ranged from 5.2 per million passengers in 2009, to 52 per million passengers in 2013
Peterson et al, 2013	Five US and international airlines	There were 11,920 in-flight medical emergency calls. Rates: 16 in-flight medical emergencies per 1 million passengers; 1 in-flight medical emergency per 604 flights. Worldwide estimate: 44,000 in-flight medical emergencies each year.
Szmajer et al, 2001	Air France	One in-flight medical emergency per 20,000 passengers
Tonks, 2008	British Airways Health Services	There were 31,200 medical incidents, out of the 36 million passengers. Three thousand were serious problems such as chest pain. They called for help from a professional on board 375 times.

Different reporting strategies are evident after reviewing Table 3. Some studies report medical events per number of passengers or enplanement, while others report events per number of flights. The numbers cited in the literature can reasonably be expected to be an underestimate of the true in-flight medical events frequencies. Mild or uncomplicated in-flight medical issues are not all necessarily reported to the crew.

As health care providers, having a sense of the most common in-flight medical events and knowledge of the available resources onboard can help them be effective volunteers when the need arises (Peterson et al, 2013). Responding to an in-flight medical event can be anxiety-provoking; Appendix A shows a suggested approach to patient care during an in-flight medical event as recommended in a paper written by a physician and pilot (Donner, 2017). Table 4 shows the most common symptoms and affected body systems on a side-to-side comparison between several studies. Please note that for simplicity, even when some studies made classifications like nausea, vomiting or diarrhea, and headache or seizures, they were grouped under gastrointestinal or neurological, respectively. The reader is encouraged to review the different categories used in the different studies.

Table 4. Categories of in-flight medical events (percentages)

Symptoms / Event	Jung et al, 2016	Peterson et al, 2013	Baltsezak, 2008	Delaune et al, 2003	DeJohn et al, 2000	Cummins et al, 1989
Syncope or presyncope	18.1	37.4	14.60	15.0	22.4	4.0
Gastrointestinal / Digestive	19.6	13.6	35.60	12.0	7.7	15.0
Cardio/chest pain	7.6	8	9.92	12.2	22.6	20.0
Respiratory	9.9	12.1	6.80	11.0	8.1	8.0
Trauma	14.1	1.8	-	12.0	5.3	-
Neurological	4.3	8.8	4.71	13.6	11.8	2.0
MSK pain or injury/Ortho	2.8	1.0	8.37	-	-	5.0
Burns	-	-	-	-	-	4.0
Weakness/malaise	-	-	-	3.7	-	-
Allergic reaction	4.7	2.2	3.66	2.8	2.4	-
Infectious symptoms/diseases	4.3	2.8	2.61	2.1	-	-
Psychiatric/ Psychological	3.9	2.4	3.14	3.0	3.4	1.0

Dermatological	-	-	2.61	-	-	-
Endocrine	2.1	1.6	0.52	2.4	4.7	2.0
HEENT	1.6	0.4	2.61	2.8	1.8	-
Laceration	-	0.3	-	-	-	3.0
OB/GYN	1.1	0.5	1.57	1.4	2.9	2.0
Urological/ Genitourinary	2.4	-	1.57	1.2	1.6	1.0
Forgotten medication	-	-	1.04	-	-	-
Pediatric	-	-	-	-	-	1.0
Alcohol/Drugs	-	-	-	0.7	-	-
Side effect from medication	-	-	0.52	-	-	-
Dehydration	-	-	-	0.5	-	-
Unconscious (no recovery)	0.4	-	-	-	-	-
Unconscious (delayed recovery)	0.04	-	-	-	-	-
Other/Miscellaneous/ Unknown	2.9	7.0	-	2.9	5.1	26.0

Note: Due to rounding not all columns add up to 100%.

Syncope was the most common in-flight medical event in two studies (Peterson et al, 2013, and Delaune et al, 2003). Gastrointestinal issues like nausea, diarrhea, or abdominal pain, were the most prevalent in-flight medical issue in the studies by Jung et al (2016) and Baltsezak (2008). On the other hand, cardiovascular problems like chest pain, was the number one issue in the studies by DeJohn and colleagues (2000), and Cummins and colleagues (1989). Not all studies have the same categories or body systems to report their findings. Some categories like burns, pediatric, and alcohol/drugs were used infrequently; while some categories like syncope or gastrointestinal issues were used by all six studies presented on Table 4.

There are several available resources onboard commercial airliners, ranging from CPR-trained cabin crew members, to access to medical consultation from ground support. In addition, first aid kits and emergency medical kits can be found in some flights.

The purpose of this study is to compare the requirements and components of the first aid kits and emergency medical kits onboard commercial aircraft according to different countries' civil aviation regulations.

Significance

The findings of this study will help bring awareness to the traveling healthcare provider about the regulations that dictate the components of the first aid kit and emergency medical kit available in civil aviation aircrafts. This study will highlight similarities and differences between studied countries. Based on the comparison presented, airlines or governmental civil aviation authorities may decide to expand or clarify their own regulations regarding first aid and emergency medical kits.

CHAPTER 2: DATA AND METHODS

To retrieve the applicable civilian aviation regulations regarding first aid kits and emergency medical kits, the author visited the online websites of the different civilian aviation authorities of interest, and followed the links to the appropriate documents and regulations sections. In the case of American regulations, the website for the Electronic Code of Federal Regulations (e-CFR) was used to retrieve the applicable information. Table 5 displays the web sources used on this study. Data on the contents and quantities of the first aid kits and emergency medical kits was sometimes accompanied by details regarding universal precautions kits and automated external defibrillator (AED) regulations, and they were included. The collected data was stored and organized into spreadsheets (Microsoft Excel for Windows, Microsoft Corp., Redmond, WA). Side-by-side comparison of the contents of the first aid kits and emergency medical kits was done. Only regulations that could be retrieved in the English language were included in this study.

Table 5. Data sources for regulations

Country	Civilian Aviation Agency	Source of Regulations
USA	Federal Aviation Administration	https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title14/14cfr121_main_02.tpl
EASA member states	European Aviation Safety Agency	https://www.easa.europa.eu/system/files/dfu/Air%20OPS%20Easy%20Access%20Rules_Rev.09_May%202017.pdf
India	Directorate General for Civil Aviation	http://dgca.nic.in/ftppub/D2X-X3%20(1%20DEC%202010).pdf
Indonesia	Directorate General for Civil Aviation	http://hubud.dephub.go.id/?en/dsku/download/7004
UAE	UAE General Civil Aviation Authority	https://www.gcaa.gov.ae/en/ePublication/Pages/CARs.aspx
Canada	Transport Canada Civil Aviation Authority	https://www.tc.gc.ca/eng/civilaviation/regserv/cars/part7-standards-standard725-419.htm

CHAPTER 3: RESULTS

Every country analyzed had regulations in place that dictate the number and components of first-aid and emergency medical kits. Some countries also had regulations in place for universal precaution kits and AEDs. In this chapter a comparison between the number and component of the first aid kits, emergency medical kit, universal precautions kit, and AEDs is presented. The reader is encouraged to see Appendices A to F for not only the specific details about the medical kits, but also other practical details, such as legal applicability and maintenance requirements for those kits.

First-Aid Kits

There are differences in the number of first-aid kits required by each country. Table 6 shows how many are required by number of passenger seats. The USA, Indonesia and Canada share the same requirements in terms of number required, and cap at four first aid kits even on aircraft capable of transporting more than 400 passengers. In EASA member states, India and UAE, operators carry five first aid kits on aircraft capable of transporting more than 400 passengers, and six kits if the aircraft is certified to carry more than 500 passengers.

Table 6. First-aid kits by number of passenger seats

No. of passenger seats	USA	EASA	India	Indonesia	UAE	Canada		
0-50	1	1	1	1	1	1		
51-100	2			2		2	2	2
101-150		2	2		2			
151-200	3	3	3	3	3	3		
201-250							3	3
251-300	4	4	4	4	4	4		
301-350					4		4	4
351-400		5	5		5			
401-450								
451-500		6	6		6			
501 or more								

When it comes to the contents of the first aid kit, some items are found universally on all countries studied. Medical items like adhesive tape, antiseptic wipes, bandages, and scissors are some examples. On the other hand, some items are specific to just one country. For example, foil-type blanket is only required by Canada, while a ground/air visual signal code is only required by UAE. Tourniquet in the first-aid kit is only required by India, but other countries have regulations that mandate tourniquets in their emergency medical kit. Table 7 provides a side-by-side comparison of the equipment in first-aid kits according to the applicable regulations.

