

Frequency and Type of Medical Emergencies at the International Airport

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ABSTRACT

Background: The aim of this study was to evaluate the utilization levels and adequacy of the emergency medical facility at the international airport.

Methods: The outreach emergency medical records of Chiang Kai Shek International Airport from February 2002 through January 2003 were reviewed. Salient details with respect to the time, chief complaints, location, diagnoses and personal profiles of the patients were recorded.

Results: A total of 420 medical emergencies were included in the study. Gender distribution was almost equal. The average age of the travelers treated was 39.5 years. Most of the medical events occurred between 18:00 and 24:00 hours (38.8%), and the most common location was the boarding gate (58.1%). Gastrointestinal conditions (22.9%), traumas (15.2%), and respiratory distress (15.0%) were the three prevailing medical emergencies. Most of the accidents causing trauma occurred when disembarking from a plane or during luggage delivery. One third (31.7%) of the patients had to be referred to a hospital for further treatment. Of these, 12.8% were due to acute cerebrovascular accidents. There were six critical cases (three died), including acute myocardial infarction (AMI) and acute respiratory failure.

Conclusion: Severe medical emergencies occurred in 7.6% of our study cases. We recommend that a fast medical shuttle is available to shorten the response time. The findings of this study may be useful for planning emergency medical facilities at international airports.

Keywords: emergency, airport, medical facility

INTRODUCTION

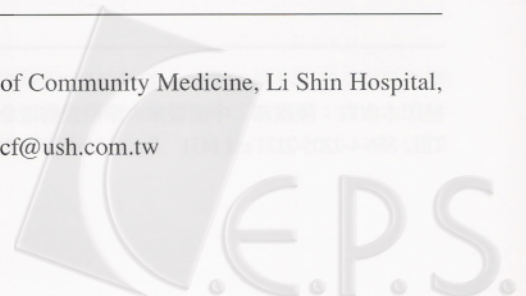
During the past few decades, emphasis has been placed on the importance of emergency planning for aircraft disasters in airport medical services.¹⁻⁴ After the improvement of aircraft safety, the volume of air traffic has risen steeply during recent years. Many airport administrators have started to broaden their horizons to include the safety, health, and comfort of passengers flying commercial aircraft. In 2002, the number of commercial passengers exceeded 16 billion annually, with a growth rate 6.3% on average.⁵ As access to medical assistance during flights is quite restricted, airport medical clinics play vital roles in managing medical emergencies after

landing. Review of the frequencies for, and types of, emergency medical events is vital to ensure more effective responses to such incidents at airports. Most of the published research relates to in-flight emergencies,⁶ but relatively few investigations of medical events at airports have been addressed. In 1973, Cheng and Hung demonstrated that 0.003% of all passengers at the Taipei International Airport had medical emergencies.⁷ Antunano and Aquino reported the incidence was 0.047% in Mexico.⁸ Toshiro et al showed that annual incidence of such events at Narita International Airport in Japan was 0.001%.⁹ In 1986, a study of passengers at the Seattle-Tacoma Airport revealed one medical emergency took place for every 39600 individuals,¹⁰ while Speizer demonstrated an overall incidence for in-flight

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medical emergencies of 0.0003%.¹¹ The most difficult problem in comparing the frequencies and types of medical events is that the definitions used for recognition and diagnoses of medical events in airports varied across studies, because the majority of events were milder diseases such as dizziness and upper respiratory infection.^{12,13} Based on the good results of the Japanese study, modern facilities and well-planned transport system can be set up at airport medical clinics to reduce the occurrence of medical events and to take care of airport users without delay.^{14,15} The aim of this study was, therefore, to investigate the frequency and type of medical emergencies handled at an airport medical clinic.

MATERIALS AND METHODS

Background

Chiang Kai-Shek (CKS) International Airport opened in February 1979. It is located 40 kilometers from Taipei, Taiwan and covers an area of 1223 hectares. The CKS Airport Medical Clinic offers around-the-clock general and emergency medical and outreach services at the airport 365 days a year. The CKS Airport Medical Clinic has been run by the Li Shin Hospital since January 2002. Approximately 20 million passengers traveled on 135072 flights during the study period.¹⁶

Data collection

Medical records for emergency events requiring outreach of medical services from the CKS Airport Medical Clinic were reviewed from February 1, 2002 through January 31, 2003. The data collected included details of time, chief complaints, diagnoses (using ICD-9 codes), location, and the personal profiles of the passenger. There were a total of 504 emergency calls during this period. Of these, 478 (94.8%) involved passengers, 20 (4.0%) aircraft crew, and six (1.2%) were airport employees. Of these 478, 58 cases were passengers in transition who were returning to Taiwan (hurt overseas and returning to their own country, only needed evaluation while they stayed at CKS airport) and, thus, were excluded from our study. Our study population consisted of 420 cases.

