

The Terror Attacks in Madrid, Spain, 2004

Kamedo-report 90

The National Board of Health and Welfare classifies its publications into various document types. This is a document produced by specialists. This means that it is based on science and well-trying experience. The documents are usually prepared by external specialists commissioned by the National Board of Health and Welfare or the Institute for Evidence-Based Social Work Practice (IMS). The authors are solely responsible for the content and conclusions. The National Board of Health and Welfare/IMS does not draw conclusions in the document. The specialists' summary may, however, be used as a basis for establishing the standpoint of the authority/institute.

The Committee for Disaster Medicine Studies (KAMEDO) has been in existence since 1964. It started under the auspices of the Swedish Research Delegation for Defence Medicine, which, however, was reorganized in 1974 and KAMEDO was transferred to the Swedish Defense Research Establishment (FOA). In 1988, KAMEDO was integrated into the Unit for Emergency Preparedness at Socialstyrelsen/The National Board of Health and Welfare.

KAMEDO's main task is to send observers to disaster areas all over the world to study recent disasters, collect useful information and to get familiarized with the problems of disaster medicine. The observers are sent to disaster areas with short notice, they collect relevant information on a collegial basis from doctors and others, thereby pointing out that all information received is strictly for scientific use. Four main groups of interest that have been studied are medical, psychological, organizational and social aspects of disasters.

The results of the studies are published in KAMEDO-reports. Since 1979 (report No. 34) they all include an English summary which, as of No. 55, are available from the National Board of Health and Welfare's website www.socialstyrelsen.se. A few reports have been fully translated into English but are not available on the website.

The general guidelines for KAMEDO's operations are established by a committee that convenes two to three times each year. Ongoing tasks are primarily handled by the two scientific secretaries who work for KAMEDO on a consultant basis.

KAMEDO's chairman is Bertil Hamberger, Karolinska Institutet, Stockholm. The two secretaries are Louis Riddez, senior consultant at the surgical clinic, Karolinska University Hospital in Solna; and Helge Brändström, senior consultant at the anaesthesia and intensive care clinic, centre for emergency and disaster medicine, Norrland's University Hospital in Umeå. Other members include representatives from Uppsala University Hospital, the centre for prehospital and disaster medicine in Västra Götaland region, the Swedish National Defence College (Crismart), the Headquarters of the Swedish Armed Forces, the National Police Board, the National Board of Health and Welfare, the Stockholm Fire Brigade and the Stockholm County Council.

Article number 2007-123-36

Published www.socialstyrelsen.se, september 2007

Preface

The bomb attack against four commuter trains in Madrid, 11 March 2004, is the most serious terrorist attack to occur in Spain or in any European country in peacetime. A total of 191 people lost their lives and over 1,500 were injured. The attack was so extensive that it was necessary to call in resources from several neighbouring municipalities. This resulted in not only the regional but also the national command organisation being activated – something which has previously never happened.

Madrid and Stockholm are both large, capital cities, and they have similar transport systems. Despite the fact that Madrid is four times the size of Stockholm, Sweden can learn a lot from how the rescue work during the Madrid disaster was carried out. Consequently, the comments in the report often compare the conditions in the two countries.

The observers that KAMEDO sent to Madrid were Roger Bolling, Helge Brändström, Rebecca Forsberg, Anders Rüter, Tore Vikström and Per Örtenwall. In addition Ylva Ehrlin and Vivian Soest were there on behalf of the Swedish National Police Board. The contents of this report are to a large extent based on interviews with people who in one way or another worked in connection with the disaster.

The report is oriented towards those who work with medical and psychological care during major incidents and disasters, to those responsible for training and to disaster planning coordinators at county councils and municipalities, as well as to national agencies, committees and organisations with interests in disaster management.

Per Kulling

Unit Manager

Unit for Emergency Preparedness

Observers and report authors

Roger Bolling, certified administrator, Regional unit for crisis and disaster management, Stockholm county council.

Helge Brändström, senior consultant, Västerbotten county council.

Ylva Ehrlin, police superintendent, Stockholm County.

Rebecca Forsberg, registered nurse – studying international crisis and conflict management, Umeå.

Anders Rüter, senior consultant, Disaster medicine centre, Linköping.

Vivian Soest, police superintendent, Stockholm County.

Tore Vikström, acting professor, manager, Disaster medicine centre, Linköping.

