

—Report on Experiments and Clinical Cases—

International Airport and Emergency Medical Care

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Abstract

The Nippon Medical School New Tokyo International Airport Clinic (Airport Clinic) was opened in 1992 as Japan's first 24-hour international airport clinic. To date, it has provided medical services to a total of 117,953 patients. Of these, 85,545 (72.5%) were airport employees, 28,662 (24.3%) were passengers, and 3,746 (3.2%) were others. Of the total, non-Japanese patients accounted for 8,485 (7.2%). In the year to March 31, 2001, the Clinic treated an average of 43.9 cases per day.

The number of emergency patients was 2,969 or 2.3% of the total, of whom 500 (0.4%) were non-Japanese. There were 47 deaths, with age ranging from 14 to 84 (average age 64.0). The ratio of males to females who died was 28:19. Of the 47 deaths, 18 were non-Japanese. Pulmonary thromboembolism is considered to have played a role in 25 of the deaths.

Based on more than 8 years of airport clinical experience, we believe that a first-class international airport should have excellent medical facilities that can provide quality emergency medical services to travelers and disaster victims. (J Nippon Med Sch 2002; 69: 185-191)

Key words: international airports, Narita Airport, emergency medical system, air travel, pulmonary thromboembolism

Introduction

Twenty-four years have passed since the New Tokyo International Airport (Narita Airport) was opened in May 1978. Now handling 54% of all air travelers and 66% of all air cargo to and from Japan, the airport is the most important of the nation's 19 international airports.

The Nippon Medical School New Tokyo International Airport Clinic (Airport Clinic) was opened in December 1992 when the airport's new Terminal 2 was built, and so has now been in service for

more than 8 years.

The Airport Clinic offers 24-hour general and emergency medical services and responds to accidents at and around Narita Airport around the clock, 365 days a year. Of the approximately 118,000 patients treated to date, 47 arrived at the Clinic with their heart having stopped beating, or died in the Clinic, and 25 of them were considered to have had pulmonary thromboembolism (economy-class syndrome).

In this paper, we report the Airport Clinic's activities and discuss the medical system and emergency medical care at international airports.

Table 1 Airport Clinic Patients

Total patients	117,953
Airport personnel	85,545 (72.5%)
Passengers	28,662 (24.3%)
Others	3,746 (3.2%)
Non-Japanese	8,485 (7.2%)
Average daily patients (Dec. 1992—Mar. 2001)	38.4
Average daily patients (Apr. 2000—Mar. 2001)	43.9

Dec. 1992—Mar. 2001

Narita Airport

About 26~28 million passengers pass through Narita Airport each year. There are about 370 flights per day, using one runway at present (Runway A, 4,000 meters), but a parallel runway (Runway B, 2,180 meters) will enter service in May 2002, increasing the annual passenger count by 20 million and number of daily flights by 170.

Airport Clinic

Table 1 and **Fig. 1** are statistical summaries of the patients who visited the Airport Clinic in the first 8 years and 4 months since its opening¹⁻⁵.

Of the total 117,953 patients, 85,545 (72.5%) were airport employees, 28,662 (24.3%) were passengers, and 3,746 (3.2%) were others. Non-Japanese patients accounted for 8,485 (7.2%).

In fiscal 2000, we treated a total of 15,983 cases. Of these, 9,818 (61.4%) were airport employees, 4,425 (27.7%) were passengers, 1,097 (6.9%) were aircraft crew, and 643 (4.0%) were others. Non-Japanese patients accounted for 1,247 (7.8%). On average, 43.9 patients visited the Clinic per day in fiscal 2000.

Emergency Cases

There were 2,696 emergency patients, or 2.3% of the total. Of these, 152 (5.6%) were first cared for in the airport premises outside the Airport Clinic, 578 (21.4%) were transported to the Clinic by ambulance and 1,966 (73.0%) on wheelchairs or stretchers. Non-Japanese patients accounted for 500 (18.5%). The male/female ratio was 1,334:1,362. Thus, females slightly outnumbered males. The average age was 39.0 ± 18.3 .