Definition of emergencies

Our definition of critical emergency and severe emergency was based on the triage of emergency in Taiwan.¹⁷ The critical emergency was defined as first degree, in which the patient's disease condition was quite urgent and needed rescued right away. Severe emergency was defined as second degree in which the patient was in pain or had an abnormal life situation.

Statistics and Analysis

The Student's t test was used to compare independent samples and statistical calculations were done using the Statistical Program for Social Science version 10.0

(SPSS; Chicago, Ill, USA). A p<0.05 was considered significant.

RESULTS

Demography

Medical emergencies occurred 35 times per month on average, increasing in direct proportion to passenger numbers (Figure 1). Overall frequency of emergencies was approximately one case for every 321 flights, one per 46425 passengers, 21.5 cases per million passengers, or 1.2 cases each day. Female cases slightly outnumbered the male cases and the average age of the individuals was 39.5 years. However, a statistically significant difference was not demonstrated comparing average age between the genders (p=0.11). Passengers from Taiwan accounted for the greatest percentage of the emergency cases (36.2%), followed by passengers from North America (24.8%), South-East Asia (20.0%), and

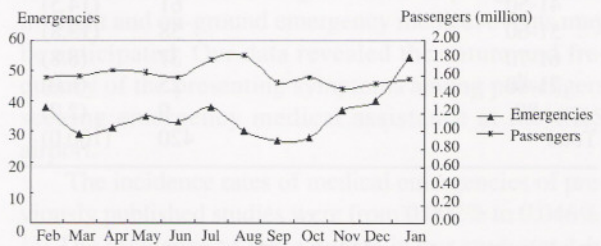


Figure 1. Frequency of Medical Emergencies and Passenger Flows (Feb. 2002 - Jan. 2003).

Table 1. Salient Demographic Data of Medical Emergencies

Characteristics	Numbers (%)	
Age (p=0.11)		
Male	41.21±20.50 years	
Female	37.85±21.19 years	
Gender		
Male	207	(49.3)
Female	213	(50.7)
Nationality		
Taiwanese	152	(36.2)
North American	104	(24.8)
Southeast Asian	84	(20.0)
Other	80	(19.0)
Time		
06:00-12:00	110	(26.2)
12:00-18:00	130	(31.0)
18:00-24:00	163	(38.8)
00:00-06:00	17	(4.0)
Location		
Boarding gate	244	(58.1)
Arrival/Departure lobby	78	(18.5)
Cabin	35	(8.3)
Apron	34	(8.1)
Other	29	(7.0)
Total	420	(100.0)

other countries (19.0%). Allocation of the emergencies to 6-hour periods revealed that most cases occurred before midnight (18:00-24:00 hours; 38.8%), followed by the afternoon (12:00-18:00 hours; 31.0%), morning (06:00-12:00; 26.2%) and the early hours of the morning (00:00-06:00 hours; 4.0%); with the frequency directly proportional to the volume of passengers entering the airport. Location for these emergencies (Table 1) was the boarding gates (58.1%), arrival/departure lobbies (18.5%), within the passenger cabin (8.3%), and on the runways (8.1%). Passengers between the ages of 31 and 40 years were at the most risk, followed by those were between 21 and 30 years (Table 2). Regarding the fur-

Table 2. Age Distribution of Medical Emergencies.

Age (years)	Numbers (%)
0-10	56 (13.3)
11-20	13 (3.1)
21-30	76 (18.1)
31-40	85 (20.2)
41-50	61 (14.5)
51-60	58 (13.8)
61-70	37 (8.8)
71-80	25 (6.0)
>80	9 (2.2)
Total	420 (100.0)

Table 3. Disposition of Medical Emergencies

Disposal	Numbers (%)
Went home	97 (23.1)
Continued traveling	190 (45.2)
Referral to other medical facility	
Medical center	27 (6.4)
Regional hospital	33 (7.9)
Local hospital	31 (7.4)
Other hospital	42 (10.0)
Total	420 (100.0)

Table 4. Chief Complaints of Medical Emergencies

Classification	Numbers (%)
Gastrointestinal symptoms	99 (23.6)
Trauma	64 (15.2)
Loss of consciousness	40 (9.5)
Dizziness	38 (9.0)
Cardiovascular	25 (6.0)
Upper respiratory infection	26 (6.2)
Dyspnea	20 (4.8)
Musculoskeletal pain	9 (2.1)
Fever	20 (4.8)
Dermatological complaints	13 (3.1)
Neurological	8 (1.9)
Irritability or anxiousness	7 (1.7)
Other	51 (12.1)
Total	420 (100.0)

ther treatment of these emergency cases, 190 (45.2%) passengers continued their scheduled trip, 97 (23.1%) went home after arrival, while the others (31.7%) were transferred to a neighboring hospital for further care (Table 3).

