

Correct triage at the scene increases success in the ED: Sabiha Gökçen Airport plane accident

Kenan Ahmet Turkdogan, M.D.,¹ Yusuf Uğurlu, M.D.,² Selim Altınarık,² Osman Türk,² Fatih Türkmen, M.D.,² Levent Özder,³ Ahmet Çelik,³ Elif Arslan,² Erdal Yılmaz, M.D.⁴

¹Department of Emergency Medicine, Health Sciences University, Bağcılar Training and Research Hospital, İstanbul-Türkiye

²Department of Emergency Health Services, Provincial Health Directorate of İstanbul, İstanbul-Türkiye

³Department of Director of Emergency Medical, Sabiha Gökçen International Airport, İstanbul-Türkiye

⁴Department of Emergency Medicine, Health Sciences University, Kartal Dr. Lütfi Kırdar City Hospital, İstanbul-Türkiye

ABSTRACT

BACKGROUND: Triage is the most important part of the management of events, such as accidents, earthquakes, fires, and floods, in which mass injuries occur. The aim of this study is to evaluate the effects of triage on patient outcomes, injuries, the role of trauma mechanisms, and spinal immobilization during transportation following the plane crash at the İstanbul Sabiha Gökçen airport that involved 183 patients on February 5, 2020.

METHODS: Command control center data and ambulance and medical charts were examined retrospectively. The results were evaluated in terms of spinal immobilization, injury type, triage codes, and ISS values during emergency interventions and transportation.

RESULTS: We received the first notice at 18:21 about the plane that had landed and crashed at 18:19 on February 5, 2020, and the first team reached the security gate at 18:26. The first team arrived at the debris field and performed triage. On the airside of the airport, the first victims were taken at 18:32, transferred at 18:36, and reached the hospital at 18:41. The first case was taken from the debris field at 18:35 and transferred to the hospital. Of the 183 patients on the plane, three became exitus at the scene, 43.7% of the victims were female, and the mean age was 35.0±15.7. The mean systolic blood pressure of the victims was 122.0±17.4. The mean distance to hospitals, transportation time, intervention time, heart rate, and ISS levels were measured as 55.0 (23.0–79.0) km; 780.5 (390.0–1540.0) s; 817.0 (552.0–1200.0) s; 86.0 (78.0–100.0); and 4.5 (1.0–9.0), respectively. A positive significant correlation was found between ISS and the days of hospitalization ($r=0.577$; $p<0.001$).

CONCLUSION: The fact that no patient was lost during the follow-up and treatment is an indication that triage, appropriate patient referral to the appropriate hospital, and primary and secondary care are well performed, as well as the crash of the plane while landing. Coordinated acts of the airport and 112 emergency health services and guidance for appropriate triage reduced both pre-hospital and hospital mortality.

Keywords: 112 Emergency Health Services; coordination; domestic medical rescue team; plane accident; trauma; triage.

INTRODUCTION

Aviation accidents cover a variety of incidents involving balloons, gliders, wing sails, helicopters, small planes, passenger planes, and military planes.^[1] The number of flights around the world has reached 20 million a year, and there are nearly 20 serious plane accidents resulting in a thousand deaths.^[2]

The National Transportation Safety Board recorded 44,828 aviation incidents in the USA between 1983 and 2005. Approximately 200 cases with 750 casualties are currently reported annually.^[3] According to the State Aircraft Accident Investigation Commission, about 100 serious aviation accidents have occurred in Poland.

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Address for correspondence: Kenan Ahmet Turkdogan, M.D.