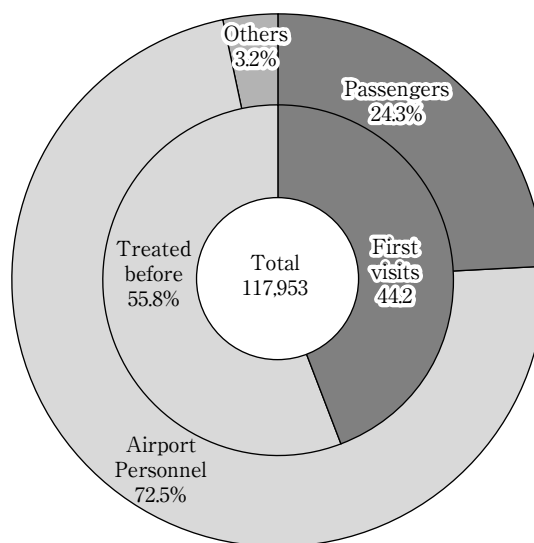


Fig. 1 Patient Breakdown Treated at the Airport Clinic

Dec. 1992—May. 2001

Of these 2,696 emergency patients, 52 (2.0%) were in a serious state, with an average age of 59.6 ± 15.2 ; 468 (17.4%), in a severe state, average age 48.5 ± 17.6 ; 1,649 (61.1%), in a moderate state, average age 36.4 ± 17.5 ; and 527 (19.5%) in a slight state, average age 36.9 ± 17.8 .

Regarding the male/female ratio, 31 (1.2%):21 (0.8%) were in a serious state; 293 (10.9%):175 (6.5%) in a severe state; 734 (27.2%):915 (33.9%) in a moderate state; and 276 (10.2%):251 (9.3%) in a slight state. Serious and severe state patients accounted for 324 (12.0%) among the male emergency patients and 196 (7.3%) among the female emergency patients with males exceeding females by 1.7 times. Seven hundred and ten patients (26.3%) were transferred to other hospitals. Forty-seven deaths occurred at the Clinic (1.7%) (**Table 2** and **Fig. 2**).

Table 2 Emergency Patients (N = 2,696)

Treatment at airport premises	152 (5.6%)
Carried to the Clinic by ambulance	578 (21.4%)
Carried to the Clinic on wheelchairs, stretchers, etc.	1,966 (73.0%)
Transferred to other hospitals	710 (26.3%)
Deaths at the Clinic	47 (1.7%)

Dec. 1992—Mar. 2001

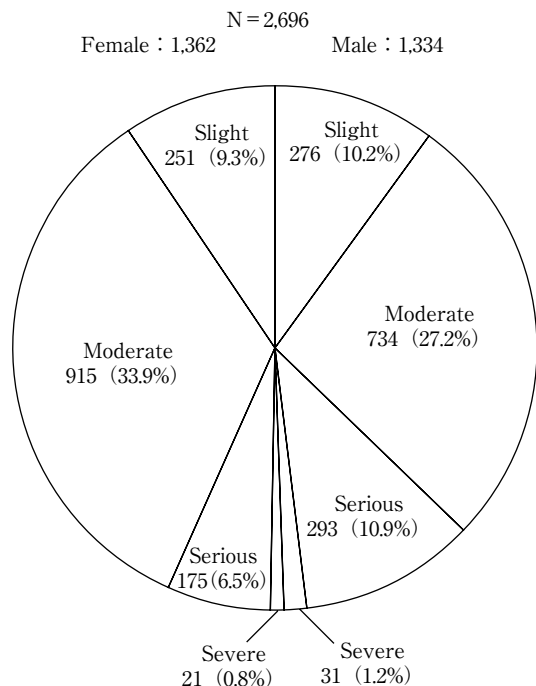


Fig. 2 Male/Female Patient Severity

Dec. 1992—May. 2001

The largest number of emergency patients was among those in their 20 s, while severity was higher in the 50-to-70-year age bracket.