Per Örtenwall, senior lecturer and senior consultant, Västra Götaland region.

Scientific secretary

Helge Brändström, KAMEDO.

Editorial revisions

Eva Magnusson, editor at the National Board of Health and Welfare.

Analysis of material

The final review and analysis of the material was conducted by two of the authors (Helge Brändström and Per Örtenwall). This then formed the basis of the conclusions and recommendations that are expressed in the report. These should therefore be considered as personal views that do not necessarily represent the views of the entire author group.

Innehåll

<i>Preface</i>	3
<i>Summary</i>	9
Terrorist attack of March 11, 2004	9
Course of events	9
Alarm	9
Prehospital medical care	10
Medical transport and distribution	10
Prioritisation and command	10
Hospital care	11
Relatives and confidentiality	11
Psychosocial support	11
The significance of accurate information	12
Identification of the dead	12
Psychosocial support in the aftermath	12
Police investigation	13
Observer's experiences and conclusions	13
Prehospital care	13
Hospital care	17
The nature of terrorism	20
<i>Background</i>	22
Spain	22
Geography and population	22
Modern day politics	23
Medical services in Spain	23
Madrid	24
The capital city at the heart of Spain	24
The rail bound transport system	24
Healthcare in the Madrid region	24
Serious incidents	25
The ETA terrorist organisation	25
<i>The event</i>	26
Terrorist attack, 11 March 2004	26
Atocha Central Station	27
Santa Eugenia	28
El Pozo	29
Télllez – outside Atocha Central Station (Figure 3, page 28)	30
Course of events, step by step	31
Injuries caused by the explosions	32
The explosions	32
<i>Rescue work organisations</i>	34
Prehospital care	34
Summa 112	34
Samur	35
The Red Cross	37

The Madrid 112 emergency call centre	37
The rescue service	39
The rescue service association Comunidad Madrid	39
Madrid city rescue service	39
The Police	39
<i>Alarm and command</i>	41
The alarm function	41
Madrid 112	41
Summa 112	41
Samur	42
Command at the incident sites	42
Hospital management	43
<i>Prehospital care</i>	45
The incident sites	45
Atocha central station (07.39)	45
Santa Eugenia station (07.43)	45
El Pozo station (07.47)	45
Télez - outside Atocha central station (07.49)	46
Organisation of prehospital work	47
Incident sites	47
Staff	47
Casualty assembly points	47
No triage	48
Communication and command	48
The reflections of the response operation personnel	48
Medical transport	49
The reflections of the ambulance organisations	50
Summa 112	50
Samur	51
<i>Hospital care</i>	53
The Gregorio Marañón University Hospital	53
Shortage of information	54
The emergency department was emptied and operations cancelled	54
Triage carried out	54
Relatives attended to	54
Personal experiences	55
University hospital Doce de Octubre (12 October)	56
The disaster plan was followed	56
The emergency ward was strengthened and operations cancelled	56
Triage carried out	57
Relatives attended to	57
Personal experiences	57
<i>Psychosocial support</i>	59
General approach	59
Treatment at Gregorio Marañón Hospital	59
Psychosocial support was not included in the disaster plan	59
Accurate information and clear leadership were important	60

Treatment at Doce de Octubre (12 October) Hospital	61
Psychosocial work outside the hospitals	61
Relief and information	61
The relatives of the dead	61
Focused support	62
<i>Identification</i>	64
Conditions and work methods	64
At the incident site	64
Temporary morgue at the exhibition centre	64
<i>Police work</i>	66
The work of the national police	66
<i>Discussion</i>	68
<i>References</i>	72
Verbal sources	72
Published sources	72

Summary

Terrorist attack of March 11, 2004

Course of events

A total of ten bombs placed on four different trains were detonated during the terrorist attack in Madrid on March 11, 2004. Fourteen explosive devices had been prepared and put in rucksacks and sports bags which had then been placed on trains at Acalá de Henares station east of Madrid. Each bomb contained explosive material and a detonator which was connected to the alarm function of a mobile phone.

The first bomb exploded at 7.39 am, after which a further nine bombs were detonated within a period of a few minutes. Four bombs never exploded. The locations that were attacked were the central station Atocha and the stations at Santa Eugenia and El Pozo plus the area around Téllez. The trains which were attacked at Téllez and El Pozo were each estimated to have between 1,000 and 1,800 passengers onboard.