Chief complaints and Diagnoses

The chief complaints for the enrolled cases are categorized in Table 4. Gastrointestinal symptoms were the most prevalent (n=99; 23.6%), followed by trauma (n=64; 15.2%), and loss of consciousness (n=40; 9.5%). Stratification of the sample population according to the ICD-9 diagnosis revealed that diseases of the gastro-intestine were the most prevalent (22.9%; n=96), followed by trauma (n=64; 15.2%), and respiratory disorders (15.0%; n=63). Of cases attributed to trauma, lacerations predominated (29.7%), accounting for 4.5% of all cases (Table 5). During the study period, there were six critical emergency cases (which meant cases were in shock, near death or were deceased when observed). All were males, with ages ranging from 52 to 78 years (average 65.5 years). Three were from Taiwan, and one each from the Philippines, England, and Japan. Three were dead on arrival (in-flight). The detailed descrip-

Table 5. ICD-9 Diagnoses

Diagnose	Numbers (%)
Gastrointestinal system	96 (22.9)
AGE	75 (17.9)
Abdominal pain	14 (3.3)
Other	7 (1.7)
Respiratory system	63 (15.0)
URI	33 (7.9)
Hyperventilation	10 (2.4)
Asthma	11 (2.6)
Other	9 (2.1)
Cardiovascular system	35 (8.3)
Syncope	11 (2.6)
Ischemic heart disease	8 (1.9)
Sudden cardiac death	5 (1.2)
Other	11 (2.6)
Neurological system	45 (10.7)
Acute stroke	19 (4.5)
Consciousness change	11 (2.6)
Seizure	11 (2.6)
Other	4 (1.0)
Trauma	64 (15.2)
Laceration	19 (4.5)
Bruising or contusion	13 (3.1)
Fracture	16 (3.8)
Closed minor injury	8 (1.9)
Burn	8 (1.9)
OBS/GYN	8 (1.9)
Unclassified	73 (17.4)
Dizziness/palpitation	28 (6.7)
Psychosis	17 (4.1)
Neurovascular disorder	14 (3.3)
Arthritis	14 (3.3)
Other	36 (8.6)
Total	420 (100.0)

Table 6. Outcome of Critical Emergencies

Date	Age (years)	Gender	Nationality	Location	CPCR	Diagnosis	Outcome
3/2002	52	M	Taiwan	Terminal	Yes	AMI	Referral to hospital
5/2002	78	M	Philippines	In-flight	Yes	DOA	DOA
5/2002	56	M	England	In-flight	Yes	DOA	DOA
6/2002	63	M	Taiwan	In-flight	Yes	DOA	DOA
6/2002	68	M	Taiwan	Terminal	No	CVA/DM	Referral to hospital
10/2002	76	M	Japan	In-flight	No	ARF	Referral to hospital

Abbreviations: DOA, dead on arrival; CVA, cerebral vascular accident; DM, diabetes mellitus; CPCR, cardiopulmonary cerebral resuscitation; ARF, acute respiratory failure.

Table 7. Causes of Traumatic Emergencies

Injury	Numbers (%)
Scalding by hot fluids	
In-flight	8 (12.5)
Fall or slip	
Deplaning	21 (32.8)
Inside terminal	5 (7.8)
On the apron	5 (7.8)
In the departure area	5 (7.8)
Other	7 (10.9)
Hit by luggage	
In-flight	10 (15.7)
Other	3 (4.7)
Total	64 (100.0)

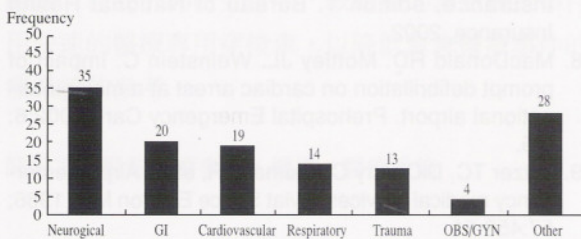


Figure 2. Hospitalizations Stratified According to Emergency Classification.

tions for these critical cases are shown in Table 6. A total of 133 patients (31.7% of all emergency cases) were transferred to hospitals after initial management in the airport. Most were due to neurological disease (26.3%), particularly acute cerebrovascular accident (n=17; Figure 2). Reviewing the causes of trauma cases, slip or fall during boarding or departure (n=21; 32.8%) was the most common problem, while scalding with hot drinks in the passenger cabin accounted for eight cases (12.5%). Ten patients were treated due to head injury resulting from falling luggage (Table 7).