Table 3 shows causes of emergency treatment and their breakdown by severity. Acute abdomen was most common with 787 cases (29.2%), followed by injury (396 cases, 14.7%) and respiratory diseases (336 cases, 12.5%), respectively. These were followed by infectious diseases (201 cases, 7.5%), ischemic heart diseases (172 cases, 6.4%), cerebrovascular diseases (117 cases, 4.3%), vascular diseases (78 cases, 2.9%), acute poisoning (61 cases, 2.3%), gastrointestinal bleeding (31 cases, 1.1%), metabolic diseases (29 cases, 1.1%) and liver/kidney diseases (11 cases, 0.4%). The remaining 477 cases (17.6%)

were due to other illnesses.

Vascular diseases ranked top in severity with 65 out of the 78 cases (83.3%) being either serious or severe. Second was cerebrovascular diseases with 58.1% (68 cases) being either serious or severe, followed by metabolic diseases (55.2%, 16 cases), ischemic heart diseases (43.7%, 75 cases), respiratory disease (15.5%, 52 cases) and other illnesses (15.7%, 75 cases). Most cases of acute abdomen, infectious diseases and acute poisoning were moderate or slight. In injury cases, 9.6% were serious or severe, 37.9% were moderate and about half were slight in severity.

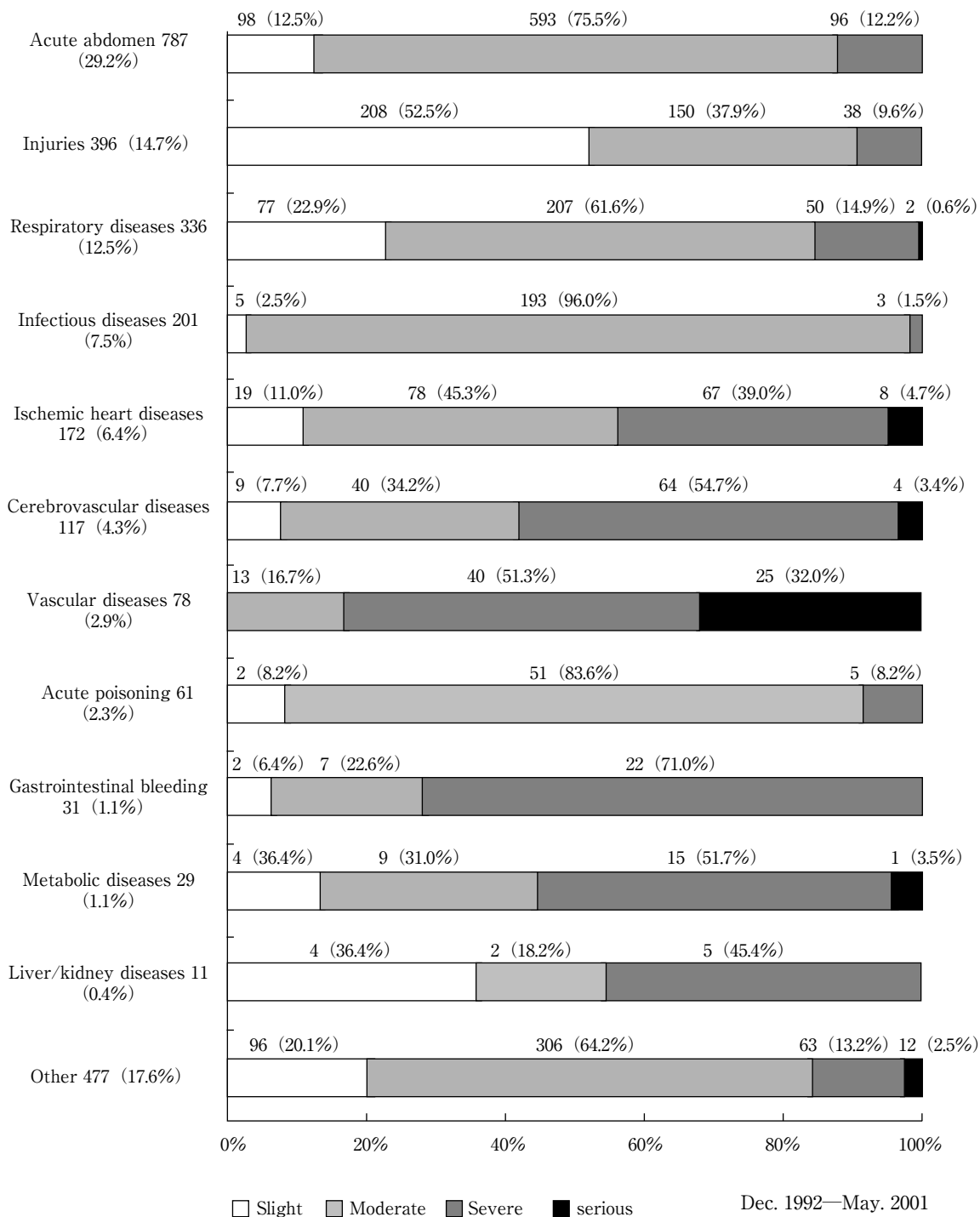
Deaths at the Clinic

The number of cases who had suffered cardiopulmonary arrest (CPA) when they arrived at the Airport Clinic or died at the Clinic was 47 (1.7%). Their age ranged from 14 to 84 with an average of 64.0. The male/female ratio was 28: 19.