This incident is the most serious that has occurred in a European country in peacetime. A total of 191 people were killed and more than 1,500 injured. The magnitude of the attack called for the mobilisation of resources from several municipalities in the region. This resulted in not only the regional but also the national command organisation being activated – something which has previously never happened.

Alarm

The first call concerning the attack at Atocha central station came in to the emergency service centre Madrid (112) at 7.39 am on March 11. At the same time as the person placing the call was being questioned the alarm was being forwarded to the emergency service centres for the two ambulance organisations in Madrid – Summa 112 and Samur. The alarm was then also forwarded to the police and the emergency and rescue service as well as to other concerned authorities. After some time, as calls came in concerning the other attack locations, this information was also forwarded. At about 8.30 am an emergency response regional command centre was set up in Madrid. A little later, at about 10.00 am, the Spanish government established co-ordination at a national level.

During the first 16 hours more than 22,000 incoming calls were registered at the emergency service centre Madrid 112 in connection with the attacks. There was at no time a shortage of personnel at the centre since the incidents occurred at the same time as a shift change and the shift that was going off duty was ordered to remain. About 2/3 of the available switchboard capacity at the centre was engaged.

Madrid 112 was used as an information centre during the day, meaning that authorities and relatives could call there for information about the hospitals which victims had been taken to.

Prehospital medical care

The first ambulance arrived at Atocha seven minutes after the alarm was raised, and the first critically injured patient was transported from there 23 minutes later, following the arrival of the Samur ambulance organisation. Prior to this a large number of victims had taken themselves to hospitals in taxis or private vehicles.

Within 30 minutes of the alarm being raised casualty assembly points in hospital tents had been set up at all four incident sites. In addition, a sports hall at Téllez was used for this purpose. At one of the locations, at least, a tent was set up in direct proximity to a demolished railway carriage, thus placing it within the risk zone for possible further explosions.

There was a rapid flow-through at the casualty assembly points. Despite this, advanced treatment was applied at all of them, including intravenous access, intubation and pleural drainage. Life threatening haemorrhaging was also stopped by applying compression bandages and tourniquets.

Medical transport and distribution

All the injured had been moved away from the incident sites by 10.17 am, i.e. 2 hours and 38 minutes after the first explosion. Medical transport officers at the sites attempted to distribute “their” patients evenly throughout Madrid’s emergency hospitals. There was, however, no distribution system or an updating of the situations at the various hospitals available at the incident sites.

In total 927 injured persons, of whom 165 were judged to be seriously wounded, were transported by ambulance to at least 15 different hospitals and clinics in Madrid. It did not come to light until later that the distribution among the hospitals had been rather uneven.

Prioritisation and command

No form of triage system by colour marking or similar for prioritisation was used, either at the incident sites or the casualty assembly points, despite the fact that the equipment for this was readily available. It was felt that it was “obvious who had received light, serious or critical injury to the extent that an indication system was not necessary”¹.

The prehospital care operation was organised through co-operation between Samur and Summa 112. Both organisations are among the best qualified ambulance organisations in the world, in terms of both availability of advanced technology and qualified personnel. The command on site was executed by Samur, the police, and the fire and rescue service. Both Summa 112 and Samur felt that they alone had led and co-ordinated the medical

¹ This and other quotes are taken from interviews at Gregorio Marañón and Samur.

operations in the affected areas. According to the regulations the command of medical care operations lay with Samur.

Hospital care

Directly after the alarm the hospital management at Gregorio Marañón – one of the largest hospitals in Madrid and also one of the hospitals that received the most patients – took the decision to postpone all the operations planned for that day. This immediately made 22 operating theatres available. Following this, beds were made available by beginning the process of releasing patients. One hundred and sixty-one beds were made available within two hours, and within six hours 438 beds were available. Most of the intensive care patients could be moved to a lower care intensity level, intermediate care or post-operative care.

The emergency ward was organised in such a way that patients were categorised at the ambulance entrance. The most serious cases were taken to the, so called, trauma room. From there they were taken in for operation, to an ICU or to a ward that was opened especially in connection with this alert.

Relatives and confidentiality

All the hospitals were placed under extreme pressure from relatives. Just a few hours after the attacks more than 600 relatives had gathered at the accident & emergency ward at Gregorio Marañón hospital. They were shown to a large assembly hall where a list of injured patients was read out every 30 minutes.