DISCUSSION

The international airport is the first impression travels have of a country. Providing rapid and sufficient emer-

gency services by trained personnel at the airport medical clinic becomes very important. Therefore, regular analysis of the emergencies experienced by passengers at the international airport medical clinic is necessary but relatively few studies had been published. The CKS International Airport is one of the busiest airports in Asia, with the volume of passengers increasing by 10% annually.¹⁶ Given the rising number of elderly travelers and the increase in the length of non-stop flights, more in-flight and on-ground emergency medical events may be anticipated. Our data revealed the nature and frequency of the presenting symptoms among passengers seeking emergency medical assistance at the CKS airport.

The incidence rates of medical emergencies of previously published studies were from 0.002% to 0.046%.⁷⁻¹³ The incidence of these events in our study (at 1 in 46425 passengers (0.002%) or 1-2 cases per day) was almost equal to that at Narita Airport in Japan but was relatively lower than airports in Mexico and Oman. In terms of the occurrence of these emergencies, the daily peaks differed slightly when we compared Narita (06:00 to 12:00 and 16:00-19:00 hours) and CKS airports (18:00-24:00 hours). The distinction of peak flow between the two airports may be caused by the airport size and flight schedules.

In terms of the types of emergencies, most of the chief complaints were of mild severity, such as gastrointestinal conditions, abrasions or laceration wounds. However, one-fifth of all cases experienced more severe problems such as loss of consciousness and cardiovascular events that required immediate medical care. The relative frequency of the disease categories was not markedly different from that of other reports.^{6,12,15} The provision of medical services at the CKS airport is somewhat different from that of similar facilities elsewhere. Providing outreach medical services from the airport medical clinic in response to emergencies involving passengers and staff is one of the main functions, and the response time can be critically important in life-threatening situations.

Based on the results of previous studies, the automated external defibrillator (AED) has been helpful in treating patients with cardiac arrest.^{18,19} In 2002, Chan

et al reported that cardiac emergencies were the most common of the serious in-flight medical emergencies.²⁰ Hence installation of AED equipment in the aircraft and provision of Advance Cardiac Life Support (ACLS) training to the cabin crew may decrease the numbers of mortalities associated with cardiovascular collapse.²⁰

The designs of both the aircraft and the airport environs are important for the safety of the environment in terms of the.²² In our study, more than half of our medical emergencies occurred at the boarding gate (58.1%) and 32.8% of traumatic emergencies happened while passengers were out of plane. A safer design for deplaning is recommended and therefore some of the injuries the resulted from passengers slipping or falling may be avoided. In addition, we recommend that the airport medical clinic should be close to the departure area in order to respond to emergencies rapidly.

Although severe medical emergencies were rare, 7.6% of the cases (including ischemic heart disease, sudden cardiac death and acute stroke) in our study involved severe problems. Response time is fundamental to prevent development of more critical situations. According to the results of a previous study, if resuscitation was initiated within 4 minutes of the event and if definitive care was provided within 8 minutes, the survival rate of the emergency patient was increased.²¹ Hence, a fast medical shuttle that can get the doctor to the scene in less than 5 minutes results in improved outcomes and better care.

Our results may be useful to the civil aviation and airport authorities in planning and developing emergency medical service systems. Due to the restrictions to the study period and informatics systems, patients who were referred to hospitals were not followed up. Moreover, the efficacy and the cost effectiveness of ACLS training are still unknown. Further research is necessary to understand better how to facilitate safe and effective emergency settings for the increasing number of passengers. We also recommend that every airport medical clinic regularly analyze the outcomes of emergencies to identify shortcomings and improve the quality of their facilities.

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國際機場發生緊急醫療事件之頻率與種類

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摘要

目的：評估國際機場緊急醫療處理能力之適切性與使用情形。

方法：我們審閱中正國際機場在2002年2月至2003年1月間的緊急醫療記錄，包括發生時間、地點、病患基本資料、主訴及診斷等。

結果：共有420件緊急醫療事件被納入研究分析中。個案在性別部分沒有差異，平均年齡為39.5歲，最常發生醫療事件時段為18:00~24:00(38.8%)，最常發生地點則是在出入境大廳(58.1%)；最常發生的醫療事件依序為腸胃道症狀(22.9%)、創傷(15.2%)及呼吸症狀(15.0%)，絕大多數創傷在登機或傳遞行李時發生。將近有1/3(31.7%)的病患需要被轉送至其他醫院作進一步處置，其中12.8%為急性中風；在研究期間共有6個嚴重個案(其中3人死亡)，發生原因包括急性心肌梗塞及急性呼吸衰竭。

結論：在我們的研究當中，較嚴重的緊急醫療事件發生率約佔所有個案7.6%，我們建議在機場醫療中心能採用快速的醫療專用穿梭車，以降低緊急醫療事件的反應時間，而相關研究資料可供其他國際機場建立緊急醫療系統的參考。

關鍵字：緊急醫療事件，機場，醫療設施

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