The Clinic statistics show that 25 (53.2%) of them died of pulmonary thromboembolism (“economy-class syndrome”), 9 (19.1%) of ischemic heart diseases, 4 (8.5%) of intra-cranial hemorrhage and/or cerebral infarction, 2 (4.3%) of cachexia due to end stage of cancer and 7 (14.9%) of other causes.

International arrival passengers accounted for most of the deaths with 33 cases (70.2%), followed by airport employees (4 cases, 8.5%), departing passengers (2 cases, 4.3%), and non-passenger airport visitors (1 case, 2.1%). There were also 7 unknown cases (14.9%). By nationality, Japanese accounted for 28 (59.6%), Americans 7 (14.9%), Southeast Asians 5 (10.6%), Chinese/Koreans 4 (8.5%), Europeans 2 (4.3%) and Brazilians 1 (2.1%) (**Table 4**).

Table 3 Emergency Patient Severity (N = 2,696)



Transfer to Other Hospitals

Seven hundred and ten patients were transferred to other hospitals (26.3% of all emergency cases) after receiving initial emergency treatment at the Airport Clinic. These hospitals include the Nippon Medical School Chiba Hokuso Hospital and the Narita Red Cross Hospital. Of these transferred patients, 210(29.5%) suffered from acute abdomen, 78(10.9%)

from cerebrovascular diseases, 66 (9.3%) from ischemic heart diseases, 65 (9.1%) from respiratory diseases, 48 (6.7%) from injuries, 44 (6.2%) from vascular diseases, 26 (3.7%) from gastrointestinal bleeding, 25 (3.5%) from acute poisoning, 14 (2.0%) from metabolic diseases, 7 (1.0%) from liver/kidney diseases and 7(1.0%) from infectious diseases (Table 5).