Table 7. Equipment in first-aid kits

Equipment	USA	EASA	India	Indonesia	UAE	Canada
Adhesive tape	✓	✓	✓	✓	✓	✓
Ambu Bag			✓			
Antiseptic swabs	✓	✓	✓	✓	✓	✓
Arm splint, non-inflatable	✓			✓		
Bandages	✓	✓	✓	✓	✓	✓
Biohazard disposal bags		✓				
Blanket: foil type						✓
Disposable gloves			✓		✓	✓
Disposable resuscitation aid		✓				
Dressings		✓	✓		✓	✓
First Aid Kit Container						✓
First-aid manual, current edition			✓		✓	
Ground/Air visual signal code					✓	
Hand cleanser or cleansing towelettes					✓	
Leg splint, non-inflatable	✓			✓		
List of contents, two languages		✓			✓	
Medical incident record form			✓		✓	
Mouth-to-mouth resuscitation mask with one-way valve					✓	
Pad with shield, or tape, for eye			✓		✓	
Safety pins		✓	✓		✓	✓
Scissors	✓	✓	✓	✓	✓	✓
Steri-strips (or equivalent adhesive strip)		✓	✓		✓	
Thermometers (non-mercury)		✓	✓		✓	
Tourniquet			✓			
Tweezers		✓	✓		✓	✓

There is variability among regulations when it comes to including medications in the first-aid kit. On one end of the spectrum, Canada does not require to have medications in the first-aid kit, while India requires 14 types of medications in its first-aid kit. Indonesia and the USA only require one type of medication in their first aid kit, ammonia inhalants. In the middle of the spectrum, EASA state members and the UAE, require similar medications with the exception of anti-diarrheal medication that the UAE does not require. Table 8 highlights the differences between regulations regarding medications in the first-aid kits.

Table 8. Medications required in first-aid kits

Medications	USA	EASA	India	Indonesia	UAE
Ammonia inhalants	✓			✓	
Analgesic ointment			✓		
Analgesic, mild to moderate		✓	✓		✓
Antacid		✓	✓		✓
Anti-angina			✓		
Antibiotic eye drops			✓		
Antibiotic ointment			✓		
Antibiotic tablets			✓		
Anti-diarrheal		✓	✓		
Antiemetic		✓	✓		✓
Antihistamine / anti-allergy		✓	✓		✓
Antipyretic			✓		
Antispasmodic			✓		
Nasal decongestant		✓	✓		✓
Oral rehydration solution			✓		

Emergency Medical Kits

Although every country analyzed has regulations in place for emergency medical kits, in reality not every flight in those jurisdictions will have one onboard. Aircraft registered in the USA or Indonesia must have an emergency medical kit onboard on flights where a flight attendant is required. According to EASA and Emirati regulations, an emergency medical kit must be carried in aircraft with 30 passenger seats, for flights over 60 minutes. In Canada, emergency medical kit must be carried in aircraft authorized to carry more than 100 passenger seats. In Canada, USA, and Indonesia, flight time is not a consideration in terms of the emergency medical kit regulations. In India, an emergency medical kit must be carried in aircraft authorized to carry more than 100 passengers on flights more than 2 hours duration.

There are certain items in the emergency medical kit that are carried by every country analyzed, medical equipment like sphygmomanometer, stethoscope, needles, and syringes. Canada is the only country that does not require disposable gloves in the emergency medical kit, but they do require it in the first-aid kit. Although the FAA only requires one pair of protective gloves in the emergency medical kit, it does however recommend operators to keep additional pairs accessible on the aircraft (FAA Advisory Circular 121-33B). Only EASA state members require a basic delivery kit, blood glucose testing equipment, and even an intubation set. Table 10 provides a side-by-side comparison of equipment required in the emergency medical kit.

Table 9. Comparison of equipment required in the emergency medical kit

Equipment	USA	EASA	India	Indonesia	UAE	Canada
ACLS cards		✓				
Adhesive tape	✓			✓	✓	✓
Airways, oropharyngeal	✓		✓	✓	✓	✓
Alcohol sponges	✓	✓		✓		✓
Antiseptic wipes			✓		✓	
Aspirator		✓				
Bag-valve mask		✓			✓	
Basic delivery kit		✓				
Basic life support cards			✓		✓	
Blood glucose testing equipment		✓				
CPR masks	✓			✓		✓
Emergency tracheal catheter			✓		✓	
Flashlight and batteries			✓		✓	
Gloves (disposable)	✓	✓	✓	✓	✓	
Instructions / List of contents	✓	✓		✓	✓	✓
Intravenous administration kit	✓		✓	✓	✓	✓
Intravenous cannulas/catheters		✓	✓		✓	
Intubation set		✓				
Needle disposal box		✓	✓		✓	✓
Needles	✓	✓	✓	✓	✓	✓
Scalpel		✓				
Scissors	✓			✓		✓
Self-inflating manual resuscitation device	✓			✓		
Sphygmomanometer	✓	✓	✓	✓	✓	✓
Sponge gauze					✓	
Stethoscope	✓	✓	✓	✓	✓	✓
Surgical mask			✓		✓	
Syringes	✓	✓	✓	✓	✓	✓
Thermometer					✓	
Tourniquet	✓			✓	✓	✓
Umbilical cord clamp			✓		✓	
Urinary catheter		✓	✓		✓	

In terms of medications carried in the emergency medical kit, there are certain drugs that are required by all countries analyzed, medications like aspirin, antihistamines, atropine, bronchodilator, dextrose 50%, epinephrine, and saline solution. On the other hand, medications like lidocaine are only required by the USA and Indonesia, while medication for postpartum bleeding is only required by India and UAE. EASA member states don't have a regulatory mandate to carry medications to treat postpartum hemorrhage, even when they require a basic delivery kit. Table 11 provides a side-by-side comparison of medications required in the emergency medical kit.

Table 10. Comparison of medications required in the emergency medical kit

Medications	USA	EASA	India	Indonesia	UAE	Canada
Acetylsalicylic acid (ASA)	✓	✓	✓	✓	✓	✓
Adrenocortical steroid		✓	✓		✓	
Analgesics	✓	✓	✓	✓	✓	
Antiarrhythmic		✓				
Antiemetic		✓	✓		✓	
Antihistamine / Diphenhydramine	✓	✓	✓	✓	✓	✓
Antispasmodic		✓	✓		✓	
Atropine	✓	✓	✓	✓	✓	✓
Beta-blocker / Antihypertensive medication		✓	✓		✓	
Bronchodilator	✓	✓	✓	✓	✓	✓
Dextrose 50% / Medication for Hypoglycemia	✓	✓	✓	✓	✓	✓
Digoxin					✓	
Diuretic		✓	✓		✓	
Epinephrine	✓	✓	✓	✓	✓	✓
Lidocaine	✓			✓		
Medication for postpartum bleeding			✓		✓	
Nitroglycerin / Coronary	✓	✓	✓	✓		✓

vasodilator						
Saline solution	✓	✓	✓	✓	✓	✓
Sedative/anticonvulsant		✓	✓		✓	

Universal Precaution Kits

The universal precaution kit can aid cabin crew members in managing incidents of ill health onboard associated with a case of suspected communicable disease, or in the case of illness involving contact with bodily fluids. Of the countries analyzed in this study, only India and UAE had regulations that specifically address universal precautions kit. In both India and UAE, aircraft that require at least one flight attendant to operate must have at least one universal precaution kit; two kits must be carried if the airplane is authorized to carry more than 250 passengers. Air operators from India are encouraged to carry additional universal precaution kits at times of increased public health risk. The components of the universal precaution kit are the same for both countries (Table 9). They both have items to help protect, and properly handle and dispose of body fluids.

