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Mass-Casualty Terrorist Bombings In Istanbul, Turkey, November 2003: Report of the Events and the Prehospital Emergency Response

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Keywords: bombing; emergency management; emergency medicine; emergency medical services; injury; maldistribution; terrorism; trauma; Turkey

Abbreviations:
AH = American Hospital
BC = British Consulate
DOA = dead on arrival
ED = emergency department
EMS = emergency medical service
HEICS = Hospital Emergency Incident Command System
HSBC = Hong Kong Shanghai Banking Corporation
IBDA-C = Islamic Great Eastern Raiders Front
IED = improvized explosive devices
SEERSH = Sisli Etfal Education and Research State Hospital
TERSH = Taksim Education and Research State Hospital

Web publication: 13 August 2004

Abstract

Background: This paper describes the two mass-casualty, terrorist attacks that occurred in Istanbul, Turkey in November 2003, and the resulting prehospital emergency response.

Methods: A complex, retrospective, descriptive study was performed, using open source reports, interviews, direct measurements of street distances, and hospital records from the American Hospital (AH) and Taksim Education and Research State Hospital (TERSH) in Istanbul.

Results: On 15 November, improvised explosive devices (IEDs) in trucks were detonated outside the Neve Shalom and Beth Israel Synagogues, killing 30 persons and injuring an estimated additional 300. Victims were maldistributed to 16 medical facilities. For example, AH, a private hospital located six km from both synagogues, received 69 injured survivors, of which 86% had secondary blast injuries and 13% were admitted to the hospital. The TERSH, a government hospital located 1 km from both synagogues, received 48 injured survivors. On 20 November, IEDs in trucks were detonated outside the Hong Kong Shanghai Banking Corporation (HSBC) headquarters and the British Consulate (BC), killing 33 and injuring an estimated additional 450. Victims were maldistributed to 16 medical facilities. For example, TERSH, located 18 km from the HSBC site and 2 km from the the BC received 184 injured survivors, of which 93% had secondary blast injuries and 15% were hospitalized. The AH, located 9 km from the HSBC site and 6 km from the BC, received 16 victims.

Conclusion: The twin suicide truck bombings on 15 and 20 November 2003 were the two largest terrorist attacks in modern Turkish history, collectively killing 63 persons and injuring an estimated 750 others. The vast majority of victims had secondary blast injuries, which did not require hospitalization. Factors associated with the maldistribution of casualties to medical facilities appeared to include the distance from each bombing site, the type of medical facility, and the personal preference of injured survivors.

Rodoplu U, Arnold JL, Tokyay R, *et al*: Mass-casualty terrorist bombings in Istanbul, Turkey, November 2003: Report of the events and the prehospital emergency response. *Prehosp Disast Med* 2004;(19)2:133–145.

Introduction

The Republic of Turkey, with a population of 67 million, sits at the geographic, political, and cultural crossroads between Europe, Asia, and the Middle East.[1,2] Located in the northwest corner of Turkey, Istanbul is Turkey's largest city (population 12 million) and is its commercial capital. Istanbul also

Information type	Data abstracted
Bombing	Time of detonation Type of target Location of target Environment of target Composition of IED Magnitude of improvised explosive device Type of IED delivery system Type of terrorist Use of terrorist suicide Detonation point Nature of physical effects of blast Occurrence of structural collapse Occurrence of structural fire Occurrence of crater at detonation point Depth of crater at detonation point Maximum distance of physical effects from detonation point Nature of physical effects at maximum distance from detonation point Types of victims Locations of victims
Prehospital Emergency Response	Types of first responders Time of arrival of initial first responders a scene Time of arrival of first ambulance at scene Number of ambulances at scene Number of EMS personnel at scene Number of medical facilities receiving injured survivors Names of medical facilities receiving injured survivors Numbers of injured survivors at medical facilities receiving injured survivors Types of on-scene hazards Occurrence of scene assessment Use of personal protective equipment Use of on-scene command and control system Use of on-scene triage of victims Establishment of scene security Type of communication between prehospital EMS and hospitals Occurrence of convergence phenomena Types of converging persons Type of public notification Type of risk communication

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Table 1—Data abstracted from open sources (EMS = emeregency medical services, IED = improvised explosive device)

straddles the European and Asian continents, with two sides of the city on each continent bisected by the Bosphorus Straits.

Over the past two decades, terrorism has exacted an enormous toll on Turkey, a secular democracy with its population 99.8% Muslim. From 1984 to October 2003, an estimated 30,000 to 35,000 Turkish citizens were killed by a nearly continuous occurrence of terrorism-related events.[3] At least 17 terrorist attacks during this period produced ≥30 casualties, seven of which were bombings.[3]

During much of 2003, the United States of America and its coalition partners occupied Iraq, spawning a series of large-scale reprisals by terrorist groups in Iraq and Saudi Arabia. In November 2003, this emerging terrorist movement spread to Istanbul with the two most devastating terrorist attacks in modern Turkish history.[3] The two mass-casualty, terrorist attacks that took place in Istanbul on 15 and 20 November 2003 and the resulting prehospital emergency response are described.

Materials and Methods

Study Type

A complex, retrospective, descriptive study was performed, using open-source reports, interviews, hospital records, and the direct measurement of distances between the bombing sites and medical facilities. This study was approved by the Institutional Review Boards at the Taksim Education and State Research Hospital (TERSH) on 15 March 2004 and by the American Hospital (AH) in Istanbul on 05 March 2004.

Study Setting, Population, and Period

The two terrorist attacks that took place in Istanbul on 15 and 20 November 2003 were studied. The study population included: (1) administrators at medical facilities (general hospitals, specialty hospitals, and clinics) in Istanbul that received injured survivors; (2) 1-1-2 Istanbul paramedics (residents dial telephone number 1-1-2 for emergency medical services), who participated in the prehospital emergency response; and (3) injured survivors, who used the emergency department at AH and TERSH on those dates.