Table 4 Dead Patients

No.	Year	Mth.	Day	Age	Sex	Nationality	Arrival or Departure	Cause of death
1	'92	12.	25	82	M	Taiwan	Before departure	Heart failure
2	'93	1.	5	19	F	Japan	Before departure	Anorexia
3		2.	8	65	F	U.S.A.	From China	PTE, Lung cancer
4		4.	2	68	M	U.S.A.	From U.S.A.	PTE
5		4.	30	78	M	Hong Kong	From Hong Kong	Aneurismal rupture
6		11.	28	63	F	Japan	From Australia	PTE
7	'94	3.	26	32	F	Japan	From U.S.A.	PTE
8	'95	9.	5	47	M	Japan	From China	PTE, arrhythmia
9		9.	11	61	M	Philippines	From U.S.A.	Colon cancer post operation
10		9.	25	61	M	Japan	Customer	Aneurismal rupture
11		10.	13	66	M	Japan	From Brazil	SAH
12	'96	3.	23	76	M	Japan	From Brussels	PTE
13		7.	14	50	F	Japan	Unknown	PTE
14		11.	26	67	M	China	From China	PTE
15		12.	12	22	M	Japan	From Paris	SAH
16	'97	2.	7	68	M	Japan	Unknown	PTE
17		4.	27	64	F	Japan	From Brazil	PTE
18		11.	10	38	M	Brazil	Employee	Myocardial infarction
19		11.	13	74	F	Japan	From Brazil	PTE
20	'98	1.	2	63	M	Japan	From Houston	PTE
21		3.	1	84	M	Philippines	From Hawaii	PTE
22		3.	30	68	F	Japan	From Australia	PTE
23		6.	29	61	M	U.S.A.	From Bangkok	PTE
24		7.	21	46	M	U.S.A.	From Korea	PTE
25		9.	25	71	M	Spain	From E.U.	Liver cancer
26		10.	23	68	F	Korea	From Korea	Unknown
27		12.	13	69	M	U.S.A.	Unknown	PTE
28	'99	3.	8	65	F	Japan	From Iran	PTE
29		4.	27	62	F	Japan	Unknown	Cerebral infarction
30		5.	18	14	M	Japan	Unknown	Asphyxiation
31		8.	3	65	F	Japan	From Switzerland	PTE
32		8.	30	51	M	Indonesia	From U.S.A.	Lung cancer
33		10.	29	52	M	Japan	Unknown	Myocardial infarction
34		12.	7	57	F	Japan	Unknown	PTE
35	'00	1.	11	51	M	U.K.	From Australia	Unknown
36		2.	6	80	M	U.S.A.	From U.S.A.	PTE
37		3.	7	62	M	Japan	Employee	Myocardial infarction
38		5.	2	70	F	Indonesia	From Singapore	PTE
39		6.	3	62	F	Japan	From Tunisia	Breast cancer
40		6.	28	69	F	Japan	From Brazil	PTE
41		8.	28	55	M	Japan	Employee	Myocardial infarction
42		9.	3	53	F	U.S.A.	From U.S.A.	PTE
43		10.	6	68	M	Japan	From Netherlands	Cerebral hemorrhage
44		10.	23	57	M	Japan	Employee	Myocardial infarction
45		11.	6	66	M	Japan	From Taiwan	Sigmoid colon cancer
46		12.	14	62	F	Japan	From U.S.A.	PTE
47	'01	3.	31	32	F	Singapore	From Singapore	Asthma attack

PTE: Pulmonary thromboembolism

SAH: Subarachnoid hemorrhage

May, 1998—Mar, 2001

Table 5 Transfer to Other Hospitals

	No.	(% of total)
Acute abdomen	210	(29.5)
Cerebrovascular diseases	78	(10.9)
Ischemic heart diseases	66	(9.3)
Respiratory diseases	65	(9.1)
Injuries	48	(6.7)
Vascular diseases	44	(6.2)
Gastrointestinal bleeding	26	(3.7)
Acute poisoning	25	(3.5)
Metabolic diseases	14	(2.0)
Liver/kidney diseases	7	(1.0)
Infectious diseases	7	(1.0)
Others	120	(16.8)
Total	710	(100.0)%

Dec. 1992—Mar. 2001

In the past 2 years and 11 months, 36 patients in a serious or severe state were transferred to the Intensive Care Unit of the Nippon Medical School Chiba Hokuso Hospital, of whom 14 (38.9%) had pulmonary thromboembolism and another 14 (38.9%) had ischemic heart diseases. The remaining 8 (22.2%) had other illness. Of all 14 pulmonary thromboembolism patients, positive diagnoses were made. Their age ranged from 48 to 78 with an average of 62.8. The male/female ratio was 1:13. Two female patients, one 66 and the other 69 years old, died. The survivors' ages ranged from 48 to 78 with an average of 62.0; the male/female ratio was 1:11 (**Fig. 3**). The nationalities of the 12 survivors were: Japanese 8, Australian 2, Brazilian 1 and Indian 1. Both of the dead patients were Japanese⁶.

