



Epidemiology of Medical Events on a Commercial African National Airline Carrier Between 2009 and 2011



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Abstract

Introduction: An estimated 3.8 billion passengers traveled on commercial aircraft in 2016, of whom close to 1.5 billion crossed international boundaries. Modern commercial aircrafts can carry up to 800 passengers and can fly more than 18 hours. Although not very common, in-flight medical incidents can result in flight diversions that are costly and extremely inconvenient. The aim of the current study was to review in-flight medical incidents on a commercial African carrier between 2009 and 2011.

Methods: A secondary analysis of data collected by air stewards during in-flight medical events that were recorded in a register were retrieved for the 3-year period 2009-2011. All medical documented data was evaluated.

Results: A total of 3306 medical events equating to an average of 155 cases per million passengers per year were documented over the 3-year study period, of which 3279 were specified into medical categories. Cardiovascular cases (1124; 34.0%) gastrointestinal (727; 22.0%), muscular-skeletal (302; 9%), and respiratory (202; 6%) were the most common cases. Most incidents (74%) were managed by the cabin crew. Five of the medical incidents led to diversions. There were 9 deaths on board over the 3-year period.

Conclusion: In-flight medical incidents are rare events. Comparisons with other airlines is difficult due to the non-standardization of recording methods. A global uniform reporting format across all airlines is necessary. Further research is required to determine the factors associated with medical incidents so that pre-emergency preparedness plans can be strengthened.

Keywords: In-flight Medical Events, Aviation Medicine, Travel Medicine

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Introduction

Commercial airlines enable the flow of people, capital goods, and technology, and facilitates tourism, international trade, and the exchange of ideas between countries. Traveling on an airplane is no longer an exclusive luxury of the wealthy. The introduction of budget airlines and intense competition amongst tourism authorities that promote cheap and attractive holiday packages have served to increase access to commercial airline travel to many more individuals. An estimated 3.8 billion passengers¹ traveled on commercial aircrafts globally in 2016, with close to 1.5 billion crossing international boundaries. The number of passengers in 2016 reflected an increase of 1.3 billion (34%) in passengers numbers from 2009.¹ The International Air Transport Association (IATA) expects the number of passengers to double to 7.2 billion

passengers to travel in 2035.¹

Air travel is regarded as safe from an accident perspective, as most decisions are made after careful consideration of its impact on safety. However, there are a number of health implications associated with commercial air travel. These include, among others, an exacerbation of medical conditions in passengers with cardiac, pulmonary, and hematological conditions due to a reduction in oxygen saturation; an up to four-fold increase in risk of deep vein thrombosis; jet lag; and risk of on-board transmission of infection either through close personal contact or being seated within two rows of an index passenger.²

There is a growing number of older passengers, and it is estimated that by 2030, more than 50% of passengers will be older than 50 years,³ with a significant number having

underlying chronic medical conditions. Increasing life expectancy and its associated burden of non-communicable diseases coupled with increased stress due to flight delays, new security measures, as well as a longer duration of flying time (more than 18 hours)² and increased number of passengers per aircraft have the potential to increase the number of in-flight medical events.

Current estimates are that medical events occur 1:10 000 to 1:40 000 passengers, which equates to 25–100 per million passengers.³ A more recent publication cites figures of in-flight emergencies as one event per 14 000–39 600 passengers⁴ with one medical emergency reported per 604 flights.⁵ In 2007, British Airways flew 36 million passengers, and 31 200 medical incidents were reported, which translates to an incidence of 867 cases per million passengers.⁶ Most of these cases were for minor complaints, such as dizziness and headaches, and the flight attendants handled most of them. Only 3000 were considered serious, which equates to 83 serious events per million passengers flown.

There is currently no legal obligation for airlines to report medical incidents on board their aircrafts. Furthermore, there is no standard reporting template. In one attempt to assess the documentation for in-flight medical events, 1318 airlines were approached, of which only 10 responded.⁷ A large variation in the documentation used was found.

The majority of studies reporting on in-flight medical incidents emanate from developed countries, with a paucity of publications from lower or middle income countries. There have been studies documenting the medical kits available on aircrafts,^{10,11} but data on their appropriateness for medical events is lacking.

This retrospective study was initiated to ascertain the types of in-flight medical events documented by flight attendants on South African Airways (SAA), the national airlines of South Africa and one of the largest African national airline carriers. SAA has domestic (within South Africa), regional (flights to African and regional Indian Ocean islands such as Mauritius), and international routes (flights to Europe, North and South America, Asia, and Australia).

Methods

Study Design

A retrospective cross-sectional study was conducted.