Search Strategy

Open sources of information about the two attacks that were available to the public in Turkey were identified, including print publications, local television reports, and websites. Other open sources of information also were identified through a computer search of the LexisNexis Academic database for international newspaper articles, news wires, and news transcripts that reported the two attacks, using the following keywords: Istanbul, November 15, November 20, bomb, bombing, terrorism, terrorist, dead, injured, and hospital.

Data Collection and Processing

Data from open sources were abstracted and are outlined in Table 1. When possible, this information was corroborated with eye-witness accounts of the events. When different sources provided contradictory data, data were included that met the consensus agreement of the authors.

Using these data, the medical facilities that received victims on each date were identified.[4–11] Then, one author interviewed administrators at each of the identified facilities to determine: (1) the type of facility (private hospital, private clinic, government hospital, government clinic); (2) the number of in-patient beds at the facility; (3) the number of emergency department (ED) beds; and (4) the number of injured survivors who sought emergency care at the facility on each date. Another author interviewed para-

Facility Name	Type of Facility	Number of In-patient Beds	Number of ED Beds	Street Distance from Neve Shalom Synagogue (km)	Street Distance from Beth Israel Synagogue (km)	Number of Injured Survivors Seeking Emergency Care	Number of Victims Dead on Arrival
American Hospital	PH	300	12	6	6	69*	0
Taksim Education and Research State Hospital	GH	300	15	1	1	46	3
Sisli Etfal Education and Research State Hospital	GH	300	15	7	8	36	N/A
St. George Austrian Hospital	PH	80	5	7	8	20	N/A
Osmanolglu Clinic	PC	0	0	2	1	20	N/A
Istanbul University Medical Faculty Hospital	GH	750	20	7	8	16	N/A
Metropolitan Hospital Florence Nightingale	PH	100	5	5	6	9	N/A
Okmeydani Social Security Hospital	GH	400	20	11	9	8	N/A
German Hospital	PH	150	12	6	7	4	N/A
Haseki Education and Research State Hospital	GH	300	15	8	7	4	2
Sisli Social Security Hospital	GH	300	20	9	9	4	N/A
Memorial Hospital	PH	100	7	8	9	4	N/A
Florence Nightingale Hospital	PH	200	12	11	10	3	N/A
Vakif Gureba Social Security Hospital	GH	300	15	12	9	3	N/A
Istanbul University Cerrahpasa Medical Faculty Hospital	GH	850	25	11	14	3	N/A
Haydarpasa Numune Hospital	GH	500	20	10	12	2	N/A
Total		4,930	218			248	

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Table 2—Distribution of victims to medical facilities on 15 November 2003 (PH = private hospital, PC = private clinic, GH = government hospital, ED = emergency department, N/A = data not available, *7 more victims were received in transfer from other facilities)

medics from the Istanbul 1-1-2 ambulance service to determine the shortest street route between each bombing site and each medical facility. He then drove an automobile along each route and recorded the odometer reading in km at the starting point (bombing site) and at the end point (medical facility driveway). Interviewees gave their verbal informed consent to participate in the study.

In addition, two authors identified injured survivors who sought emergency care at the EDs at AH on 15 November and TERSH on 20 November from ED log books in the two hospitals. The two authors then reviewed the hospital records of these injured survivors and abstracted the following data: (1) mode of ED arrival (emergency medical services (EMS) or non-EMS); (2) ED injury type (primary blast injury, secondary blast injury, fracture, or intracranial injury); and (3) ED disposition (hospital admission, discharge home, or transfer to another medical facility), using a standard study data form. Primary blast injuries were defined as pulmonary, auditory, or abdominal blast injuries. Secondary blast injuries were defined as lacerations, puncture wounds, or wounds with foreign bodies. Intracranial injuries were defined as open or depressed

Name	Type of facility	Number of in-patient beds	Number of ED beds	Street distance from HSBC headquarters (km)	Street distance from British consulate (km)	Number of injured survivors seeking emergency care	Number of victims dead on arrival
Taksim Education and Research State Hospital	GH	300	15	18	2	184	12
Sisli Etfal Education and Research State Hospital	GH	300	15	14	4	70	N/A
German Hospital	PH	150	12	18	2	48	N/A
Beyoglu Eye Hospital	PH	300	0	20	1	23	N/A
Acıbadem Etiler Clinic	PC	0	0	1	16	18	N/A
American Hospital	PH	300	12	9	6	16*	0
Haseki Education and Research State Hospital	GH	300	15	28	8	13	N/A
Acıbadem Hospital	PH	200	12	35	18	13	N/A
Beyoglu Social Security Clinic	GC	0	0	19	1	8	N/A
Florence Nightingale Hospital	PH	200	12	6	8	6	N/A
Gultepe Ensar Hospital	PH	100	10	2	15	5	N/A
Mecidiyekoy Cevre Hospital	PH	100	12	5	9	4	N/A
Levent Hospital	PH	150	15	1	15	4	N/A
Bogazici Medical Center	GC	50	5	3	10	3	N/A
Besiktas Salih Ciftci Clinic	PC	80	5	4	10	2	N/A
Okmeydani Social Security Hospital	GH	400	20	12	12	1	N/A
Total		**2,930**	**160**			**418****	

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Table 3—Distribution of victims to medical facilities on 20 November 2003 (PH = private hospital, PC = private clinic, GH = government hospital, GC = government clinic, ED = emergency department, N/A = data not available, *four more victims were received in transfer from other hospitals, **an estimated 50 injured survivors were treated at the Levent Surgery Clinic, of which 23 were transferred to hospitals for further evaluation and are included in the values for other hospiutals.)

skull fractures or intracranial hemorrhage of any type. An individual injured survivor was counted as having more than one injury type if present. Information was sought from these two hospitals, because they received the greatest number of injured survivors on each date.[5,9,10]

Data Analysis

The street distance from each bombing site to each medical facility was calculated by subtracting the odometer reading at the starting point from the odometer reading at the ending point for each course driven. Using the

	Rate (%)	
	American Hospital	Taksim Education and Research State Hospital
Primary blast injury	0	1
Secondary blast injury	86*	93*
Fracture	10	
Intracranial injury	2	2
Hospital admission	13	15

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Table 4—Emergency department injury and hospital admission rates at American Hospital on 15 November 2003 and Taksim Education and Research State Hospital on 20 November 2003. (*Lacerations)

abstracted data from AH and TERSH, specific injury rates (number of injured survivors who sought emergency care with a specific injury/number of injured survivors who sought emergency care) and hospital admission rates (number of injured survivors who sought emergency care who were admitted to the hospital or transferred to another hospital for presumptive admission/number of injured survivors who sought emergency care) were calculated.