Sağlık Bilimleri Üniversitesi, Bağcılar Eğitim ve Araştırma Hastanesi, Acil Tıp Kliniği, İstanbul, Türkiye

Tel: +90 533 - 145 29 32 E-mail: drturkdogan@gmail.com

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In International Civil Aviation Convention Annex 13, an aviation accident is defined as an event, in which a person becomes fatally or seriously injured, the aircraft suffers damage or structural failure, or the aircraft is incomplete or completely inaccessible between the time people board an aircraft with the intention of flying and the time they land.^[4]

One hundred and eighty people survived, and three people died on the plane that crashed while landing at the İstanbul Sabiha Gökçen airport on February 5, 2020. Such mass casualty incidents require the utilization of specific procedures, such as medical evaluations, triage, and treatment.^[5] Due to the large number of polytraumatized patients, especially in large-scale accidents, it may be difficult to diagnose all injuries.^[5] Delays in the diagnosis of injuries may lead to increased morbidity, longer hospitalization, and higher cost.^[6-8] The present study engages in a literature analysis and discusses the triage, hospital transfer, injury type, and treatment process for the passengers and crew on the Boeing 737 that crashed at Sabiha Gökçen airport.

MATERIALS AND METHODS

Permissions were taken from the Bakırköy Dr. Sadi Konuk Training and Research Hospital Clinical Research Ethics Committee (dated March 16, 2020, and numbered June, 2020) and Provincial Health Directorate of İstanbul (15916306–604.01.01) for this retrospective study.

Command control center data, ambulance, and patient medical charts (including information such as the age, gender, and position of the ambulances directed), medical equipment used, systolic blood pressure, ISS data, the distance of the hospitals to the place of the accident, the number of patients treated in the related branches, hospitalization time, and presence of fracture in the passengers and crew of the Boeing 737 that crashed at the İstanbul Sabiha Gökçen airport on February 5, 2020 and caused 183 injuries were retrospectively examined. In addition, the SGHL Emergency Plan and the triage practices of the airport-operated emergency health unit (EHU) were evaluated.

Triage and Practices

Since the on-call doctor of the EHU who arrives at the scene in emergencies that occur at or around the airport takes charge as the health coordinator, the İstanbul provincial directorate of the Health 112 Command Control Center (112 CCC) domestic medical rescue team (UMKE) requested help. The following areas were established for health services to be provided in the accident/incident area. The area closest to the scene of the accident, which was under protection by law enforcement and in which no one except rescue and first aid personnel were allowed to enter, was determined to be the assembly area. In the triage area, where the injured were evaluated by the health personnel on duty according to their conditions, a black triage card was placed on the victims who died, a red triage card was placed on the severely injured, a yellow triage card was placed on the moderately wounded, and a green triage card was placed on the slightly wounded victims. They were sent to medical care areas with medical intervention vehicles, devices, and health personnel, where the vehicles could easily and quickly access and where the first intervention was performed on the injured. The injured was transferred to hospitals by the coordination of the 112 CCC and registered with the İstanbul Department of Crisis (ASKOM) coordination with ambulances or apron buses, depending on their triage at the care areas. Hospitals were selected according to the secondary examination in the ambulance, while the ambulances were on the move, and when this selection was approved by the ASKOM according to the availability of the hospital, the patient was transferred to that hospital.

RESULTS

On February 5, 2020 at 18:21:20, the Rescue and Fire Fighting Alarm Center announced to our 112 CCM that the Pegasus airways TC IZK-registered flight number PC 2193 Boeing 737 passenger plane on an İzmir-İstanbul flight had left the runway from runway field 24. The first notification was received and the Sultanbeyli-4 team reached the safety gate at 18:26. On the debris field, Pendik-10 performed



Figure 1. Pictures showing the three different points of Entrance A (a), the runway field (b), and debris field (c) from where the injured were taken.

triage at 18:29 as the first ambulance team to arrive. The injured were taken from three different points: Entrance A (Fig. 1a), the runway field (Fig. 1b), and the debris field (Fig. 1c).

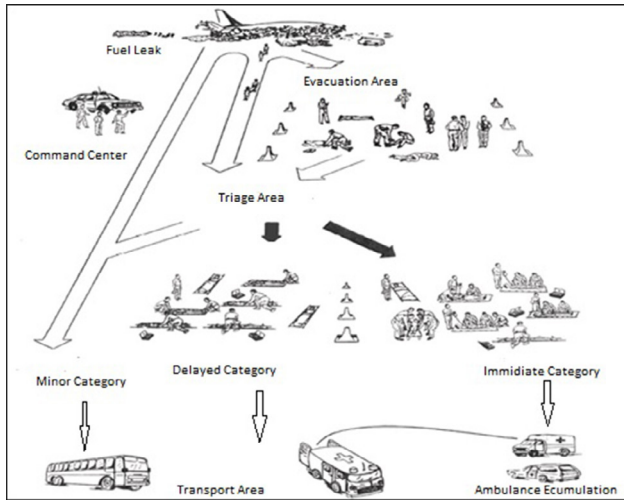


Figure 2. Picture showing the field triage at the airport for the injured.