Table 11. Comparison of contents of the universal precaution kit

List of contents	India	UAE
Dry powder that can convert up to 1 L liquid spill into a sterile granulated gel	✓	✓
Germicidal disinfectant for surface cleaning	✓	✓
Skin wipes	✓	✓
Face/ eye mask (separate or combined)	✓	✓
Gloves (disposable)	✓	✓
Protective apron	✓	✓
Large absorbent towel	✓	✓
Pick-up scoop with scraper	✓	✓
Bio-hazard disposal waste bag	✓	✓
Instructions	✓	✓

Automated External Defibrillators

The USA, EASA member states, and India have some specific requirements about AEDs. In the USA at least one AED is required onboard. Operators from EASA member states can determine whether or not to carry an AED, based on risk assessment pertinent to each operator. In India, scheduled airlines operating international flights of more than 2 hours duration must carry an AED. On the other hand, Indonesia, UAE, and Canada have no regulations at all regarding AED onboard commercial aircraft.

CHAPTER 4: DISCUSSION

Summary and Key Results

Every country analyzed had regulations in place that dictate how many first-aid and emergency medical kits must be carried onboard commercial aircraft, and the components that must be carried in each kit. Some countries also had regulations in place for universal precaution kits and AEDs.

First-Aid Kits

Commercial aircraft in the USA, Indonesia, and Canada carry up to four first-aid kits. EASA member states, India, and UAE have up to six first aid kits onboard. The contents of medical equipment in the first-aid kits varied by country. All countries but Canada, had some type of medication in the first-aid kit.

Emergency Medical Kits

Every country analyzed had regulations regarding onboard emergency medical kits, but not every flight is equipped with one. In the USA and Indonesia, if a flight requires a flight attendant, then an emergency medical kit must be onboard. Other countries have flight time and/or number of passenger seat limitations. According to EASA and Emirati regulations, an operator is only required to carry an emergency medical kit if the aircraft is authorized to carry 30 passenger seats, and if the flight exceeds 60 minutes of flight time. In India, an operator is only required to carry an emergency medical kit if the aircraft is authorized to carry more than 100 passengers on flights more than 2 hours duration. In Canada, an emergency medical kit must be carried

if the aircraft is authorized to carry more than 100 passenger seats. The medical equipment and medications required in the emergency medical kits varied by country.

Universal Precautions Kits

Of the countries studied, only India and UAE require a universal precautions kit, if the aircraft requires a flight attendant. On aircraft authorized to carry more than 250 passengers, two kits must be carried.

Automated External Defibrillators

There are regulations in place in the USA, EASA member states, and India regarding AEDs onboard commercial aircraft. On the other hand, Indonesia, UAE, and Canada have no regulations regarding AEDs. In the USA at least one AED is required onboard. Operators from EASA member states can determine whether or not to carry an AED, based on risk assessment pertinent to each operator. In India, scheduled airlines operating international flights of more than 2 hours duration must carry an AED.

Strengths and Limitations

In 2010, Sand and colleagues compared the contents of the emergency medical kit between different European airlines. Nonetheless, to the author's knowledge, this is the first study that compares regulations for first-aid kit and emergency medical kit onboard aircraft between several different countries outside the boundaries of the same regulatory body.

Despite attempts to seek information, from embassies and airline companies and online searches, about civil aviation regulations in East Asian countries, the author was unable to get access to the region's regulations. Future studies should expand on the multi-country comparison, particularly those of East Asian countries. Between China, Japan, and Korea the number of air-travelers in 2016 exceeded 682 million passengers (World Bank, n.d.). The author was able to retrieve the civil aviation regulations concerning medical equipment for Russia and Brazil, but not in the English language. Future researchers working in the area of international civil aviation regulations should have means of certified translation.

The present study shows the minimum components of the first-aid and emergency medical kits, some airlines may choose to have expanded kits that better suit their operations. Hence, what is available onboard could be different from what we have described here, based solely on the regulations.

Governmental policies, including civil aviation regulations are dynamic, and subject to review and amendments. The reader is advised to corroborate the information presented here from the original governmental agencies. If discrepancies exist, the information from the official source will take precedence.

Implications

Contents of the first-aid kits and emergency medical kits are subject to different national civil aviation regulations. Some air operators don't have medical equipment onboard given loopholes in the regulations, such as number of passenger seats and flight time. The implications of not having medical supplies onboard can vary from no change in medical outcome, to potentially loss of life.

Regardless of the flight duration or type of flight planned (domestic vs. international), the author believes that governments have the ethical responsibility to

safeguard public safety and wellbeing by setting standards and regulations with that goal. Regulatory authorities should ensure that medications and medical equipment are available on every flight. The argument that a short flight does not need to carry medical equipment is not acceptable to the author because even if a decision is made to divert such a flight in the case of a medical event, that action could take 20-30 minutes or more, potentially jeopardizing lives.

Relevant to public health, the author recommends having a universal precautions kit on every commercial aircraft. Such kit can aid cabin crew members protect themselves and others while handling incidents of ill health onboard associated with a case of suspected communicable disease, or in the case of illness involving contact with bodily fluids. This is of particular importance in the setting of epidemics.

In addition to medications and medical equipment, regulations should be in place for all aircraft to carry an AED, even on short flights. AEDs have become a key component in the chain of survival in contemporary cardiopulmonary resuscitation. Early defibrillation is crucial for survival with good neurological outcome after cardiac arrest (Ströhle, 2014).

Conclusion

The author discussed civil aviation regulations regarding first aid kit, emergency medical kit, universal precaution kit, and AEDs. The project's intent was to familiarize healthcare providers, particularly those traveling by air, on the regulations, and components of emergency medical equipment and medications available onboard commercial aircrafts in the USA, Europe, India, Indonesia, UAE, and Canada.

With the numbers of air travels expected to increase, familiarity with available resources to manage an in-flight medical event is helpful and could be life-saving. Inability to provide appropriate medical care onboard an aircraft in the case of an in-

flight medical event poses potential unacceptable dangers at all levels, from the individual to the population level.

With the goal of increasing safety for air passengers, the author recommends policy changes to expand the current civil aviation requirements, so that every flight is properly equipped with medications and medical equipment.

Appendix A: American Regulations

Title 14 of the Code of Federal Regulations (14 CFR), Aeronautics and Space, contains the regulations that govern operations of commercial US-registered air carriers. Requirements for emergency medical equipment can be found on Subpart X (Emergency Medical Equipment and Training) of Part 121 (Operating Requirements: Domestic, Flag, and Supplemental Operations). The first aid kit and emergency medical kit components and quantities are listed on Appendix A (of the regulations) to Part 121.

Subpart X—Emergency Medical Equipment and Training

§121.801 Applicability

This subpart prescribes the emergency medical equipment and training requirements applicable to all certificate holders operating passenger-carrying airplanes under this part. Nothing in this subpart is intended to require certificate holders or its agents to provide emergency medical care or to establish a standard of care for the provision of emergency medical care.

§121.803 Emergency medical equipment

(a) No person may operate a passenger-carrying airplane under this part unless it is equipped with the emergency medical equipment listed in this section.

(b) Each equipment item listed in this section—

(1) Must be inspected regularly in accordance with inspection periods established in the operations specifications to ensure its condition for continued serviceability and immediate readiness to perform its intended emergency purposes;

(2) Must be readily accessible to the crew and, with regard to equipment located in the passenger compartment, to passengers;

(3) Must be clearly identified and clearly marked to indicate its method of operation; and

(4) When carried in a compartment or container, must be carried in a compartment or container marked as to contents and the compartment or container, or the item itself, must be marked as to date of last inspection.

(c) For treatment of injuries, medical events, or minor accidents that might occur during flight time each airplane must have the following equipment that meets the specifications and requirements of appendix A of this part:

(1) Approved first-aid kits.

(2) In airplanes for which a flight attendant is required, an approved emergency medical kit.

(3) In airplanes for which a flight attendant is required, an approved emergency medical kit as modified effective April 12, 2004.

(4) In airplanes for which a flight attendant is required and with a maximum payload capacity of more than 7,500 pounds, an approved automated external defibrillator as of April 12, 2004.