The general descriptive results then were organized into narrative and tabular forms. Histograms were used to compare the street distances between each bombing site and each medical facility and the number of victims received at each medical facility. Injury and hospital admission rates were organized into tabular form.

Results

Description of the Bombings on 15 November 2003

On the morning of 15 November 2003, two of Istanbul's oldest synagogues were bombed by suicide bombers driving explosive-packed trucks in two nearly simultaneous attacks.[12-25] The first suicide bombing occurred at 09:29 hours (h), when a pickup truck exploded in front of the Neve Shalom Synaogue in the Beyoglu district of Istanbul.[14,15,18,20-24] The synagogue is located on Buyuk Hendek Street, a narrow, crowded shopping street lined with electrical goods and computer shops.[16,17,22,24] This first truck carried an improvised explosive device (IED) consisting of approximately 400 kg of ammonium sulfate, ammonium nitrate, and compressed fuel oil mixed in containers.[13,18,23,26] The blast tore open the synagogue facade and left a two-meter-deep crater in the street.[14,16,17,19,20,22,25] Windows were blown in over a radius of 200 meters from the site of the explosion.[20] The damage extended onto side streets hundreds of meters away.[16,17] Seventy buildings were damaged, including the synagogue, which was seriously damaged, and 16 buildings sustained moderate damage.[27]

At 09:30h and approximately 5 km away from the initial explosion, a second pickup truck carrying a similar IED exploded in front of the Beth Israel Synagogue on Osmanbey Nakiye Ergul street in the Sisli district of the city.[13-15,18,20,21] The explosion left a wide crater in the street, and shattered windows in surrounding buildings.[19]

Together, the two bombings on 15 November 2003 killed 30 persons and injured an estimated 300.[20,21,25,28-33] At the time of the explosions, both synagogues were full of Sabbath worshippers (more than 300 people were in the Neve Shalom Synagogue for a Bar Mitzvah), while the streets outside were crowded with Saturday morning shoppers and storekeepers.[20,21,24,25] In both bombings, the vast majority of victims were Muslim Turks, who were passing-by outside the synagogues or working in nearby shops.[20-22,24,25,33] Worshippers inside the synagogues were protected by the fronts of the buildings.[22,33] As a result, only six immediate deaths were reported in victims located within the two synagogues.[20,22,23] Many injuries on the street were caused by flying shards of glass, masonry, and fragments of cars. In each bombing, a corpse was found with wires attached, suggesting that the perpetrator was a suicide bomber. Two terrorist organizations, the Islamic Great Eastern Raiders Front (IBDA-C) and Al Qaeda both claimed responsibility for the attacks.[23,34]

Prehospital Emergency Response on 15 November 2003

Immediately after the attack, bystanders performed spontaneous search and rescue at both bombing sites.[15-17] Minutes later, they were joined by first responders from the Istanbul fire and police services. At the same time, the Istanbul 1-1-2 EMS sent every available ambulance to the sites. Meanwhile, Istanbul 1-1-2 EMS (under the Ministry of Health), the Crisis Center (part of the provincial government), and the Medial Bureau (appointed by the Governor of Istanbul) began working together to coordinate the prehospital emergency response. According to the Ministry of Health, the first ambulance arrived at the Beth Israel site within three minutes of the first blast. Although eyewitnesses reported the heavy stench of ammonia at the sites, first responders rushed into the area without personal protective equipment and little scene assessment took place for a secondary event.[35] Meanwhile, the public (volunteers and the curious) and the media began to arrive on-scene, adding to the chaos. Many victims with minor injuries left the scene and sought emergency care at local hospitals and clinics on their own. At 15 minutes after the explosion, 26 ambulances were now at both sites and the Istanbul police were just beginning to establish scene security.[14,15] At one hour after the first blast, 50 ambulances with 170 personnel were on-scene.[15] Injured survivors were taken to hospitals either by ambulances or passing vehicles.[14]

The city's Health Department reported that victims were treated at 23 different medical facilities.[10,12,15,17,21] Table 2 shows the distribution of 248 injured survivors to 16 of these medical facilities. Nine of these medical facilities are government hospitals, six are private hospitals, and one is a private clinic that lacks in-patient or ED beds. Together these 16 facilities have 4,930 in-patient beds and 218 ED beds. All 16 are located on the European side of Istanbul, within 11 km of at least one bombing site. The