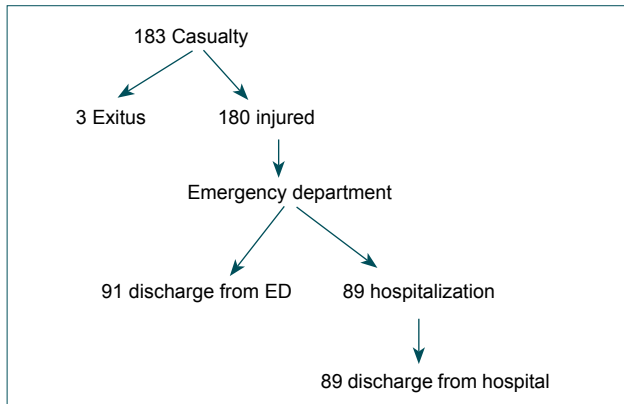


Figure 3. Picture showing the medical conditions of the injured.

Tuzla-4, Pendik-6, Pendik-7, and Pendik-8 teams arrived at the airport at 18:32. The Pendik-10 team took their first case at 18:38 and left the scene. Within an hour, 117 ambulances and seven UMKE vehicles had arrived at the scene. Search and rescue activities were terminated at 20:04 after the information that the number of passengers and the number of injured whose triaging had been completed were matched by

Table 2. The number of fractures that were treated with and without surgery

Fracture	Treatment without surgery	Treatment with surgery	
Humerus fracture	1	4	5
Zygomatic fracture	1	1	2
Malleolus fracture	2	3	5
Thoracic fracture	3	2	5
Elbow		1	1
Femur fracture		2	2
Tibia Fracture		3	3
Shoulder		2	2
Lumbar fracture	9	6	15
Joint dislocation	2		2
Radioulnar fracture		2	2
Hip fracture		1	1
Sternum	1		1
Costal fracture	2		2
Clavicle fracture	2		2
Cervical fracture		3	3
Maxilla fracture	2	2	4
Nasal fracture	4		4
Total	29	32	61

Table 1. Treatment time (days) and ISS values of the hospitalized patients

Service the patients were treated in	Number of patients treated (n=180)*	Treatment time	Median ISS value
Orthopaedics	42	5.5 (2.0–7.0)	9.5 (6.0–13.5)
General surgery	19	2.0 (2.0–7.5)	8.0 (4.5–9.5)
Brain surgery	20	2.0 (1.5–7.0)	9.0 (1.0–10.0)
Emergency	89	1.0 (1.0–1.5)	2.0 (1.0–3.5)
Pediatric surgery	1	8	16.0±1.5
Cardiovascular surgery	1	9	17±2.7
Internal medicine	4	3.6±0.4	3.0±0.5
Thoracic surgery	2	2.5±0.7	17±0.8
Plastic surgery	1	9	16.2±0.9
Intensive care	1	12	41.0

*The number of patients according to the service the patients' treatments were terminated.

the ASKOM. During triage in the scene (Fig. 2), 32 long spine boards, 86 neck collars, 90 splints, and plenty of bandages, tampons, and gauze were used.

Of the 183 patients, three from the plane became exitus at the scene; the medical conditions of the remaining patients are shown in Figure 3. Of the injured, 43.7% were female, and the mean age was 35.0 ± 15.7 . The mean systolic blood pressure of the injured was 122.0 ± 17.4 . The mean distance to hospitals, transportation time, intervention time, heart rate,

and ISS levels were measured as 55.0 (23.0–79.0) km; 780.5 (390.0–1540.0) s; 817.0 (552.0–1200.0) s; 86.0 (78.0–100.0); and 4.5 (1.0–9.0) s, respectively. Table 1 shows the branches, in which the injured were treated at the hospital, the treatment time, and ISS values. A positive significant correlation was found between the ISS value and days of hospitalization ($r=0.577$; $p<0.001$). Table 2 shows the number of injured with fractures and whether they required surgery.