Appendix A (of the regulations) to Part 121—First Aid Kits and Emergency Medical Kits

Approved first-aid kits, at least one approved emergency medical kit, and at least one approved automated external defibrillator required under §121.803 of this part must be readily accessible to the crew, stored securely, and kept free from dust, moisture, and damaging temperatures.

FIRST-AID KITS

1. The minimum number of first aid kits required is set forth in the following table:

No. of passenger seats	No. of first-aid kits
0-50	1
51-150	2
151-250	3
More than 250	4

2. Except as provided in paragraph (3), each approved first-aid kit must contain at least the following appropriately maintained contents in the specified quantities:

Contents	Quantity
Adhesive bandage compresses, 1-inch	16
Antiseptic swabs	20
Ammonia inhalants	10
Bandage compresses, 4-inch	8
Triangular bandage compresses, 40-inch	5
Arm splint, noninflatable	1
Leg splint, noninflatable	1
Roller bandage, 4-inch	4
Adhesive tape, 1-inch standard roll	2
Bandage scissors	1

3. Arm and leg splints which do not fit within a first-aid kit may be stowed in a readily accessible location that is as near as practicable to the kit.

EMERGENCY MEDICAL KITS

1. Until April 12, 2004, at least one approved emergency medical kit that must contain at least the following appropriately maintained contents in the specified quantities:

Contents	Quantity
Sphygmomanometer	1
Stethoscope	1
Airways, oropharyngeal (3 sizes)	3
Syringes (sizes necessary to administer required drugs)	4
Needles (sizes necessary to administer required drugs)	6
50% Dextrose injection, 50cc	1
Epinephrine 1:1000, single dose ampule or equivalent)	2
Diphenhydramine HC1 injection, single dose ampule or equivalent	2
Nitroglycerin tablets	10
Basic instructions for use of the drugs in the kit	1
Protective nonpermeable gloves or equivalent	1 pair

2. As of April 12, 2004, at least one approved emergency medical kit that must contain at least the following appropriately maintained contents in the specified quantities:

Contents	Quantity
Sphygmomanometer	1
Stethoscope	1
Airways, oropharyngeal (3 sizes): 1 pediatric, 1 small adult, 1 large adult or equivalent	3
Self-inflating manual resuscitation device with 3 masks (1 pediatric, 1 small adult, 1 large adult or equivalent)	1:3 masks
CPR mask (3 sizes), 1 pediatric, 1 small adult, 1 large adult, or equivalent	3
IV Admin Set: Tubing w/ 2 Y connectors	1
Alcohol sponges	2
Adhesive tape, 1-inch standard roll adhesive	1
Tape scissors	1 pair
Tourniquet	1
Saline solution, 500 cc	1
Protective nonpermeable gloves or equivalent	1 pair
Needles (2-18 ga., 2-20 ga., 2-22 ga., or sizes necessary to	6

administer required medications)	
Syringes (1-5 cc, 2-10 cc, or sizes necessary to administer required medications)	4
Analgesic, non-narcotic, tablets, 325 mg	4
Antihistamine tablets, 25 mg	4
Antihistamine injectable, 50 mg, (single dose ampule or equivalent)	2
Atropine, 0.5 mg, 5 cc (single dose ampule or equivalent)	2
Aspirin tablets, 325 mg	4
Bronchodilator, inhaled (metered dose inhaler or equivalent)	1
Dextrose, 50%/50 cc injectable, (single dose ampule or equivalent)	1
Epinephrine 1:1000, 1 cc, injectable, (single dose ampule or equivalent)	2
Epinephrine 1:10,000, 2 cc, injectable, (single dose ampule or equivalent)	2
Lidocaine, 5 cc, 20 mg/ml, injectable (single dose ampule or equivalent)	2
Nitroglycerin tablets, 0.4 mg	10
Basic instructions for use of the drugs in the kit	1

3. If all of the above-listed items do not fit into one container, more than one container may be used.

AUTOMATED EXTERNAL DEFIBRILLATORS

At least one approved automated external defibrillator, legally marketed in the United States in accordance with Food and Drug Administration requirements, that must:

1. Be stored in the passenger cabin.

2. After April 30, 2005:

(a) Have a power source that meets FAA Technical Standard Order requirements for power sources for electronic devices used in aviation as approved by the Administrator; or

(b) Have a power source that was manufactured before July 30, 2004, and been found by the FAA to be equivalent to a power source that meets the Technical Standard Order requirements of paragraph (a) of this section.

3. Be maintained in accordance with the manufacturer's specifications.

Appendix B: European Regulations

EASA regulations can be found on the document Acceptable Means of Compliance and General Guidance to Annex IV Commercial air transport operations [Part-CAT] of Commission Regulation (EU) 965/2012 on air operations. The following details are excerpts from the regulations

AMC1 CAT.IDE.A.220 First-aid kit

(a) Aeroplanes shall be equipped with first-aid kits, in accordance with Table 1.

Table 1

Number of first-aid kits required

Number of passenger seats installed	Number of first-aid kits required
0-100	1
101-200	2
201-300	3
301-400	4
401-500	5
501 or more	6

(b) First-aid kits shall be:

- (1) readily accessible for use; and
- (2) kept up to date.

AMC1 CAT.IDE.A.220 First-aid kit

CONTENT OF FIRST-AID KITS

(a) First-aid kits should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be complemented by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers, etc.).

(b) The following should be included in the first-aid kit:

(1) Equipment

- (i) bandages (assorted sizes);
- (ii) burns dressings (unspecified);
- (iii) wound dressings (large and small);
- (iv) adhesive dressings (assorted sizes);
- (v) adhesive tape;
- (vi) adhesive wound closures;
- (vii) safety pins;
- (viii) safety scissors;
- (ix) antiseptic wound cleaner;
- (x) disposable resuscitation aid;
- (xi) disposable gloves;
- (xii) tweezers: splinter; and
- (xiii) thermometers (non-mercury).

(2) Medications

- (i) simple analgesic (may include liquid form);
- (ii) antiemetic;
- (iii) nasal decongestant;
- (iv) gastrointestinal antacid, in the case of aeroplanes carrying more than 9 passengers;
- (v) anti-diarrhoeal medication, in the case of aeroplanes carrying more than 9 passengers; and
- (vi) antihistamine.

(3) Other

- (i) a list of contents in at least two languages (English and one other). This should include information on the effects and side effects of medications carried;
- (ii) first-aid handbook, current edition;
- (iii) medical incident report form;
- (iv) biohazard disposal bags.

(4) An eye irrigator, whilst not required to be carried in the first-aid kit, should, where possible, be available for use on the ground.

AMC2 CAT.IDE.A.220 First-aid kit

MAINTENANCE OF FIRST-AID KITS

To be kept up to date, first-aid kits should be:

- (a) inspected periodically to confirm, to the extent possible, that contents are maintained in the condition necessary for their intended use;
- (b) replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant; and
- (c) replenished after use in-flight at the first opportunity where replacement items are available.

AMC1 CAT.IDE.A.225 Emergency medical kit

- (a) Aeroplanes with an MOPSC of more than 30 shall be equipped with an emergency medical kit when any point on the planned route is more than 60 minutes flying time at normal cruising speed from an aerodrome at which qualified medical assistance could be expected to be available.
- (b) The commander shall ensure that drugs are only administered by appropriately qualified persons.
- (c) The emergency medical kit referred to in (a) shall be:
 - (1) dust and moisture proof;
 - (2) carried in a way that prevents unauthorised access; and
 - (3) kept up to date.

AMC1 CAT.IDE.A.225 Emergency medical kit

CONTENT OF EMERGENCY MEDICAL KIT

- (a) Emergency medical kits should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be complemented by the

operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers, etc.).

(b) The following should be included in the emergency medical kit:

(1) Equipment

- (i) sphygmomanometer — non-mercury;
- (ii) stethoscope;
- (iii) syringes and needles;
- (iv) intravenous cannulae (if intravenous fluids are carried in the first-aid kit, a sufficient supply of intravenous cannulae should be stored there as well);
- (v) oropharyngeal airways (three sizes);
- (vi) tourniquet;
- (vii) disposable gloves;
- (viii) needle disposal box;
- (ix) one or more urinary catheter(s), appropriate for either sex, and anaesthetic gel;
- (x) basic delivery kit;
- (xi) bag-valve masks (masks two sizes: one for adults, one for children);
- (xii) intubation set;
- (xiii) aspirator;
- (xiv) blood glucose testing equipment; and
- (xv) scalpel.