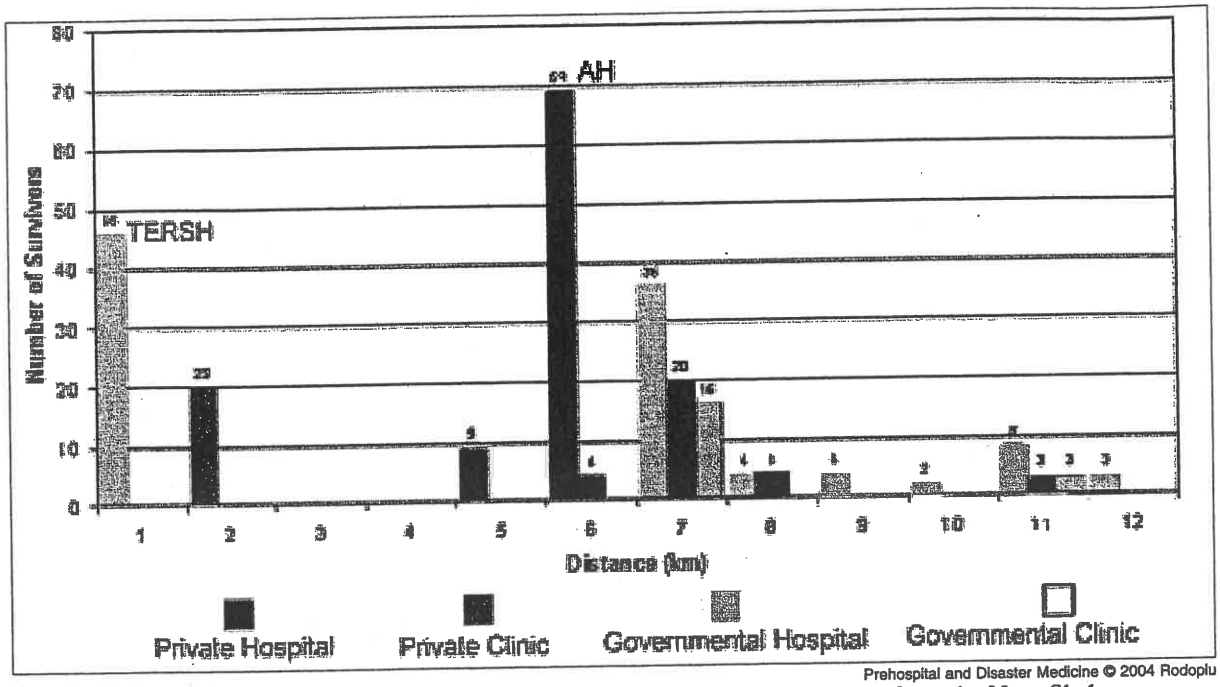


Figure 1—Distribution of injured survivors relative to the medical facility's distance from the Neve Shalom Synagogue on 15 November 2003.

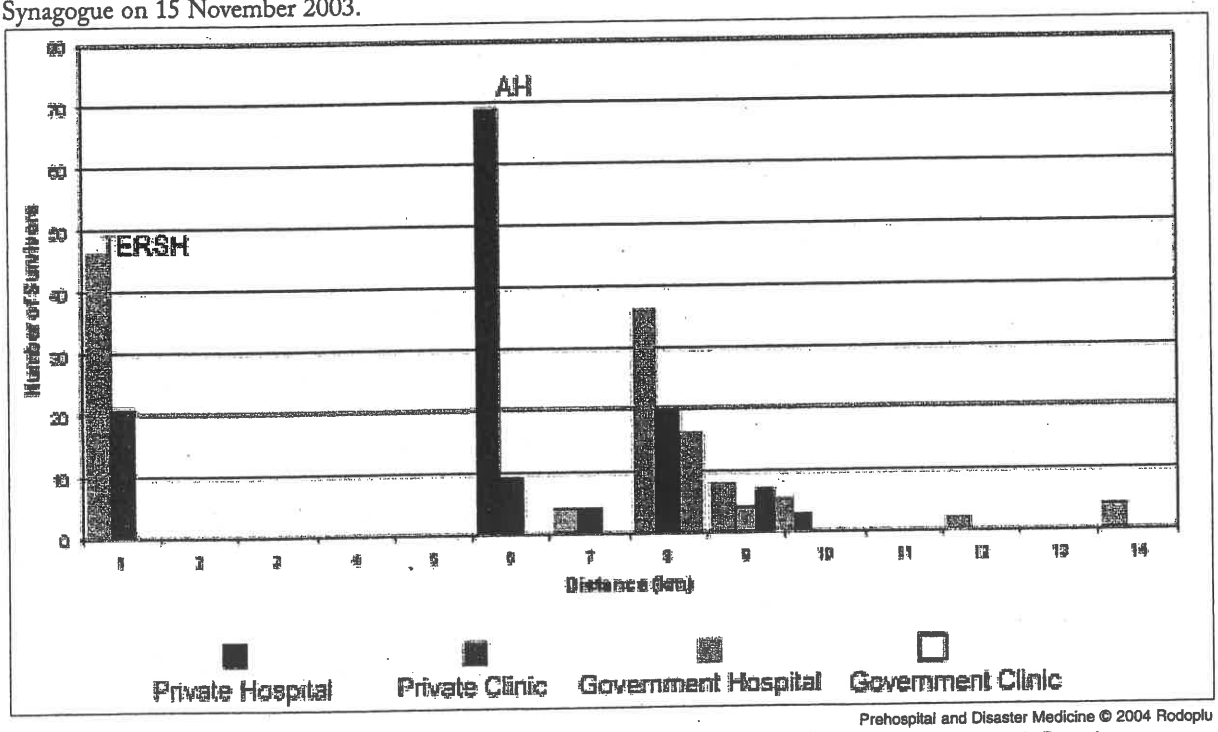


Figure 2—Distribution of injured survivors relative to the medical facility's distance from the Beth Israel Synagogue on 15 November 2003.

distribution of these 248 injured survivors to the 16 medical facilities in relation to the street distance from the Beth Israel Synagogue site are illustrated in Figure 1. The distribution in relation to the street distance from the Neve Shalom Synagogue site are in Figure 2.

Sixty-nine injured survivors sought emergency care at AH, the greatest number who presented to any of the medical facilities that day. The mode of arrival was recorded only for seven victims, of which none were reported to have arrived by EMS. No victims were dead on arrival (DOA). Of the 49 victims seeking emergency care who received documented diagnoses, 42 (86%) suffered lacerations, of