The fact that no patient was lost during follow-up and treat-

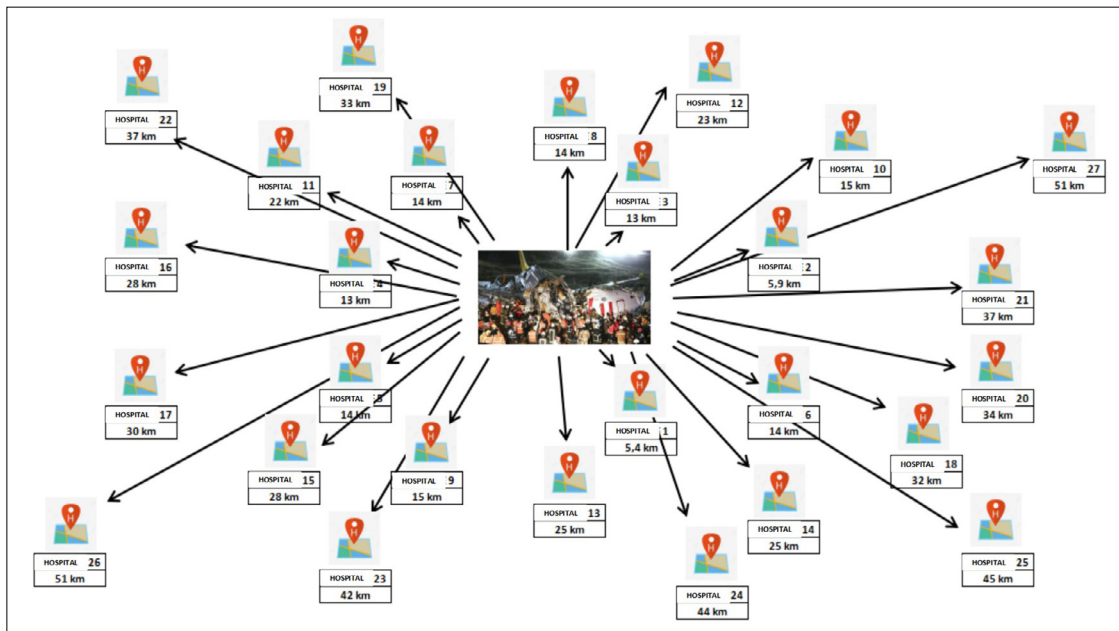


Figure 4. The distance between the hospitals and Sabiha Gökçen Airport where the plane accident took place.