Spanish law concerning confidentiality with regard to medication corresponds to Swedish law, but on this occasion a deliberate decision was made to override this regulation. This decision was initially taken by the affected hospitals separately, but was later sanctioned at regional and then national level.

A problem that soon affected the hospitals was that both the land line and mobile phone systems became overloaded and unserviceable. This caused difficulties in terms of information distribution both internally and externally.

Psychosocial support

The psychosocial support of the injured and their relatives at Gregorio Marañón hospital had not been prepared for in the disaster plans. The hospital management appointed a senior, experienced psychologist to take responsibility for this aspect. The point of departure was that "the first priority was to save lives, but then to apply all possible resources to protect and restore mental health". The next priority was to, firstly, care for the injured, and then the relatives and finally for the team that had cared for the victims.

According to the guidelines given in crisis management literature, one should gather families and separate them from other relatives. This was, however, not possible in this situation, since personnel had altogether too many relatives to attend to.

The significance of accurate information

Those responsible for psychosocial support soon saw the significance of giving accurate information. For this reason the names of the injured and where they were being cared for was read out. This information was updated every half hour. In order for the information to be as accurate as possible, it was first checked by a control group before being issued.

After two days a special website was set up showing a list of injured persons. The Ministry of the Interior took responsibility for the web site and the decision to publicise the list of patients. A list of those who had been killed was not made public, however.

The hospitals also strove to give accurate information to the media, in order to avoid the spreading of rumours.

Identification of the dead

The bodies and remains of the dead were taken to Ifema, which is Madrid's exhibition area. Here personnel from the "Office for mental health" took on the task of caring for the relatives of the dead. Between March 11 and 13 a team of psychiatrists, psychologists, social workers and secretaries worked around the clock to support waiting relatives. Parallel to this Summa 112 organised voluntary psychologists who worked from March 11 to 22.

Identification of the dead went very quickly; after just 24 hours 155 of the total 191 bodies had been identified and the relatives notified.

On March 13 the identification work was moved from the exhibition area to a cemetery with a cold storage room. Also here psychosocial support was available to relatives. By March 15 all the dead had been identified and the work then finalised. In 37 cases DNA analysis was required in order to certify identification.

Psychosocial support in the aftermath

Children and young people who were involved appeared not to be in great need of psychological support initially, but when a mobile unit actively started visiting schools the number of visits rose significantly. These visits were initially discouraged by headmasters and teachers, who felt that there was no need for such support in their particular school.

In addition to this, two afternoon units for involved children were set up in two of the most affected areas; these were still open a year after the event.

Relief and debriefing of operative personnel was arranged partly through the medical service's own channels, and partly through a strengthening of psychiatric care resources at healthcare centres.

The "Office for mental health" offered to provide assistance for police and fire and rescue service personnel. Both of these authorities, however, declined the offer for the reason that they would provide psychosocial support via their own channels. Representatives of the Office felt that the explanation given by the management of the police and fire and rescue services reflected a concern that external help with crisis management would undermine morale in the units and lead to an increase in sick-leave among staff.

Police investigation

The police investigation after the attack led to seven of the suspected terrorists being localised in a flat in the Leganés district on April 3. Police units surrounded the property and the neighbouring inhabitants were evacuated. Shots were fired during the break-in, after which the terrorists blew up both themselves and the flat. Continued police work during the following months resulted in the arrest of more than 20 other suspects, the majority from Morocco. The police suspect that there is a strong link between the Madrid attacks and the terrorist network al-Qaida.

Observer's experiences and conclusions

Prehospital care

Ambulance organisations

Emergency prehospital activities in Madrid are divided between two organisations – Summa 112 and Samur. Less demanding medical transport is also provided by other ambulance organisations, e.g. the Red Cross.

Summa 112 is operational in the whole of the Madrid region, whereas Samur only operates in the city of Madrid. Consequently there are two emergency ambulance organisations operating in central Madrid, of which Summa 112 is responsible for emergency calls within private housing areas and Samur is responsible for incidents occurring outdoors and in some official buildings.

Comments: Both Summa 112 and Samur are among the best qualified ambulance organisations in the world in terms of advanced technology and qualified personnel.