Data Collection

All available data for the airline was collected for the 3-year period of January 2009 to December 2011. The airline's head office is based in Johannesburg, South Africa, and all data was obtained from there, including the number of flights on domestic, regional, and international levels as well as the number of passengers in the same categories. All documented in-flight medical incidents were collated for the same period. Since this was a retrospective study, the medical categories that the airline historically used to document these incidents was utilized. The number of medical incidents reported, deaths recorded, and flight diversions due to a medical incident on board were established and correlated with the number of passengers flown as well as the number

of flights undertaken by the airline. Medical incidents were defined as any medical condition brought to the attention of the cabin crew. All incidents were documented by cabin crew and data was entered into predefined medical categories by medical nursing sisters attached to the airline. The predefined categories were cardiovascular, gastrointestinal, musculoskeletal, respiratory, central nervous system, other (which included deep vein thrombosis, urogenital, metabolic, and ear, nose, and throat). Each aircraft had an automated external defibrillator (AED), used to manage sudden cardiac arrest and to evaluate cardiac rhythm, on board. The use of AED, the use of oxygen supplementation, and the assistance of volunteer passenger medical personnel were also analyzed.

Data Analysis

A Microsoft Excel database was created for data entry. The data was then imported into StataCorp Stata version 13 for analysis. Descriptive statistical analysis was conducted on the data. No human subjects were identifiable and no medical interventions were performed for which informed consent would have been required.

Results

Incidence of Medical Events

A total of 3306 medical events (1 event/6432 passengers or 155/million passengers or 1/50 flights) were recorded between 2009 and 2011 across all routes flown by the carrier, of which 1938 (58%) medical events were recorded on international flights (Table 1). A total of 390 events per one million passengers on international flights (1 medical event recorded per 12 international flights), 134 events per one million passengers on regional flights (1 event per 68 regional flights) and 62 events per million passengers on domestic flights (1 event per 140 domestic flights) were recorded for international, regional, and domestic routes, respectively, across the 3 years (Table 1).

Outcomes of Medical Events

Over the 3-year period, 5 aircraft had to be diverted (1 diversion per 33 313 flights or 0.2 diversions/million passengers). Nine passengers (0.4 per 1 million passengers) died on board the aircraft between 2009 and 2011. Four deaths were recorded in 2009 (0.6/million passengers), 4 in 2010 (0.6/million) and 1 in 2011 (0.1/million), which averages to 0.4/million passengers (1/18 507 flights) for the 3-year period. The AED was used 16 times in the 3-year period (6 times in 2009, on 8 occasions in 2010, and twice in 2011), and supplementary oxygen was used 1511 times (45.7%) during the 3 years (499 times in 2009, 536 occasions in 2010, and 476 occasions in 2011). The cabin crew handled 2432 (73.6%) of the incidents. Medical passenger volunteers assisted in 804 (24.3%) cases.

Nature of Medical Events

The nature of medical events was not recorded for 27 cases, and documentation existed for 3,279 cases. Cardiovascular conditions with 1124 cases (34.0%) was the most common condition followed by gastrointestinal (727; 22.0%), muscular-skeletal (302; 9.1%), respiratory (223; 6.7%), central nervous

Table 1. Number of Medical Events, Passengers, and Flights Between 2009 and 2011

Year	International	Regional	Domestic	Total
Number of Passengers Flown				
2009	1 608 281	1 646 549	3 979 360	7 234 190
2010	1 677 762	1 629 342	3 795 828	7 102 932
2011	1 687 050	1 767 041	3 473 147	6 927 238
Total	4 973 093	5 042 932	11 248 335	21 264 360
Number of Medical Incidents Reported				
2009	632	184	223	1039
2010	616	270	243	1129
2011	690	223	225	1138
Total	1938	677	691	3306
Number of Flights				
2009	7401	14 749	34 698	56 848
2010	7741	15 890	33 347	56 978
2011	8136	15 603	28 998	52 737
Total	23 278	46 242	97 043	166 563

system (202; 6.1%), metabolic (98; 3.0%), ear, nose, and throat cases (46; 1.4%), and urogenital conditions (38; 1.2%). Deep vein thrombosis occurred in 3 (0.1%) travelers over the 3-year period. The other 516 (15.8%) incidents were classified as miscellaneous (Table 2).

Discussion

The current study, similar to many other published studies, utilized retrospective data that was extracted from medical incident reports of a single African national carrier for the 3-year period 2009 to 2011. The findings from the current study indicate a higher number of incidents ($n=3306$ and 155/million passengers) versus 1312 (130/million passengers) medical incidents between 2011 and 2013 of a major flight company operating charter flights for less than 5 hours in Eurasia.³ There were also more incidents per number of passengers; one event per 6432 passengers versus one event per 14 000 to 39 600 passengers as reported by other publications,⁴ or one medical event per 50 flights versus one event per 63 flights reported in a German study.⁷ The findings from the current study may possibly be attributable to the increased number of medical incidents on the international routes of the African airline (one medical event per 12 flights or 61 incidents per million passengers). The African airline has long-haul destinations to countries in Europe, Asia, Australia, and America with flying times exceeding 12 hours duration.