(2) Instructions: the instructions should contain a list of contents (medications in trade names and generic names) in at least two languages (English and one other). This should include information on the effects and side effects of medications carried. There should also be basic instructions for use of the medications in the kit and ACLS cards (summarising and depicting the current algorithm for advanced cardiac life support).

(3) Medications

- (i) coronary vasodilator e.g. glyceriltrinitrate-oral;
- (ii) antispasmodic
- (iii) epinephrine/adrenaline 1:1 000 (if a cardiac monitor is carried);
- (iv) adrenocorticoid — injectable;
- (v) major analgesic;
- (vi) diuretic — injectable;
- (vii) antihistamine — oral and injectable;
- (viii) sedative/anticonvulsant — injectable, rectal and oral sedative;
- (ix) medication for hypoglycaemia (e.g. hypertonic glucose);
- (x) antiemetic;
- (xi) atropine — injectable;
- (xii) bronchial dilator — injectable or inhaled;
- (xiii) IV fluids in appropriate quantity e.g. sodium chloride 0.9 % (minimum 250 ml);
- (xiv) acetylsalicylic acid 300 mg — oral and/or injectable;

(xv) antiarrhythmic — if a cardiac monitor is carried;

(xvi) antihypertensive medication;

(xvii) beta-blocker — oral.

* Epinephrine/Adrenaline 1:10 000 can be a dilution of epinephrine 1:1 000

(4) The carriage of an automated external defibrillator should be determined by the operator on the basis of a risk assessment taking into account the particular needs of the operation.

(5) The automated external defibrillator should be carried on the aircraft, though not necessarily in the emergency medical kit.

AMC2 CAT.IDE.A.225 Emergency medical kit

CARRIAGE UNDER SECURE CONDITIONS

The emergency medical kit should be kept either in the flight crew compartment or in another secure location in the cabin that prevents unauthorised access to it.

AMC3 CAT.IDE.A.225 Emergency medical kit

ACCESS TO EMERGENCY MEDICAL KIT

(a) When the actual situation on board so requires, the commander should limit access to the emergency medical kit.

(b) Drugs should be administered by medical doctors, qualified nurses, paramedics or emergency medical technicians.

(c) Medical students, student paramedics, student emergency medical technicians or nurses aids should only administer drugs if no person mentioned in (b) is on board the flight and appropriate advice has been received.

(d) Oral drugs should not be denied in medical emergency situations where no medically qualified persons are on board the flight.

AMC4 CAT.IDE.A.225 Emergency medical kit

MAINTENANCE OF EMERGENCY MEDICAL KIT

To be kept up to date, the emergency medical kit should be:

(a) inspected periodically to confirm, to the extent possible, that the contents are maintained in the condition necessary for their intended use;

(b) replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant; and

(c) replenished after use-in-flight at the first opportunity where replacement items are available.

GM1 CAT.IDE.A.225 Emergency medical kit

SECURE LOCATION

‘Secure location’ refers to a location in the cabin that is not intended for the use by passengers and preferably to which passengers do not have access.

Appendix C: Indian Regulations

In India, the components of the first aid kit and emergency medical kit are established by the Civil Aviation Requirements (CAR), Section 2 – Airworthiness, Series ‘X’ Part III, Provision of Medical Supplies in Aircraft.

Subject: PROVISION OF MEDICAL SUPPLIES IN AIRCRAFT

1. INTRODUCTION:

Rule 57 of aircraft rules, 1937 requires that every aircraft shall be fitted and equipped with the instrument and equipment including radio apparatus and special equipment as may be specified according to the use and circumstances under which the flight is to be conducted. This part of Civil Aviation Requirements lays down the requirement for placement and use of First-aid Kit, Medical Kit and Universal Precaution kit on aircraft registered in India, and is issued under Rule 133A of the aircraft rules.

2. DEFINITIONS

2.1 First-aid kit: A kit containing such items which can be used for the purpose of first-aid treatment of injuries which may occur in flight or as a result of minor accidents.

2.2 Medical kit: A kit containing such life saving drugs intended to be administered only by a qualified medical practitioner if and when available.

2.3 Universal precaution kit: A kit for the use of cabin crew members in managing incidents of ill health associated with a case of suspected communicable disease, or in the case of illness involving contact with body fluids.

2.4 **“Small Aircraft”** means an aircraft, classified as an aeroplane with a maximum take-off mass of less than 5700 kg, or a single engined helicopter.

3. REQUIREMENT OF MEDICAL SUPPLIES:

3.1 All Indian Registered aircraft shall carry medical supplies as follows:

- (a) First-aid kits for carriage on all aircraft,
- (b) Medical Kit for carriage where the aircraft is authorized to carry more than 100 passengers, on a sector length of more than two hours, and
- (c) a universal precaution kits for carriage on all aircraft that require a cabin crew member.

3.2 The number of first-aid kits, Medical Kit and Universal Precaution kits should be appropriate to the number of passengers which the aircraft is authorized to carry:

Passenger	First-aid kits	Medical kit
0 -- 100	1	-
101 -- 200	2	1
201 -- 300	3	1
301 -- 400	4	1
401 -- 500	5	1
More than 500	6	1

4. CONTENTS OF THE FIRST-AID KIT:

4.1 Each First-aid Kit shall contain at least the following or other approved contents:

List of contents	Quantity
Antiseptic swabs (10/ pack)	2
Bandage: adhesive strips	20
Bandage: gauze 7.5 cm × 4.5 m	2
Bandage: triangular; safety pins	2
Dressing: burn 10 cm × 10 cm	5
Dressing: compress, sterile 7.5 cm × 12 cm	5
Dressing: gauze, sterile 10.4 cm × 10.4 cm	5
Tape: adhesive 2.5 cm (roll)	2
Steri-strips / equivalent adhesive strip/ suture material	2
Pad with shield (or tape) for eye	1
Scissors: 10 cm	1
Tape: Adhesive, surgical 1.2 cm × 4.6 m	1
Tweezers: splinter	1
Disposable gloves (multiple pairs)	2
Thermometers (non-mercury)	1
Ambu Bag [*]	1
Mild to moderate analgesic	10
Antiemetic	10
Antiemetic drops [#]	1
Nasal decongestant	1
Antacid	10
Antihistamine	10

First-aid manual, current edition	1
Incident record form	5
Antibiotic tablet	10
Antibiotic ointment	1
Antibiotic Eye drops	1
Anti-diarrheal	10
Anti- allergy	10
Anti-spasmodic tablet/ capsule	10
Anti-spasmodic drops [#]	1
Anti-pyretic tablet	10
Anti-pyretic syrup [#]	1
Anti-angina – Sorbitrate	10
Analgesic ointment	1
Crepe bandage	2
Oral Rehydration Solution sachets	5
Tourniquet	1

* May be kept separately in close proximity of the FAK/ MK/ AED.

[#] May be omitted from smaller aircraft.

5. MEDICAL KIT:

5.1 Large public transport aircraft, capable of carrying more than 100 passengers, shall in addition to the First-aid kit be equipped with Medical kit which shall contain the life saving drugs.

5.2 All Scheduled Airlines operating transport category aircraft when engaged in domestic commercial flights, shall on the basis of a risk assessment, taking into account the particular need of operation, number of passengers and duration

of sector lengths, may carry one approved Automated External Defibrillators(AED) to provide the option to treat any serious medical events during flight time. The operators may carry Automated External Defibrillators because they offer the only effective treatment for cardiac fibrillation. Also the present generation AEDs have voice instructions which need to be followed by cabin crew/doctor on board.

5.2.1 All Scheduled Airlines operating transport category aircraft when engaged in International commercial flights of duration more than 2 hours shall carry Automated External Defibrillators.