The allocation of emergency services depending on whether the incident has occurred in private housing or a public place appears rather strange from a Swedish perspective. The representatives for the two organisations, however, saw no problem in this. There is obviously a degree of "rivalry" between the organisations, which was apparent during the actual event, in that both organisations felt that they alone had led and co-ordinated the healthcare operations at the incident sites.

Regulations stipulate that responsibility for the healthcare operations lay with Samur. The doctors who were sent out by Summa 112 were therefore assigned no managerial roles by Samur as they were working within an organisation that was not integrated with Samur. Instead these doctors were allocated tasks concerning individual patients.

The importance of recognising and adhering to the framework that sets the limits between co-operating organisations is made very apparent. In Swedish terms this would apply more closely to co-operation between the fire and rescue services, the police and the medical service, but it could also apply to the Civil Aviation Administration, Maritime Administration and the mountain rescue service when incidents occur within their respective areas of responsibility.

Summa 112 has at its disposal 70 ambulances and emergency vehicles, as well as two helicopters, while Samur has about 130 ambulances, emergency vehicles and motorcycles. Both organisations also have their own staff vehicles and special disaster vehicles. Samur has 30 emergency vehicles manned with doctors. These go out along with an ambulance in order to follow and assess the work of the ambulance crew in accordance with a special model. Directly after the response the ambulance crew is graded for its performance, and feedback on the response is given.

Comments: Even taking into account the fact that Madrid is about three times more populated than Stockholm, the total resources there are significantly greater than Stockholm's. It is also interesting to note the primary purpose of the emergency vehicles manned with doctors, namely to assess the work of the ambulance crew. This resource is an excellent way of increasing the quality of ambulance responses, and it is also an extra resource should it be required.

Response plans and alarms

The response plan Platercam is based on the law regulating civil protection and emergency response. This law defines the areas of responsibility of the different authorities including the police, emergency and rescue service, and medical service. All responses begin at a local level (level 1). If the incident is of a scale requiring the mobilization of resources from several neighbouring municipalities, a regional command is set up (level 2), based at the Madrid 112-centre. The highest level is level 3, which is national. This level involves the Ministry of the Interior and the establishment of a national crisis cabinet to support the affected region.

At about 8.30 am, just under an hour after the explosions, Madrid 112 took the initiative to set up a regional command, i.e. level 2 in Platercam. Sometime later level 3 was activated by the Spanish government.

Comments: The Platercam response plan enables extremely rapid intervention and take-over of command at a national level. Sweden should consider establishing a model for a similar plan, i.e. for a rapid increase in preparedness and a take-over of the command of emergency and medical responses at the optimal level, based on the characteristics and scope of the incident.

The first incoming call concerning the explosions was received by Madrid 112 at 7.39 am on March 11. At the same time as the person placing the call was being questioned, the alarm report was forwarded to the emergency centres at Summa 112 and Samur in accordance with established procedures. In addition, the alarm was forwarded to the police and the emergency rescue service and other affected authorities.

Comments: A direct transfer of the alarm made it easy to rapidly forward the alarm to where it was required. Also in Sweden emergency centre op-

erators hold a key position in terms of the initial assessment and alarm in a serious situation. They should therefore be trained for and should simulate such situations.

Casualty assembly points and evacuation

Casualty assembly points and triage tents were set up extremely quickly, within 30 minutes, at three of the incident sites - Atocha, Santa Eugenia and El Pozo. A sports hall was used for the purpose at Téllez. All the injured that were cared for by Samur passed through the casualty assembly points and were then transported using different types of ambulances.

The processing at the casualty assembly points went very quickly – from 1 hour 10 minutes to, at the most, 2 hours 28 minutes. Despite this, advanced treatment was applied at all of them, using intravenous access, intubation and pleural drainage. Life threatening haemorrhaging was also stopped by applying compression bandages and tourniquets. A large number (about 30 percent) of those less seriously injured made their own way to a hospital, without passing through a casualty assembly point.

***Comments:** The spontaneous/wild evacuation of the injured using various forms of transport results in a swift influx of wounded to the hospitals, with the least injured often arriving first. This is a well known phenomenon when incidents occur close to hospitals, but it is something that is often disregarded when planning or training for major disasters. At the same time it is acknowledged that efforts should be made to avoid this as it creates disorder. The phenomenon is, however, in practice difficult if not impossible to influence.*

It would perhaps, instead, be better to see it as an asset rather than an impediment in situations where the medical transport capacity is limited in relation to the number of injuries. The important thing is that the personnel at the hospital are aware of the phenomenon and plan their routines accordingly. In practice it means that the hospital emergency reception quickly receives a large number of wounded that have not been diagnosed, and consequently not prioritised either. Because of this the accident & emergency wards become in practical terms a part of the incident site.