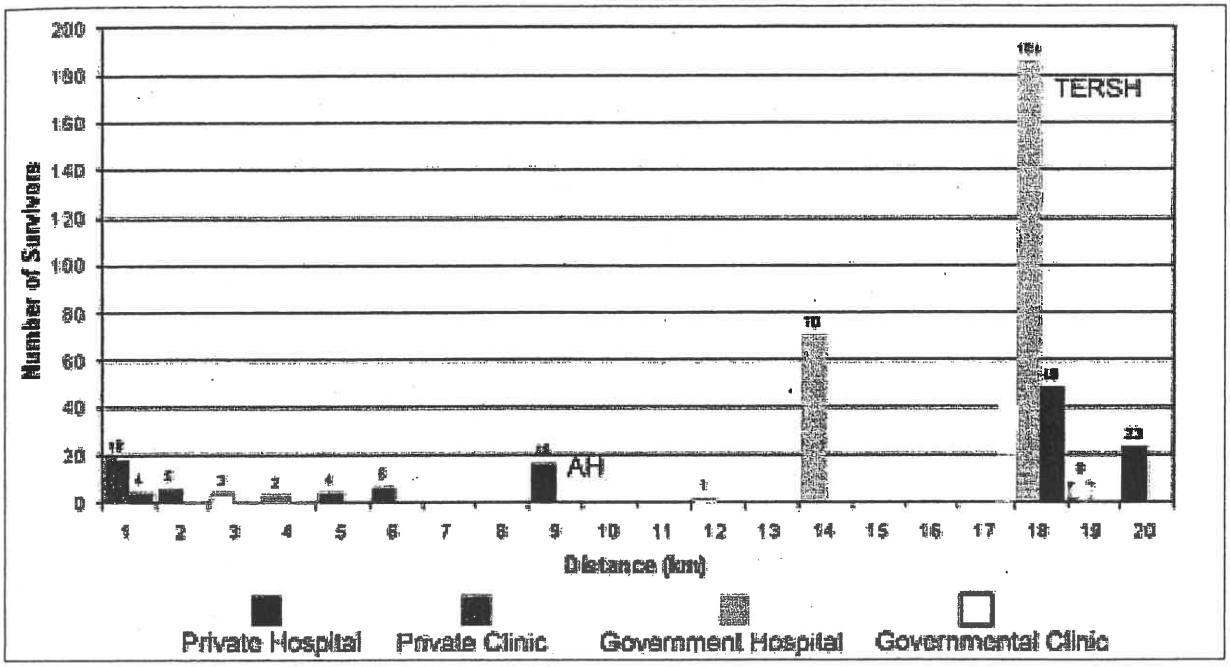


Figure 3—Distribution of injured survivors relative to the medical facility's distance from the HSBC headquarters on 20 November 2003 (AH = American Hospital, TERSH = Taksim Education and Research State Hospital)

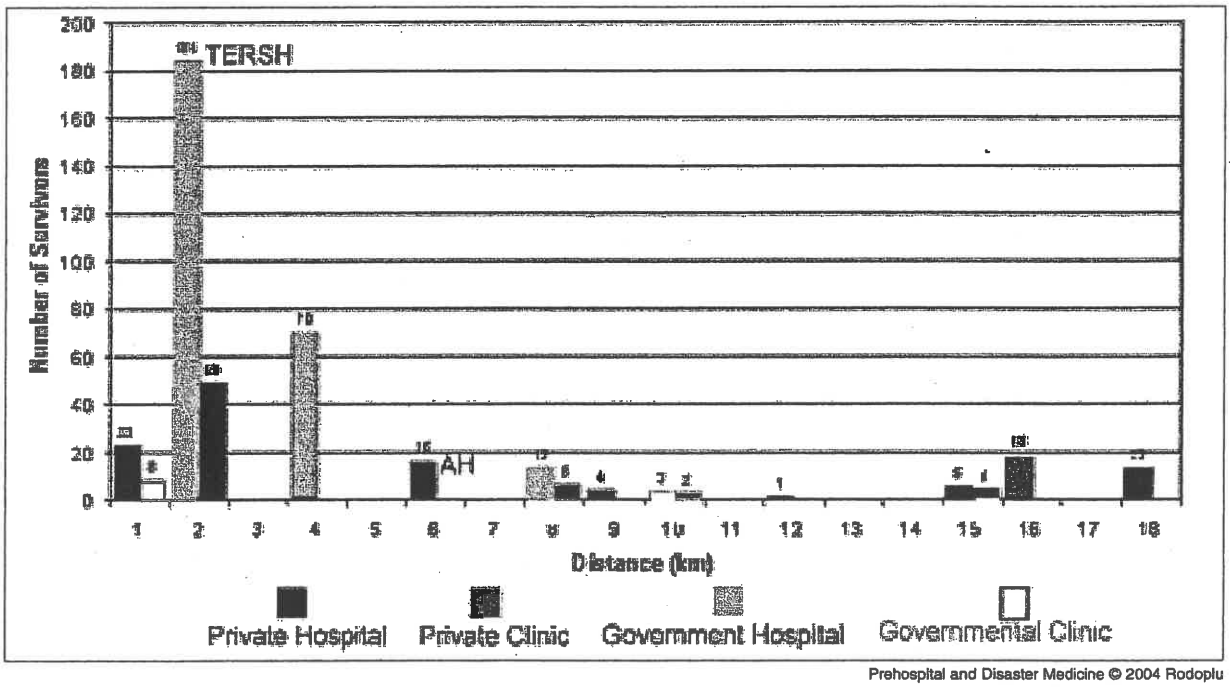


Figure 4—Distribution of injured survivors relative to the British consulate on 20 November 2003 (AH = American Hospital, TERSH = Taksim Education and Research State Hospital)

which 29 (59%) had multiple lacerations and 38 (78%) had lacerations of the face or scalp (Table 4). Only five (10%) injured survivors who used the ED at AH had fractures (one with open fractures) and one (2%) suffered an intracranial injury. Nine (13%) injured survivors who sought emergency care at AH were hospitalized there.

Almost immediately after the attack, many people in Istanbul tried to call family members, rapidly overloading

the city's landline and cellular telephone systems. As a result, much of Istanbul's telecommunications network failed. For an estimated six to eight hours, the public could not access the 1-1-2 EMS system in Istanbul.