5.2.1 The approved Automated External Defibrillators if carried:

- i. May be stored in the passenger cabin
- ii. Shall meet Technical Standard Order or equivalent requirements for power sources for electronic devices used in aviation.
- iii. Be maintained in accordance with the manufacturers specifications
- iv. Should be operated by a cabin crew trained for this purpose.

5.3 CONTENTS OF MEDICAL KIT

List of contents	Quantity
Equipment	
Stethoscope	1
Sphygmomanometer (electronic preferred)	1
Airways, oropharyngeal (3 sizes)	1 each
Syringes (appropriate range of sizes)	5/3/2
Needles (appropriate range of sizes)	10
Intravenous catheters (appropriate range of sizes)	3

Antiseptic wipes	20
Gloves (disposable)	3
Needle disposal box	1
Urinary catheter	2
System for delivering intravenous fluids	2
Surgical mask	4
Emergency tracheal catheter (or large gauge intravenous cannula)	2
Umbilical cord clamp	1
Basic life support cards	1
Flashlight and batteries	1
Medication	
Epinephrine 1:1000	2
Antihistamine – injectable	2
Dextrose 50% (or equivalent) – injectable: 50ml	2
Nitroglycerin tablets/ spray/ patch	1
Major analgesic	10
Injectable analgesic	1
Injectable anti-spasmodic	1
Injectable bronchodilator	1
Sedative anticonvulsant – injectable	3
Antiemetic – injectable	3
Bronchial dilator – inhaler	1
Atropine – injectable	10
Adrenocortical steroid – injectable	2
Diuretic – injectable	2
Medication for postpartum bleeding	2
Sodium chloride 0.9% (minimum 250 ml)	2
Acetyl salicylic acid (aspirin) for oral use	10

Oral beta blocker	10
Epinephrine 1:10000 (can be a dilution of epinephrine 1:1000)	2
If a Cardiac monitor is available with or without AED it may be added	

6. CONTENTS OF UNIVERSAL PRECAUTION KIT

List of contents	Quantity
Dry powder that can convert up to one liter liquid spill into a sterile granulated gel	As required
Germicidal disinfectant for surface cleaning	50 ml
Skin wipes	20
Face/ eye mask (separate or combined)	2
Gloves (disposable)	2 pairs
Protective apron	1
Large absorbent towel	2
Pick-up scoop with scraper	1
Bio-hazard disposal waste bag	2
Instructions	1

7. PERIODIC EXAMINATION OF THE KIT:

7.1 The stowage and the intact condition of the seal of the First-aid kits, Medical kits and Universal precaution kit, as applicable, shall be ensured prior to every flight by a person designated by the organization. The responsibility of the designated person with regard to this check shall be included in the Operations Manual.

7.2 The contents of such Kits shall be examined and certified by Registered Medical Practitioners/ Medical Officers holding at least MBBS degree once

in a year. In case any of the content of such kit has life expiry before one year, the validity should be restricted to that date.

8. TRAINING OF CREW MEMBERS IN THE APPLICATION OF FIRST-AID:

8.1 In the case of transport aircraft engaged in scheduled and non-scheduled services, it will be the responsibility of the owner/ operator to ensure that cabin crew are adequately and properly trained in the proper use of equipment in accordance with CAR Section 7 Series M Part I.

9. GENERAL REQUIREMENTS:

9.1 The First-aid kits, Medical kits and Universal precaution kit containers must be moisture and dust-proof and readily accessible to cabin attendants/flight crew, in flight, except in the case of gliders, where it can be located at any practically convenient place.

9.2 The First-aid kits, Medical kits and Universal precaution kit containers shall marked with a white cross of size at least 5 Cm to 5 Cm in green background and the words "FIRST-AID KIT"/"MEDICAL Kit"/"UNIVERSAL PRECAUTION KIT", as the case may be in prominent letters shall appear on the front surface of the container.

9.3 First-aid kits, Medical kits and Universal precaution kit shall be sealed and the contents duly certified and signed by a Registered Medical Practitioner/ Medical Officer holding at least an MBBS degree and also sign Appendix 'A'.

9.4 The First-aid kits, Medical kits and Universal precaution kit must remain sealed till the time of its use. After use it must be replenished and certified

by a medical practitioner and resealed. If the seal is broken during bomb threat inspection or due security reasons or due to usage of the kit and cannot be recertified due to non availability of qualified doctor, the kits may be carried on board in unsealed condition provided it is recertified at the first available opportunity or arrival at base, whichever is earlier.

9.5 The First-aid kits, Medical kits and Universal precaution kit containers must bear a Sl. No. given by the Operator for the purpose of identification.

9.6 First-aid and universal precaution kits should be distributed as evenly as practicable throughout the passenger cabins. They should be readily accessible to cabin crew members.

9.7 The stowage locations shall be similarly (as in para 10.2) and conspicuously marked for easy identification.

9.8 When a First-aid Kit or Medical Kit or a universal precaution kit is opened, a cabin log entry shall be made by the cabin crew indicating the purpose of breaking the seal and requesting replacement.

Appendix D: Indonesian Regulations

In Indonesia, the components of the first aid kit and emergency medical kit are established by the Civil Aviation Safety Regulation (CASR), Part 121 (Certification and Operating Requirements: Domestic, Flag, and Supplemental Air Carriers), Subpart X: Emergency Medical Equipment and Training. Notice the similarity in nomenclature and structure between US and Indonesian regulations.

SUBPART X - EMERGENCY MEDICAL EQUIPMENT AND TRAINING

121.801 Applicability.

This subpart prescribes the emergency medical equipment and training requirements applicable to all certificate holders operating passenger-carrying airplanes under this part. Nothing in this subpart is intended to require certificate holders or its agents to provide emergency medical care or to establish a standard of care for the provision of emergency medical care.

121.803 Emergency Medical Equipment.

(a) No person may operate a passenger-carrying airplane under this part unless it is equipped with the emergency medical equipment listed in this section.

(b) Each equipment item listed in this section—

- (1) Must be inspected regularly in accordance with inspection periods established in the operations specifications to ensure its condition for continued serviceability and immediate readiness to perform its intended emergency purposes;

(2) Must be readily accessible to the crew and, with regard to equipment located in the passenger compartment, to passengers;

(3) Must be clearly identified and clearly marked to indicate its method of operation; and

(4) When carried in a compartment or container, must be carried in a compartment or container marked as to contents and the compartment or container, or the item itself, must be marked as to date of last inspection.

(c) For treatment of injuries, medical events, or minor accidents that might occur during flight time each airplane must have the following equipment that meets the specifications and requirements of Appendix A (of the regulation) of this part:

(1) Approved first-aid kits.

(2) In airplanes for which a flight attendant is required, an approved emergency medical kit.

APPENDIX A (of the Indonesian regulations) - FIRST AID KITS and EMERGENCY MEDICAL KITS

Approved first-aid kits must be readily accessible to the crew, stored securely, and kept free from dust, moisture, and damaging temperatures.

(a) First-aid Kits

(1) The minimum number of first aid kits required is set forth in the following table:

No. of passenger seats	No. of first-aid kits
0-50	1
51-150	2
151-250	3
More than 250	4

(2) Except as provided in paragraph (3), each approved first-aid kit must contain at least the following appropriately maintained contents in the specified quantities:

Contents	Quantity
Adhesive bandage compresses, 1-inch	16
Antiseptic swabs	20
Ammonia inhalants	10
Bandage compresses, 4-inch	8
Triangular bandage compresses, 40-inch	5
Arm splint, noninflatable	1
Leg splint, noninflatable	1
Roller bandage, 4-inch	4
Adhesive tape, 1-inch standard roll	2
Bandage scissors	1

(3) Arm and leg splints which do not fit within a first-aid kit may be stowed in a readily accessible location that is as near as practicable to the kit.