According to Swedish disaster medicine the first priority in city environments is to move the wounded to hospital as quickly as possible, in line with the scoop and run principle. In Madrid, however, with a larger number of ambulances and close proximity of many large hospitals, the decision was made to set up casualty assembly points and to stabilise patients.

Both ambulance organisations consider that success lies in stabilising critically injured patients prior to transportation. In this instance they considered it to have been directly life-saving in many cases, in addition to relieving the pressure on the emergency wards. Such a strategy is based on the assumption that the stabilisation process, with the obvious increase in time taken to reach the hospital, can take place without increasing the risk of death or disablement. This assumption has never been substantiated.

From a Swedish perspective the above should be something to reflect upon. It is the opinion of the observers that casualty assembly points with

protection and warmth should always be used for major disasters in remote areas with few ambulances and long transportation distances. There is perhaps also good reason to reconsider the scoop and run doctrine for highly populated areas in cases involving many and seriously injured. The time factor is, of course, critical in both situations, i.e. how long it takes to set up a tent or gain access to a building. Each separate case involving injury requires an assessment of the response tactics at an early stage, based on the prevailing conditions.

Prioritisation and distribution

Triage tags were not used in Madrid, despite the fact that the equipment was readily available. It was judged to be sufficiently obvious how seriously injured people were.

Comments: *Within Swedish disaster medicine, training is carried out on a prioritisation basis; triage tags are included as a natural part of this. In Madrid there were no special disaster medical records or casualty cards, instead ambulance medical records made of thin paper with a carbon function were used. The weather was favourable but had it been raining or snowing, this would not have worked. In Swedish conditions triage and triage tags such as casualty cards should continue to be used as support for fast and appropriate care and as a part of the quality system during disaster medicine training.*

No form of distribution key or updating of the capacity situations at the hospitals was available at the incident sites. There are at least eight hospitals in Madrid with large emergency care capacity, and thus each medical transport officer tried to distribute “their” patients evenly to these.

In total 927 injured persons, of whom 165 were judged to be seriously wounded, were taken to hospital by ambulance. Not all the injuries were registered, however. There are also reports of people with slight injuries being referred directly to healthcare centres by the hospital emergency receptions, and some patients with minor injuries were treated without being registered before being sent home. Consequently the picture of the number of injuries is not completely accurate.

Comments: *A common system for the distribution of the injured to the hospitals was never implemented. Despite the fact that a regional command was established quickly (8.30 am) three of the four incident sites were more or less evacuated before the command function was up and running (10.00 am). Shortcomings in the distribution of the injured to the various hospitals were compensated for to a large extent by the huge hospital capacity in Madrid and the fact that the hospitals were warned at such an early stage. The distribution of patients between the different hospitals was not optimal, however.*

Spontaneous evacuation of patients, in combination with an intensive flow of patients to the closest, large hospitals, meant that the load placed on the key functions at the hospitals varied by the minute.

In practice, the hospitals lacked appropriate tools for describing and reporting their load, something that would have facilitated a more even distribution. In this situation of high loading, the staff abandoned the IT-system normally employed for reporting, among other things, the number of beds available. This indicates that the system was difficult to use and not suitable for a disaster situation.

Conditions are the same in Sweden, and it is probable that if a similar situation occurred in one of our large cities the outcome would be the same as in Madrid. Additionally, in Sweden the requirement for leadership and co-ordination is generally even higher both at incident sites and within the healthcare itself, since immediate hospital space is less readily available.

From a Swedish perspective one should learn from the events in Madrid and train and assess the command and reporting systems.

Hospital care

Command, prioritisation and communication

The hospitals were managed by those normally responsible, who received no information directly from the incident sites other than via the patients and ambulance personnel. During the most intensive period about 120 patients arrived per hour. Many of these were critically injured and some were intubated. Despite this, there was never the feeling of shortage of either places or personnel at either of the two hospitals that took in the majority of patients. Management of psychological care had not been planned in advance, but rather various solutions developed during the course of events. An information support system was not available but was developed throughout the day, which, among other things, involved some conscious departures from the laws concerning confidentiality.