Description of the Bombings on 20 November 2003

On the morning of 20 November 2003, suicide bombers struck again, attacking two British facilities in Istanbul in two nearly simultaneous events.[18,34,36-43] The first of the suicide bombings occurred at 10:55h when a pickup truck carrying an IED, consisting of an estimated 700 kg of ammonium sulfate, ammonium nitrate, and compressed fuel oil, mixed in metal food containers, exploded in front of the building that houses the local headquarters of the Hong Kong Shanghai Banking Corporation (HSBC), the world's second largest bank.[9,18,34,37,40,44-46] The HSBC building is located on Buyukdere Boulevard, a busy street lined with stores, restaurants, and offices, across from the Metro City Shopping Center in Levent, a commercial section of the city.[47] The explosion sheared off the facade and destroyed the first two floors of the 15-story HSBC buildings.[39,40,42,46,47] Windows were shattered in nearby high-rises, sending shards of glass crashing to the ground.[34,42] A three-meter-deep crater was left in the street outside of the bank.[34,42] Inside the bank, a fire occurred as water gushed from several damaged floors.[34,41]

At 11:00h, approximately 8 km away, another pickup truck containing a similar payload, crashed through the front gate of the British consulate and exploded directly in front of the security post.[18,34,37-40,43-45,48] The British consulate is located in the historic Beyoglu district of Istanbul only 300 meters from the Neve Shalom Synagogue.[34,39,42,45,46] The explosion occurred just inside the compound, blowing the outer wall of the compound onto the street and crushing nearby cars.[34,37,41,45,48] Two gatehouses near the consulate entrance were demolished.[41,49] A 3 meter-deep crater was left where the bomb exploded.[39,49] The explosion destroyed at least six buildings and damaged another 38.[46,50] Storefronts were ripped open for blocks and windows were blown out in buildings hundreds of meters away from the explosion.[39,43] Electrical and telephone lines were downed in the area.[46]

Together, the two attacks on 20 November killed 33 persons and injured an estimated 450 others.[31,32,34,36,37,39,41,42,43,45,49,51,52] The majority of victims were bank and consulate employees inside the two structures, pedestrians and motorists in the streets outside, and workers in nearby buildings.[39,41] A famous Turkish actor, Kerem Yilmazer, died in his car at the HSBC site. The British consul-general, Robert Short, died at the British consulate site; the force of the explosion flung his body from the consulate across the road.[34,43,49] Body parts were found as far as two blocks from the sites.[39] Minutes after the blasts, the Istanbul Stock Exchange closed after its main share index dropped 7.4%, while Turkey's Central Bank prepared to intervene in currency markets to support the falling Turkish lira.[46,53] Two terrorist groups, the IBDA-C and Al Qaeda, jointly claimed responsibility for the attacks.[34,41,45,52]

Prehospital Emergency Response on 20 November 2003

Immediately after the blasts, bystanders began digging victims out of the wreckage using their bare hands.[35,41,43] Spontaneous rescuers soon were joined by first responders from the fire and police services.[35,37,42] Once again, first responders did not don respiratory protection, although the smell of ammonia permeated the scene.[35] Minutes later, Istanbul 1-1-2 EMS dispatched 50 ambulances to the two scenes.[38] Because these ambulance crews are scheduled in 24-hour shifts every five days, these were the same personnel who had responded to the synagogue bombings on 15 November. Within 12 minutes of the blast, a television crew (with headquarters located across the boulevard from the HSBC bank) began transmitting live images of the carnage to a stunned nation.[36] Ambulances had difficulty reaching the injured because of debris on the street.[41] Bystanders helped carry out the bodies of victims.[34,40] Many victims with minor injuries left the scene either on foot or in taxis and sought emergency care at nearby hospitals and clinics.[34] For example, an estimated 50 victims of the HSBC bank bombing presented to the nearby Levent Ozel Cerrahi Klinigi (Levent Private Surgery Clinic) within 15 minutes of the blast, overwhelming the small clinic, which had only three physicians and three nurses on duty at the time. Twenty-three of these injured survivors were transported promptly by ambulances to hospitals for more detailed evaluation; the remainder were treated and released for minor injuries. Once again, the police were unable to establish perimeter control for the first 15–20 minutes.

Little triage took place at either site. Istanbul 1-1-2 EMS transported not only those seriously injured or incapacitated by the blasts, but also lightly injured victims who referred themselves to ambulances, requesting transport to hospitals.

According to the Ministry of Health, victims were treated at a minimum of 24 medical facilities. Table 3 shows the distribution of the 418 injured survivors to 16 of these medical facilities on 20 November. Four of these medical facilities are government hospitals and eight are private hospitals. Two other medical facilities are government clinics, which together, have 50 in-patient beds and five ED beds. The remaining two are private clinics, which together have 80 in-patient beds and five ED beds. Together these 16 facilities have 2,930 in-patient beds and 160 ED beds. All 16 of these medical facilities are located on the European side of Istanbul, within 16 km of at least one bombing site. The distribution of these 418 injured survivors to 16 medical facilities in relation to the street distance from the HSBC headquarters site is illustrated in Figure 3 and the distribution in relation to the street distance from the British consulate site is in Figure 4.

Taksim Education and Research State Hospital, the closest hospital to the British consulate site, received 184 injured survivors within one hour of the blast, of which 88 (48%) were brought by 1-1-2 ambulance. An additional 12 victims were transported by 1-1-2 ambulance, but were DOA. The remaining 96 victims (52%) arrived on foot or

were brought to the hospital by taxi or police vehicles.

Within five minutes of receiving notification of the blasts, hospital employees and staff began evacuating the first three floors of the TERSH. As a result, injured survivors received emergency care on the first three floors of the hospital, including the: (1) first floor, which consists of a 15-bed ED (eight are observation beds) and 12 specialty outpatient clinics; (2) second floor, which is a 40-bed general surgery ward; and (3) third floor, which is a 40-bed gynecology ward. In addition, the majority of walking wounded received emergency care in the hospital parking lot adjacent to the ED or in the hospital garden.

One hundred, seventy one (93%) of the victims who used the ED at the TERSH had secondary blast injuries, while only one injured survivor with a hemopnemothorax, had a primary blast injury (Table 3). In addition, four (2%) injured survivors who used the ED had intracranial injuries. Twenty-eight (15%) injured survivors who used the ED at the TERSH were admitted to the hospital or were transferred to another hospital for presumptive admission. All others were discharged within 12 hours.