(b) Emergency Medical Kits

(1) At least one approved emergency medical kit must contain at least the following appropriately maintained contents in the specified quantities:

Contents	Quantity
Sphygmomanometer	1
Stethoscope	1
Airways, oropharyngeal (3 sizes): 1 pediatric, 1 small adult, 1 large adult or equivalent	3
Self-inflating manual resuscitation device with 3 masks (1 pediatric, 1 small adult, 1 large adult or equivalent)	1:3 masks
CPR mask (3 sizes), 1 pediatric, 1 small adult, 1 large adult, or equivalent	3
IV Admin Set: Tubing w/ 2 Y connectors	1
Alcohol sponges	2
Adhesive tape, 1-inch standard roll adhesive	1
Tape scissors	1 pair
Tourniquet	1

Saline solution, 500 cc	1
Protective nonpermeable gloves or equivalent	1 pair
Needles (2-18 ga., 2-20 ga., 2-22 ga., or sizes necessary to administer required medications)	6
Syringes (1-5 cc, 2-10 cc, or sizes necessary to administer required medications)	4
Analgesic, non-narcotic, tablets, 325 mg	4
Antihistamine tablets, 25 mg	4
Antihistamine injectable, 50 mg, (single dose ampule or equivalent)	2
Atropine, 0.5 mg, 5 cc (single dose ampule or equivalent)	2
Aspirin tablets, 325 mg	4
Bronchodilator, inhaled (metered dose inhaler or equivalent)	1
Dextrose, 50%/50 cc injectable, (single dose ampule or equivalent)	1
Epinephrine 1:1000, 1 cc, injectable, (single dose ampule or equivalent)	2
Epinephrine 1:10,000, 2 cc, injectable, (single dose ampule or equivalent)	2
Lidocaine, 5 cc, 20 mg/ml, injectable (single dose ampule or equivalent)	2

Nitroglycerin tablets, 0.4 mg	10
Basic instructions for use of the drugs in the kit	1

(2) If all of the above-listed items do not fit into one container, more than one container may be used.

Appendix E: Emirati Regulations

Operators of aircraft registered in the UAE must comply with the Civil Aviation Regulations (CAR) of the UAE. Part IV contains the operations regulations. CAR-OPS 1 applies to commercial and private air transport in the UAE. The UAE General Civil Aviation Authority has implemented CAR-OPS 1 based on the European Joint Aviation Requirements (JAR). Subpart K details requirements regarding instruments and equipment. First aid kits, universal precautions kit, and emergency medical kit are regulated by CAR-OPS 1.745, CAR-OPS 1.750, and CAR-OPS 1.755, respectively. The UAE regulations list the components required for the first aid kit and emergency medical kit, but no quantities are specified. Civil Aviation Advisory Publication number 55 also lists the components but no quantities are stated.

CAR-OPS 1.745 First-Aid Kits

(See AMC OPS 1.745)

(a) An operator shall not operate an aeroplane unless it is equipped with first-aid kits, readily accessible for use, to the following scale:

Number of passenger seats installed	Number of First-Aid Kits required
1 to 100	1
101 to 200	2
201 to 300	3
301 to 400	4
401 to 500	5
501 or more	6

(b) An operator shall ensure that first-aid kits are:

- (1) Inspected periodically to confirm, to the extent possible, that contents are maintained in the condition necessary for their intended use; and
- (2) Replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant.

AMC OPS 1.745 First-Aid Kits

(See CAR-OPS 1.745)

The following should be included in the First-Aid Kits:

- Ground/Air visual signal code for use by survivors (may be contained in / as separate kit).
- Antiseptic swabs (10/pack)
- Bandage: adhesive strips
- Bandage: gauze 7.5 cm × 4.5 m
- Bandage: triangular; safety pins
- Dressing: burn 10 cm × 10 cm
- Dressing: compress, sterile 7.5 cm × 12 cm
- Dressing: gauze, sterile 10.4 cm × 10.4 cm
- Tape: adhesive 2.5 cm (roll)
- Steri-strips (or equivalent adhesive strip)
- Hand cleanser or cleansing towelettes
- Pad with shield, or tape, for eye
- Scissors: 10 cm
- Tape: Adhesive, surgical 1.2 cm × 4.6 m
- Tweezers: splinter

- Disposable gloves (multiple pairs)
- Thermometers (non-mercury)
- Mouth-to-mouth resuscitation mask with one-way valve
- First-aid manual, current edition
- Incident record form
- Mild to moderate analgesic
- Antiemetic
- Nasal decongestant
- Antacid
- Antihistamine

A list of contents in at least 2 languages (English and one other). This should include information on the effects and side effects of drugs carried.

NOTE: An eye irrigator whilst not required to be carried in the first-aid kit should, where possible, be available for use on the ground.

CAR-OPS 1.750 Universal Precaution Kit

(See AMC OPS 1.750)

Aeroplanes which are required to carry at least one cabin crew member as part of the operating crew, requires to have one universal precaution kit (two for aeroplanes authorized to carry more than 250 passengers) for the use of cabin crew members in managing incidents of ill health associated with a case of suspected communicable disease, or in the case of illness involving contact with body fluids, such as blood, urine, vomit and faeces and to protect the cabin crew members who are assisting potentially infectious cases of suspected communicable disease.

AMC OPS 1.750 Universal Protection Kit content

The Universal Protection Kit shall contain as minimum the following:

- Dry powder that can convert small liquid spill into a sterile granulated gel
- Germicidal disinfectant for surface cleaning
- Skin wipes
- Face/eye mask (separate or combined)
- Gloves (disposable)
- Protective apron
- Large absorbent towel
- Pick-up scoop with scraper
- Bio-hazard disposal waste bag
- Instructions

CAR-OPS 1.755 Emergency Medical Kit

(See AMC OPS 1.755)

(a) An operator shall not operate an aeroplane with a maximum approved passenger seating configuration of more than 30 seats unless it is equipped with an emergency medical kit if any point on the planned route is more than 60 minutes flying time (at normal cruising speed) from an aerodrome at which qualified medical assistance could be expected to be available.

(b) The commander shall ensure that drugs or psychoactive substances are not administered except by qualified doctors, nurses or similarly qualified personnel.

(c) Conditions for carriage

(1) The emergency medical kit must be dust and moisture proof and shall be carried under security conditions, where practicable, on the flight deck; and

(2) An operator shall ensure that emergency medical kits are:

(i) Inspected periodically to confirm, to the extent possible, that the contents are maintained in the condition necessary for their intended use; and

(ii) Replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant.

AMC OPS 1.755 Emergency Medical Kit

See CAR-OPS 1.755

The following should be included in the emergency medical kit carried in the aeroplane:

MEDICAL KIT

- Stethoscope
- Sphygmomanometer (electronic preferred)
- Airways, oropharyngeal (three sizes)
- Syringes (appropriate range of sizes)
- Needles (appropriate range of sizes)
- Intravenous catheters (appropriate range of sizes)
- Antiseptic wipes
- Gloves (disposable)
- Needle disposal box

- Urinary catheter
- System for delivering intravenous fluids
- Venous tourniquet
- Sponge gauze
- Tape – adhesive
- Surgical mask
- Emergency tracheal catheter (or large gauge intravenous cannula)
- Umbilical cord clamp
- Thermometers (non-mercury)
- Basic life support cards
- Bag-valve mask
- Flashlight and batteries

MEDICATION

- Anti-spasmodic, e.g. hyascene
- Medication for Hypoglycemia, hypertonic glucose and/or glucagon
- Digoxin
- Epinephrine 1:1 000
- Antihistamine – injectable
- Dextrose 50% (or equivalent) – injectable: 50 ml
- Nitroglycerin tablets, or spray
- Major analgesic
- Sedative anticonvulsant – injectable
- Antiemetic – injectable
- Bronchial dilator – inhaler
- Atropine – injectable

- Adrenocortical steroid – injectable
- Diuretic – injectable
- Medication for postpartum bleeding
- Sodium chloride 0.9% (minimum 250 ml)
- Acetyl salicylic acid (aspirin) for oral use
- Oral beta blocker

If a cardiac monitor is available (with or without an AED) add to the above list:

- Epinephrine 1:10 000 (can be a dilution of epinephrine 1:1 000)

A list of contents in at least 2 languages (English and one other). This should include information on the effects and side effects of psychoactive substances carried.