Comments: The hospitals were managed by their normal management personnel. From a Swedish perspective this is an aspect of interest, as we would normally, in extreme situations, set up a special management group. It is also interesting that management of psychological care was not planned or trained for in advance, that no information system was in place and that conscious departures were made from the laws concerning confidentiality. This illustrates the importance of the hospital management being familiar with their roles, that psychological care is prepared for and that an information support system is available.

The two hospitals which we visited received many injured persons who had arrived via taxi, the police or private vehicles. These were not diagnosed by healthcare personnel at the incident sites and consequently triage functions were set up at the entrances. Those who could walk were shown to a waiting room, while those on stretchers were taken directly to wards. Some triage

tags were never used, with the explanation that "we didn't have enough forms".

Another difficulty at the hospital was the inability to transfer information. Communication was a problem since both the mobile and land line phone systems collapsed both internally and externally due to overloading.

Comments: Because both the triage tags of patients arriving at the hospital emergency reception, as well as the inability to transfer information within the hospital via normal and mobile phones, are probably just as sensitive to extreme loading here in Sweden, it is likely that the same difficulties would occur in the event of such extreme circumstances. It is therefore particularly important that these aspects are taken into account in our disaster plans.

Psychosocial support, confidentiality and debriefing

With regard to the psychosocial support of the injured and their relatives that was carried out at Madrid's largest hospital, Gregorio Marañón, one could quickly draw the conclusion that the hospital had not included this aspect in its disaster plans. The hospital management quickly appointed an experienced psychologist to take responsibility for this. The decision was made to refer the relatives to Aula Magna – a large assembly hall in the hospital area. At the time of this decision being made some 600 relatives had gathered outside the hospital and several more joined later.

As information on the injuries reached the management for the psychosocial response, a list of the names of the injured and where they were being treated was read out. By doing this the laws concerning confidentiality were breached. The information was updated every half hour.

In order to make the information as accurate as possible, it was checked by a control group before being issued. A special web site containing lists of the injured was set up after 48 hours. Responsibility for the web site and the decision to publish lists of patients lay with the Ministry of the Interior. This decision also involved the laws concerning confidentiality not being adhered to. A list of the dead, on the other hand, was never made public.

The psychosocial support focused on three groups:

- all those affected
- children and young people affected
- personnel who worked with the injured and the dead.

All those affected could call a special number if they required help or support. The call centre was manned by psychiatrists and psychologists and was open until the end of June 2004. Thirty-six call lines were available in addition to those normally functioning within Madrid's mental health organisation.

Children and young people who were involved appeared initially not to be in great need of psychosocial support, but when a team actively started visiting schools with a mobile unit, the number of visits increased considerably and a clear internalisation of the anguish and suffering they were undergoing was brought to the surface. Afternoon centres for affected children were

opened in two of the worst affected areas; these were still open a year after the event.

Relief and debriefing of operative personnel was arranged partly through the medical service's own channels and partly through a strengthening of resources at healthcare centres and psychiatric clinics. The "Office for mental health" offered help with debriefing for police and fire and rescue service personnel, but their participation was surprisingly low. Both organisations claimed that they managed these aspects via their own channels, but they have not made it easy for their personnel to apply for such help. Some people within the Madrid office for mental health said that management was afraid that psychosocial support could lead to absence due to illness and undermine morale, and that this could have been the reason behind their response.

Comments: The disaster plans were followed, the emergency ward resources were strengthened, operations were postponed and the triage function was activated at both hospitals. At Gregorio Marañón hospital the psychological aspect had not been considered in the disaster plan. Despite this, the decision to solve the care of relatives by gathering them in a large assembly hall was quickly reached – a solution which, incidentally, was also used at the Doce Octubre Hospital. This initiative was the result of one person's decisiveness, and should not be taken as justification for not preparing for the problem of caring for the relatives of victims in extreme situations.

The confidentiality aspect with regard to issuing information proved to be problematic; laws concerning confidentiality were not followed, and most likely the problems surrounding both suitable locations for relatives and the need for information were underestimated.