Almost immediately after the blasts, rumors of new bombings swept the city and landline and cellular phone systems failed due to the high volume of calls.[43] The public received most of its initial information about the attacks from the television media, which promptly began broadcasting shocking images of the bombing sites. Less than three hours after the British Consulate bombing, the Turkish State Security Court banned the media from broadcasting or publishing images or interviews with rescuers or survivors from the two bombing sites, fearing that media images would escalate public fear and panic.[34,54] Hospitals posted lists of the dead and injured outside of their gates.[43] Outside of the TERSH, hundreds of people gathered to read its listings of the dead and injured.[39] In many cases, hospitals were unable to identify the dead, who had lost their identification cards in the blast. At the TERSH, one listing read "Woman, English".[43]

Discussion

With an estimated 330 victims, the 15 November attack on the Beth Israel and Neve Shalom synagogues was the largest single terrorist attack in Turkey to date, eclipsing the Hotel Madimak arson attack on 02 July 1993, which produced 93 casualties.[3] Five days later, this heinous attack was superceded by the still larger attack on British interests in Istanbul, which produced an estimated 483 victims. Altogether, the four bombings killed 63 and injured an estimated 750 persons.[31]

Each bombing produced an average of 203 victims. In contrast, the pooled median number and interquartile range of victims in 12 other open-air, mass-casualty terrorist bombings was 102 and (76–134) respectively.[55–67] Factors that likely contributed to the large number of victims in these bombings included: (1) the use of large magnitude IEDs; (2) the use of trucks to deliver these large magnitude IEDs; (3) the use of terrorist suicide to bring the IEDs into closer proximity with their intended targets; and (4) the timing of the bombings to coincide with increased building occupancy inside of the targeted structures and increased crowd density in the streets outside. It also is conceivable that the narrow urban streets of Istanbul helped increase the number of victims (especially in the Neve Shalom Synagogue bombing) by channeling blast winds to send flying fragments a much greater distance from the detonation points than would have occurred if the detonations occurred in more open settings.

Despite the larger than expected numbers of victims, these two twin bombings share several epidemiological features with other mass-casualty bombings taking place in open-air settings, including: (1) the majority of injured survivors suffered secondary blast injuries due to flying fragments (based on the secondary blast injury rate in injured survivors who used the EDs at AH and TERSH); (2) only a minimal number of injured survivors had primary blast injuries (based on the primary blast injury rates in injured survivors who used the EDs at AH and TERSH); and (3) the majority of injured survivors had minor injuries (based the hospitalization rates at the AH and TERSH). In addition, the strategy of simultaneous twin bombings maximized the psychological impact of each attack.

The simultaneous, twin bombings also placed an enormous acute burden on the prehospital emergency response system in Istanbul on each date. Although the prehospital emergency response to these attacks was nothing less than heroic, a number of features of the prehospital emergency response illustrate several inter-related challenges that may serve as important "lessons learned".

One of the most salient features of the prehospital response on each date was the maldistribution of injured survivors to hospitals. Casualty maldistribution also has been reported in the prehospital emergency response to other mass-casualty terrorist bombings, including the 1996 Oklahoma City bombing and the 2001 World Trade Center attack.[68–73]

The factors associated with the maldistribution of injured survivors in the 2003 Istanbul bombings were complex and appeared to include the distance from each bombing site, the type of medical facility, and the personal preference of victims—in different combinations on each date.

First, the victims tended to be distributed to medical facilities located closest to each bombing site. A major exception was the distribution of victims relative to the HSBC site on 20 November.

Second, victims tended to be distributed to government hospitals over the other three types of medical facilities. A major exception was the distribution of victims to the private AH on 15 November. The two government hospitals that received the most victims in all four of the bombings were TERSH and the Sisli Etfal Education and Research State Hospital (SEERSH), which together received the greatest number of victims on each date. On 20 November, the pattern of distribution of victims relative to the HSBC site suggests that, for a subset of victims, government hospital status may have been a more important factor than distance from the HSBC site. In this case, SEERSH located 14 km from the HSBC site, was the first hospital to

receive >20 victims (with TERSH receiving 184 victims, it is unlikely that many of the victims at SEERSH were from the British consulate site). Located much closer to the HSBC site than SEERSH and receiving fewer injured survivors, were five private hospitals, two private clinics, and one government clinic. The only government hospital located closer than the SEERSH was the Okmeydani Social Security Hospital, located 12 km from the HSBC site (a distance that unlikely offerred any significant advantage over the SEERSH).

Why did the two government hospitals, TERSH and SEERSH, attract more injured survivors? Likely reasons include: (1) the greater capacity of government hospitals to provide emergency medical care as suggested by their relatively greater number of ED beds than private hospitals or clinics; and (2) the provision of free government-subsidized, emergency medical care at government hospitals versus private hospitals, which historically has been charged for emergency services. According to eyewitnesses on both dates (two of whom are co-authors here), ambulance crews preferentially took injured survivors to government hospitals and individual survivors self-referred to government hospitals on their own, because they expected that only government facilities would provide free medical care. This economic triage so alarmed the government that it announced on 15 November that it also would pay for emergency medical care at private hospitals in future disasters. However, this new policy did little to change the pattern of casualty distribution on 20 November.

Third, the personal preference of victims also may have influenced the distribution of victims to medical facilities, especially on 15 November when the AH, a private hospital located 6 km from both synagogues, received 69 injured survivors (the greatest number). In contrast, the TERSH, a government hospital located 1 km from both synagogues only received 48 injured survivors and the German Hospital, a private hospital located 7 km from the Beth Israel Synagogue site and 6 km from the Neve Shalom Synagogue, only received four injured survivors. This suggests that a large subset of injured survivors "bypassed" the much closer, government-owned TERSH and the equidistant and equally private German Hospital, to seek care at the AH.

Why did the AH attract more injured survivors on 15 November? According to eyewitnesses at the AH, many of the injured survivors who sought emergency care there, had their own private physicians on the staff at the AH. It also was observed that some injured survivors persuaded ambulances to take them to AH (in addition to arriving by non-ambulance modes of transport). This suggests that the personal preference of injured survivors may have been another determinant of casualty distribution.