Discussion

Since the Airport Clinic was opened in December 1992 one of the characteristics is the large percentage of new patients, accounting for about 44% of the Clinic's total patients and 92% of passenger patients.

In treating emergency cases, we always focus on quickly gathering information about the patients and accurately assessing their severity and conditions.

With flights operating between 6:00 a.m. and 11:00 p.m. at Narita Airport, the Airport Clinic has two daily peak hours for emergency patients: early

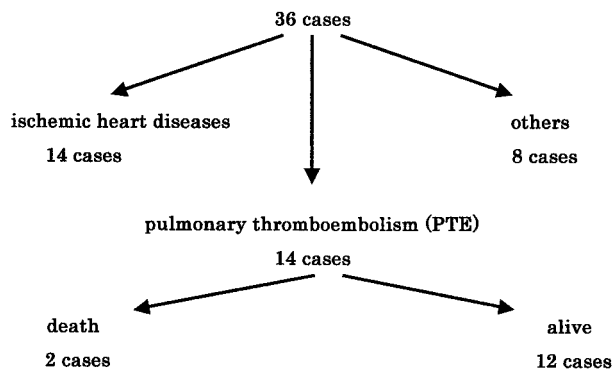


Fig. 3 Patients from Airport Clinic

May. 1998—May. 2001

morning to noon and 4:00 p.m. to 7:00 p.m. In addition to travelers, the Clinic doctors also see sick airport workers. The Clinic's staff also often leave the office to treat cases of cardiopulmonary arrest and other emergency patients on arriving airplanes, at Narita Airport railway station and in the arrival and departure lobbies.

With about 26~28 million passengers passing through Narita Airport per year, the incidence of visiting the Clinic was 1 in 4,000 passengers, that of emergency cases was 1 in 80,000, and that of death was 1 in 4 million. The incidence of death due to so-called "economy-class syndrome" (P.T.E.) was 1 in 7.5 million passengers.

Considering the large number of people who visit the airport, the number of people who require medical services there is not large. On average the Clinic has 3 to 4 emergency patients per day and 7 to 8 deaths per year. However, an increasing number of passengers show signs of greater general fatigue and discomfort after a flight, as the numbers of elderly travelers and longer non-stop flights increase.

In terms of health, a longer-haul, non-stop flight has adverse effects. Due to aircraft design, the cabin air pressure is maintained at 70 to 80% of atmospheric pressure at sea level, and the oxygen density is also far lower than that at sea level. Furthermore, the air inside the aircraft is very dry with a humidity of around 10%. These conditions typically result in an arterial blood oxygen pressure of about 55 mmHg and peripheral arterial oxygen saturation of 90%, sometimes causing symptoms of hypoxia.

They also tend to increase the risks of complication for sick air travelers and the chances of requiring medical care for those with diabetes, high blood pressure or hyperlipemia.

Another characteristic of the Airport Clinic is the large number of non-Japanese patients⁷. To date, we have treated a total of 8,485 such patients, or 7.2% of the total. Regarding emergency care, we have so far treated 500 non-Japanese patients (18.5% of the total 2,696 emergency cases), consisting of 30 (6%) serious, 98 (19.6%) severe, 297 (59.4%) moderate and 75 (15%) slight cases. Eighteen non-Japanese emergency patients have died at the Clinic (3.6%).

Narita Airport has an obligation to provide excellent medical services, especially in emergency care, for its approximately 8.6 million non-Japanese annual passengers, most of whom use the airport for transit.

Conclusion

Based on our many years of experience in a unique international airport clinic situation, we conclude that a world-class international airport should be equipped to offer excellent medical services, especially in emergency care. We therefore believe that the Clinic has an enormous responsibility to offer high-quality medical services to those who visit Japan's most important gateway.

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