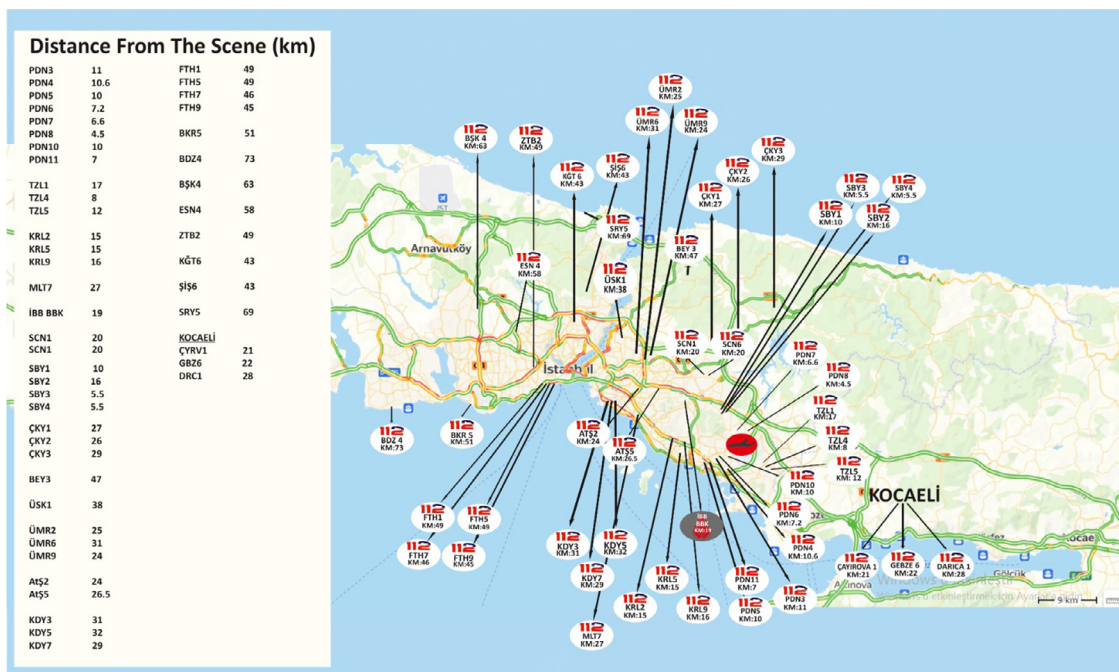


Figure 5. The distance of 112 health stations to Sabiha Gökçen Airport, where the plane crash occurred, and the current traffic density.

ment is an indicator of good triage, primary and secondary care, and the advantage of taking patients to 27 different centers in the area (Fig. 4).

The distance of 112 health stations to Sabiha Gökçen Airport, where the plane crash occurred, and the current traffic density are shown in Figure 5.

DISCUSSION

Of the 183 injured from the plane crash that occurred, while the plane was landing at the airport, three became exitus at the scene, and 180 were transferred to hospitals according to triage and primary care; 89 were discharged from the emergency service, and 91 were hospitalized. The most important reason why no patients died during the examination and treatment period at the hospital was the fact that the primary care during triage was performed well, patient-hospital matches were made well, emergencies and hospitals were matched with the appropriate patient, and patients did not wait for operations.

In their study, which compared Dutch and UK data, Postma et al.^[5] found the ISS ≥ 15 , the number of patients with head trauma, and the mortality number to be 13 (10%) and 30 (37%), 21 (17%) and 34 (41.0%), and 9 (7%) and 43 (34%), respectively. These numbers were calculated as 19 (10.4%), 35 (19.1%), and 3 (1.6%) in our study. The fact that mortality was low in our study, although the number of ISS ≥ 15 patients and patients with head trauma was higher than the Dutch data, and that no patients were lost at the hospital and during the transfer period shows that triage and patient referral organization were performed successfully.

In the plane crash in Amsterdam, triage and transportation took 3.5 h, and nine of 135 patients died at the scene.^[9] In the Sabiha Gökçen plane crash rescue that we performed, the first triage that started at 18:32 ended at 20:04 when the last patient was transported. The reason why the triage and transportation process lasted as short as 92 min was the high number of teams arriving at the scene in a short time. Furthermore, the patients were transferred to 27 hospitals using standby ambulances, and the system was coordinated quickly. A disadvantage was the fact that a helicopter ambulance was not used in the plane crash that occurred in the evening hours.

The first casualty of the Amsterdam plane crash came to the hospital 74 min later. The muddy ground and the ground at the site of the accident trapped a few patients in debris, which made it difficult for the victims to evacuate quickly.^[10] The fact that there was rainy weather in the accident here in the evening made the rescue operation difficult. However, with rapid coordination, the evacuation of the victims was made in only 92 min.

Conclusion

The fact that no patients died during follow-up and treatment is an indicator of good triage, transport of appropriate patients to the appropriate hospital and good primary and secondary care. Good primary care during triage will enable good patient-hospital matching, which, in turn, would lead to matching emergencies and operation rooms with the appropriate patient. This allows patients to not have to wait too long for an operation and decreases mortality. In addition, the tight 112 health service station chain facilitated access to the accident site despite the traffic. The coordination between the airport and 112 emergency health service teams and referrals with appropriate triage reduced both pre-hospital and hospital mortality.