There were several other features of the prehospital emergency response underlying casualty maldistribution on 15 and 20 November, including:

1. Little on-scene command and control occurred at the bombing sites. Although Istanbul 1-1-2 EMS began working with other government agencies shortly after each attack, on-scene emergency response largely was spontaneous and disorganized.
2. Istanbul 1-1-2 EMS sent every available ambulance to the bombing sites, many of which were not needed. The convergence of EMS resources complicated the coordination of on-scene resources and added to the chaos. It also left large areas of Istanbul without EMS service for several hours.
3. Emeregency medical service providers performed little medical triage at the bombing sites. As a result, ambulances brought both seriously injured victims and victims with minor injuries together. While this may have represented an efficient use of transportation resources, it added to the burden on some hospitals and complicated reception. A related challenge was that Istanbul 1-1-2 EMS did not have a triage tagging system at the time of the bombings.
4. Istanbul 1-1-2 EMS was unable to coordinate the distribution of casualties with hospitals based on the hospital capacity to provide emergency care. This, in turn, was related to a lack of communication between EMS and hospitals. As a result, hospitals closer to the bombing sites were overloaded by EMS, receiving dozens of victims in a very short time, while some hospitals farther away were underloaded, receiving few victims over many hours.
5. The Istanbul police were unable to rapidly control security at the sites. As a result, the public (volunteers and the curious) and the media converged on the scenes in the earliest minutes, complicating the prehospital emergency response at the four bombing sites. Factors contributing to the delay in establishing scene security, included: (1) widespread telecommunications failures in Istanbul, which prompted the public to drive into the areas to seek their loved ones; (2) narrow streets, which served as traffic bottlenecks, delaying police access to the sites (exacerbated by parked cars lining the already narrow roads); (3) pre-existing traffic congestion on 20 November (little traffic was on the streets at the time of the 15 November bombing); and (4) a disorganized police response due to inexperienced police leadership, with senior police officers having been replaced in a recent government shake-up.

Another feature of the prehospital emergency response to these bombings was the lack of initial scene assessment for secondary IEDs ("come hither bombs") before first responders rushed into the sites. Furthermore, despite the widely-reported stench of ammonia at the sites, first responders did not wear respiratory protection as they entered the scene. The need to assure scene safety and protect first responders is a critical issue for first response agencies in Istanbul responding to these types of events.

Lastly, government emergency managers lacked an adequate official mechanism for notifying the public and keeping the public informed about the evolving situation on each date (risk communication). This lack of public notification, coupled with the failure of the telecommunications system in Istanbul, caused many people to converge on the scenes and hospitals to seek accurate information about

missing loved ones.

These two terrorist attacks also underscore the importance of local systems of emergency response. In the past, terrorism-related events in Turkey rarely have required more than local systems of emergency medical response, except in rural areas, where regional military resources routinely provide EMS. Since Turkey faces a continued risk, not only from terrorist attacks, but also from other emergencies, such as earthquakes and structural collapses, it will benefit from the further development of local systems of emergency response. Several areas merit attention, including: (1) the incorporation of local EMS, fire services, police services, and hospitals into community emergency planning and preparedness; (2) the establishment of a horizontal command and control system (unified command) to coordinate all of the organizations involved in prehospital emergency response; (3) the establishment of compatible command and control systems (incident command systems) within each responding organization; (4) the establishment or upgrade of communication links between EMS and hospitals; (5) the establishment of uniform EMS triage protocols for mass-casualty incidents; (6) the education and training of all first responders in emergency management and relevant areas of disaster medicine; and (7) the conduction of regular community-wide emergency or disaster exercises to test and improve these command and control structures and their ability to coordinate prehospital emergency response.

Fortunately, the last decade has seen the development of several areas of local emergency response in Turkey, including the establishment of training programs for EMS providers, the spread of advanced training in trauma care modeled after the Advanced Trauma Life Support course, and the establishment of the medical specialty of Emergency Medicine to provide physician leadership for EMS. In addition, the Emergency Medicine Association of Turkey has introduced the Hospital Emergency Incident Command System (HEICS) to at least 42 Turkish hospitals, and has developed a generic hospital emergency plan based on HEICS called Hastane Afet Planı (HAP) or "Hospital Disaster Plan".[3]

Limitations

This study is limited by its dependence on information available in open sources. To date, no data that the government may have collected concerning these attacks are available to the public and no official government reports have been released. In particular, we only had access to information about the distribution of victims to 16 (70%) of the 23 medical facilities that were reportedly used on 15 November and 16 (67%) of the 24 medical facilities that were reportedly used on 20 November. The determination of street distances is limited by the assumption that ambulances would have taken the most direct routes between the bombing sites and hospitals. However, it is possible that these routes were not available to ambulances at the time due to blast-related street damage or obstacles, traffic congestion, or police activity. This study also is limited by its dependence on hospital records generated during the chaotic phase of emergency response. As a result, some victims receiving emergency care at hospitals may never have been recorded or their records may have been lost. In addition, some records were incomplete. For example, injury types only were available for 49 injured survivors in the ED at AH on 15 November. Other factors may have influenced the distribution of injured survivors to hospitals, such as public or ambulance crew perceptions about the capacity, quality, or timeliness of emergency care at specific hospitals. Even though the AH and TERSH received the greatest numbers of injured survivors on each date, injury and hospital admission rates at these hospitals may not be representative of other hospitals.

Conclusion

The twin, suicide, truck bombings on 15 and 20 November 2003 were the two largest terrorist attacks in modern Turkish history, collectively killing 63 persons and injuring an estimated additional 750. The vast majority of victims had secondary blast injuries that were relatively minor. Although the prehospital emergency response to these events was nothing less than heroic, victims were ultimately maldistributed to medical facilities, first responders put themselves at risk of a exposure to secondary terrorism-related hazards, and the public was inadequately appraised of the evolving situation. Lessons learned from the prehospital emergency response to these events may assist planning and preparedness for future mass-casualty terrorist bombings in countries at risk for these events.

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