Appendix F: Canadian Regulations

In Canada, commercial airline operations are regulated by the Canadian Aviation Regulations (CARs). Part VII regulates Commercial Air Services. Division VI (Emergency Equipment) of Standard 725 (Airline Operations – Airplanes) regulates the first-aid and emergency medical kit. The components of the first-aid kit are specified on Schedule 2 of the Aviation Occupational Safety and Health Regulations (SOR/2011-87, 2017).

First Aid Kits

705.90 (1) No person shall operate an aircraft unless the following number of first aid kits that meet the *Commercial Air Service Standards* are carried on board the aircraft:

- (a) 0 to 50 passenger seats, one kit;
- (b) 51 to 150 passenger seats, two kits;
- (c) 151 to 250 passenger seats, three kits; and
- (d) 251 or more passenger seats, four kits.

(2) First aid kits shall be

- (a) distributed throughout the aircraft cabin;
- (b) readily available to crew members and passengers;
- (c) clearly identified;
- (d) marked with the date of the last inspection; and
- (e) where the aircraft is equipped with only one first aid kit, located as close as practicable to an emergency exit.

(3) A stowage compartment that contains a first aid kit shall be clearly marked as to its contents.

725.90 First Aid Kits

A first aid kit required by section 705.90 of the *Canadian Aviation Regulations* shall contain the supplies and equipment for a Type B kit set out in Part X, Schedule II of the *Aviation Occupational Safety and Health Regulations* (AOSH). In addition, each kit shall contain one pair of protective non-permeable gloves made of latex or equivalent material.

Type B Kit: Supplies and Equipment	Quantity
Antiseptic swabs (10 pack)	1
Bandages: adhesive strips	20
Bandages: triangular, 100 cm, folded, and 2 safety pins	3
First Aid Kit Container	1
Abdominal pads (combination dressings), 12 cm x 22 cm	4
Dressings: gauze sterile, 10.4 cm x 10.4 cm	8
Tweezers	1
Gloves: disposable	6
Scissors: bandage	1
Tape: adhesive, 2.5 cm x 4.5 m	2
Blanket: foil type	1

Emergency Medical Kit

705.91 No person shall operate an aircraft that has a seating configuration, excluding crew seats, of more than 100 unless an emergency medical kit that meets the *Commercial Air Service Standards* is carried on board the aircraft.

725.91 Emergency Medical Kit

For aeroplanes with more than one hundred (100) passenger seats, an emergency medical kit must be carried and shall contain as a minimum, the following:

Items	Quantity
a) Sphygmomanometer	1
b) Stethoscope	1
c) Syringes (sizes necessary to administer required drugs)	4
d) Needles (sizes necessary to administer required drugs) and one safe disposal unit (amended 2005/06/01)	6
e) 50% dextrose injection, 50cc	1
f) Epinephrine/Adrenalin 1:1000, single dose ampoule or equivalent (amended 2005/06/01)	4 (amended 2005/06/01)
g) Diphenhydramine HCl injection, single dose ampoule or equivalent	2
h) Nitroglycerin (amended 2000/12/01)	10 tablets or equivalent (amended 2000/12/01)
i) Protective non-permeable latex gloves or equivalent, disposable (amended 2005/06/01)	2 pairs (amended 2005/06/01)
j) Bronchodilator inhaler (metered dose or equivalent) (amended 2005/06/01)	1 (amended 2005/06/01)
k) Acetylsalicylic acid (ASA) (amended 2005/06/01)	4 (amended 2005/06/01)
l) (i) CPR mask with an oxygen port and (ii) valves (amended 2005/06/01)	1 2 (amended

Items	Quantity
	2005/06/01)
m) Intravenous (IV) administration kit (incl. Alcohol sponges, tape, bandage scissors and tourniquet) (amended 2005/06/01)	1 (amended 2005/06/01)
n) appropriate intravenous (IV) solution (e.g. normal saline 0.9%(500cc) (amended 2005/06/01)	1 (amended 2005/06/01)
o) (i) Airways, oropharyngeal (3 sizes) or (ii) Ambu bag (amended 2005/06/01)	1 set 1 (amended 2005/06/01)
p) Atropine (0.4-0.6 mg per ml, single dose ampoule or equiv.) (amended 2005/06/01)	1 (amended 2005/06/01)
q) Basic instructions for use of the drugs in the kit. (amended 2005/06/01)	1 (amended 2005/06/01)

Appendix G: Approach to Patient Care during In-Flight Emergencies

(Source: Donner, 2017)

1. The isolated environment and unavailability of specialized equipment can make for a challenging experience. Maintaining a calm, competent, and professional demeanor can go a long way toward creating a less stressful environment for the patient, crew, and other airline passengers.
2. Medical professionals should respond to a call only if they are a licensed, currently practicing medical provider.
3. Be prepared to show a form of professional identification (e.g., a medical license) that verifies your training.
4. Do not respond if you have been drinking alcohol. If you have been drinking (e.g., one drink) and no other provider responds, be sure to offer full disclosure to the flight crew and the patient.
5. It is appropriate to ask the patient for consent before commencing in-flight care if they are not altered. This is generally best done with a crewmember as witness.
6. Ask for one flight attendant to continue assisting throughout the in-flight emergency. This helps to maintain continuity and ensures that you have access to needed equipment and cockpit communications.
7. If the passenger seems to be severely ill, request ground-based consultation. On all US carriers and most international carriers you will have access to a ground-based consultant that greatly eases the pressure on any in-flight medical volunteer.
8. You may legally speak to the flight crew about the medical issues. The airline is not required to follow federal regulations regarding health care privacy, because airlines are not considered to be a covered entity as defined by HIPAA.
9. History taking may be difficult because of language barriers. Family members or another available passenger may act as an interpreter. The flight crew may not

offer this, and it may be up to you to request this via a simple cabin announcement.

10. Obtain and record vital signs early in the event.
11. Physical examination can be extremely limited because of limitations in space, vibration, and ambient cabin noise. Auscultation of the heart, lungs, or abdomen may be virtually impossible.
12. Better conditions for the evaluation and care of a passenger may necessitate moving the patient to an open area, such as an aft galley. If a full resuscitation is indicated, such as bag mask ventilation or AED defibrillation, this can only be done with the patient moved to a larger area. Treating a patient in the aisle should be avoided when possible because it impedes normal flight crew operations.
13. You may be able to find additional medical equipment from other passengers. For example, in the case of a suspected hypoglycemic or hyperglycemic emergency, ask the flight attendant to announce that you are in need of a glucometer, which a passenger with diabetes might have on board.
14. Do not be afraid to request additional help. A common example might be a physician out of practice starting IV lines requesting an announcement for a nurse or emergency medical technician with IV skills. You should be ready to defer to other providers who may have more experience delivering care in acute situations (i.e., an office-based dermatologist deferring to an emergency physician).
15. Do not to perform procedures that you are unfamiliar with.
16. If the patient's presentation suggests a communicable disease, be sure to notify the cabin and/or flight crew.
17. If you are presented with a "Do Not Resuscitate" order by an accompanying family member or friend, you need to make a decision on how to proceed. The cabin crew may decide to continue resuscitation if their company policy requires it, despite the Do Not Resuscitate order.

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Vita

Wilfredo Rodríguez-Jiménez was born in the capital city of the Commonwealth of Puerto Rico, San Juan, on June 20, 1985. He attended José Rojas Cortés High School in Orocovis, Puerto Rico and graduated with High Honors in 2003. On his high school senior year, he was awarded the Horatio Alger Association of Distinguished Americans National Scholarship. Between 2003 and 2007 he studied Natural Sciences (B.S.) at the University of Puerto Rico in Río Piedras, graduating Magna Cum Laude. He received an M.S. in Human Factors & Systems, with Distinction, from Embry-Riddle Aeronautical University in Daytona Beach, Florida in 2010. He attended medical school at the University of Puerto Rico Medical Sciences Campus in San Juan, and graduated with an M.D., Cum Laude, in 2013. Dr. Rodríguez-Jiménez trained in Family Medicine from 2013 to 2016 at the Stamford Hospital, an affiliate of Columbia University, in Stamford, Connecticut. In 2016, he was accepted in the Aerospace Medicine Residency Program and MPH program (Aerospace Medicine Track) at the University of Texas Medical Branch.

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