The incidence of medical incidents from the African commercial airline is similar to that reported by Cathay Pacific Airline in 2005⁸ in which a total of 2503 cases among 15.34 million passengers, a rate of 163/million, were reported as well as an Oceania airline that reported 159/million passengers for the 1996-2004 period with a concordance between cabin crew and medical reports of 96%.⁹

Diversions are expensive, inconvenient, and can severely

Table 2. Frequency Table of Nature of Medical Events Recorded Between 2009 and 2011

Nature of Medical Events	Number	Percentage
Cardiovascular	1124	34.00
Gastro-intestinal	727	22.00
Musculoskeletal	302	9.10
Respiratory	223	6.70
Central Nervous system	202	6.10
Other (Urogenital, ENT, DVT + Metabolic)	182	5.70
Miscellaneous	516	15.80

disrupt airline operations and passenger onward and connecting journeys. One medical diversion is reported to occur for every 20 000 flights, and of those, 40% are unjustified.¹⁰ The percentage of in-flight medical emergencies necessitating a diversion that have been reported range from 1.6% to 7.9% (one diversion for every 4754 flights).¹¹ The African commercial airline in this study had 0.2% ($n=5$) or one per 33 313 flights rerouted due to an in-flight medical emergency. The reasons for the diversions were not obtainable.

There were 9 deaths (0.4/million passengers) in the study period on the African commercial airline compared to 25 deaths (0.2 per million passengers) reported between 2010 and 2011 by Lufthansa airlines¹² and 0.6/million deaths reported in a Eurasian study.³ The most frequent cause of death was sudden death in the Eurasian study (69.2%)⁷, while documentation for the deaths was not obtainable.

Medical Conditions Encountered

Cardiovascular, gastrointestinal, musculoskeletal, respiratory, and metabolic conditions were the most commonly reported conditions in the current study. These findings are similar to other published studies. Cardiovascular and neurological conditions followed by gastro-intestinal conditions were the most commonly documented inflight medical conditions between 2010 and 2011 across all Lufthansa airlines flights.¹² Cardiovascular disorders (40.0%) and neurological problems (17.8%) were the most frequent diagnoses described by aviation medicine physicians in Germany during an online survey.⁴ The potential explanation for increased cardio-pulmonary symptoms is that the reduced cabin pressure leads to a further reduction in oxygen saturation, which lowers even more with increasing flight times and can exacerbate medical conditions in passengers with pre-existing cardiac, pulmonary, and hematological conditions as they have a reduced baseline oxygen partial pressure (PaO_2).²

Oxygen was used in 46% of cases in this study, similar to the 48% in another study¹² but much higher than the 14% reported in Eurasian flights.³ The reasons for the wide variation of its use were not clearly identifiable. The AED was used a total of 16 times during the study period. It could not be established whether it was used for monitoring purposes only or whether any shocks were administered and the results thereof, if any.

Conclusion

In-flight medical events on the African airline under study

Report Highlights

What Is Already Known?

Inflight medical events are uncommon.
Most cases can be adequately dealt with by cabin crew.

What This Study Adds?

First study on an African airline that covers international, regional and domestic route.
Recommends that a standardised reporting template is developed internationally.

were uncommon events with most cases being adequately dealt with by the cabin crew. Though comparisons with other airlines are difficult, the incidence seems similar. Most cases encountered during flights can be facilitated with basic medical support or without medical treatment. All cabin crew are trained in some form of basic first aid, and at least one on each flight has training in the use of AED. There is a necessity for the standardization of documentation for reporting medical inflight medical events with further research required to determine the factors associated with medical incidents so that pre-emergency preparedness plans can be strengthened.

Study Limitations

The current study shares similar limitations with those of previous studies in this field. The results are only descriptive and, to the best of the authors' knowledge, is one of the first forwarded by an African airline. The medical categories used herein were based on descriptions of the passengers' primary symptoms, not on diagnoses. There is no standardized documentation for completion by air stewards or medical volunteers during or after an international in-flight medical emergency. A number of studies have used different denominators to calculate incidences or rates, making comparison difficult.

Most recent publications reflect the retrospective records of a single airline. Again, comparisons are not always possible as the duration and number of flights, the size of the aircraft, as well as the passenger numbers and profiles are not always similar. Currently, no data exists that documents the incidence of in-flight medical emergencies in individual countries or its worldwide occurrence.

Authors' Contributions

SP collected and analysed data, drafted and approved manuscript. OM analysed data and drafted manuscript.

Conflict of Interest Disclosures

None declared.

Ethical Approval

No ethics approval is deemed necessary in South Africa for retrospective data analysis where there is no chance of any person being identified and where no intervention was carried out.

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