Ethics Committee Approval: This study was approved by the Bakırköy Dr. Sadi Konuk Training and Research Hospital Clinical Research Ethics Committee (Date: 16.02.2020, Decision No: 2020-06).

Peer-review: Externally peer-reviewed.

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Conflict of Interest: None declared.

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ORJİNAL ÇALIŞMA - ÖZ

Sahadaki doğru triyaj acildeki başarı oranını artırır: Sabiha Gökçen Havalimanı uçak kazası

Dr. Kenan Ahmet Turkođan,¹ Dr. Yusuf Uđurlu,² Selim Altınarık,² Osman Türk,² Dr. Fatih Türkmen,² Levent Özder,³ Ahmet Çelik,³ Elif Arslan,² Dr. Erdal Yılmaz⁴

¹Sađlık Bilimleri Üniversitesi, Bađcılar Eđitim ve Arařtırma Hastanesi, Acil Tıp Kliniđi, İstanbul

²İstanbul Acil Sađlık Hizmetleri Başkanlıđı, Acil Servis Departmanı, İstanbul

³Sabiha Gökçen Uluslararası Havalimanı, Acil Tıp Departman Yönetimi, İstanbul

⁴Sađlık Bilimleri Üniversitesi, Kartal Dr. Lütfi Kırdar Şehir Hastanesi, Acil Tıp Kliniđi, İstanbul

AMAÇ: Triage, kitlesel yaralanmaların meydana geldiđi kaza, deprem, yangın ve sel gibi olayların yönetiminin büyük bir bölümüdür. Bu çalışmanın amacı, 5 Şubat 2020 tarihinde İstanbul Sabiha Gökçen Havalimanı'nda 183 hasta ile meydana gelen uçak kazasında triyajın hasta sonuçları, yaralanmalar, travma mekanizmasının rolü ve spinal immobilizasyonu üzerindeki etkilerini deđerlendirmektir.

GEREÇ VE YÖNTEM: Komuta kontrol merkezi verileri, ambulans ve tıbbi çizelgeler geriye dönük olarak incelendi. Sonuçlar acil müdahaleler ve nakil sırasında spinal immobilizasyon, yaralanma tipi, triyaj kodları ve ISS deđerleri açısından deđerlendirildi.

BULGULAR: 05.02.2020 tarihinde 18:19'da inen ve düşen uçakla ilgili ilk bildiri 18:21'de sisteme düřtü ve ilk ekip 18:26'da güvenlik kapısına ulařtı. İlk ekip enkaz alanına geldi ve triyaj yaptı. Havalimanının hava tarafında ilk kurbanlar 18:32'de alınarak 18:36'da transfer edildi ve 18:41'de hastaneye transfer edildiler. İlk vaka 18:35'te enkaz alanından alınarak hastaneye kaldırıldı. Uçakta bulunan 183 yaralıdan üçü olay yerinde çıkıř yaptı. Kurbanların %43.7'si kadın iken, yař ortalaması 35.0 ± 15.7 'dir. Kurbanların ortalama sistolik kan basıncı 122.0 ± 17.4 idi. Hastanelere ortalama uzaklık, ulařım süresi, müdahale süresi, kalp hızı ve ISS seviyeleri 55.0 (23.0–79.0) km; 780.5 (390.0–1540.0) sn; 817.0 (552.0–1200.0) sn; 86.0 (78.0–1000.0); 4.5 (1.0–9.0), sırasıyla. ISS ile yatıř günleri arasında pozitif yönde anlamlı iliřki bulundu ($r=0.577$; $p<0.001$).

TARTIřMA: Takip ve tedavi sırasında hiçbir hastanın kaybedilmemesi bařta uçađın inerken düşmesinin yanında triyajın, uygun hastanın uygun hastaneye sevkinin, birinci ve ikinci basamak bakımın iyi yapıldıđının bir göstergesidir. Havaalanı ve 112 Acil Sađlık Hizmetleri'nin koordineli hareketi ve uygun triyaj hem hastane öncesi hem de hastane ölümlerini azalttı.

Anahtar sözcükler: 112 Acil Servis; koordinasyon; travma; triyaj; uçak kazası; UMKE.

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