From a Swedish perspective it is crucial that psychological disaster management is trained for and that premises and a model for issuing information to relatives are taken into account in the disaster plans. It is also important to consider how to distribute accurate information should the phone systems become overloaded. Focussed support for the most seriously affected groups should be planned for, and special attention paid to children and young people, bearing in mind the experiences gained from Madrid. The care of operative personnel is often neglected, and if some groups see the need for help as a weakness as opposed to a need, then this should also be borne in mind.

Identification

The process of identifying the dead went very quickly. By March 12, twenty-four hours after the event, 155 of the total 191 dead had been identified and their relatives notified. Hotel rooms were booked for the relatives that could not be informed that quickly, and a special reception providing psychosocial support was opened.

On March 13, the continued work of identification was moved to a cemetery with a cold room. Here too psychosocial support was available to relatives who received the information that a family member had been identified

among the dead. The work was finalised on March 15 once the identification of all the bodies had been completed.

Comments: The identification process must be considered as having been extremely quick and effective. In disasters involving many dead, especially in hot climates, this work can become very complicated. This was clearly demonstrated during the tsunami disaster in south east Asia in 2004. This aspect should be taken into account in disaster plans.

The nature of terrorism

On March 11, ten bombs were detonated on four different trains. Four bombs never exploded. One reason for this was that the timer was set 12 hours too late. The police collected a bag containing one of the four unexploded bombs and took it to a police station without realising what the contents were – 10 kg of explosives and a detonator. In addition to the explosive device, the bag held a large amount of metal fragments, including nails, the purpose of which was to maximise injury to passengers close to the bombs.

Comments: The main purpose of a terrorist attack is to strike terror into the population and paralyse the society which has been targeted. For this reason terror bombings are often carried out at locations where many people are gathered. Experience has shown that suicide bombing, i.e. bombings carried out by people carrying a bomb about their person, are the most difficult to protect oneself against. Furthermore, the explosive devices are often constructed to cause maximum injury to people; so called anti-personnel bombs.

The emergency care of physical injuries does not depend on whether the injury has been caused by an accident or a terrorist attack. There is, however, every reason for management to pay extra attention to the security of personnel in the case of a terrorist attack. The work should be managed bearing in mind the risk of further explosions and the collapse of buildings. In Sweden there is a lack of recognition of the possibility of becoming the target of a terrorist attack, and that such could be planned to first detonate one bomb to draw in emergency service personnel and then set off further bombs to cause a maximum amount of damage to the various emergency service organisations.

It could be questioned whether the healthcare service in Stockholm could cope with a disaster similar in scale as that in Madrid, with almost 1,500 injured. In Stockholm there are seven hospitals with emergency wards, whereas in Madrid the injured were taken to 15 of a total of 24 different hospitals that were available.

One way of tackling this situation in Sweden would be to redistribute the injured – particularly those requiring intensive care – to other hospitals, either close to Stockholm (by road) or further a field (by air). The capacity to transport patients requiring intensive care is limited, however. Moreover

the management and co-ordination of such a large scale transfer has never been trained for in Sweden.

Background

Spain

Geography and population

Spain is one of the oldest and largest countries in Europe. Mainland Spain makes up 85 percent of the Iberian peninsular. The Balearic Islands in the Mediterranean and the Canary islands in the Atlantic, as well as the towns of Ceuta and Melilla on the Mediterranean coast of Morocco also belong to Spain.

In total it covers an area of 504,880 sq km and has a population of 42.8 million (2004). The official language is Castilian (Spanish). With the exception of the capital, Madrid, the population is concentrated in the coastal regions, the Canary Islands and the Balearic Islands.

Low population growth during the major part of the 20th century took a distinct upswing at around the time of the millennium. From being an emigration country, Spain received the largest immigration influx of any EU country. In 2003 just over six percent of the population were immigrants, of which half were thought to be illegal.



Figure 1. Spain Illustration: Claes Stridsberg

Modern day politics

Since the death of the dictator Francisco Franco in 1975, Spain has been transformed from a centrally controlled dictatorship to a decentralised democracy. The political stage is dominated by two large national parties – the socialist party *Partido Socialista Obrero Español* (PSoe) and the conservative party *Partido Popular* (PP). The socialist party, which had been in opposition for eight years, unexpectedly won the parliamentary election in March 2004. The terrorist attack in Madrid, or rather the way in which it was handled by the then prime minister, José Maria Aznars, is felt to have been the deciding factor.

Up until the final moments all the opinion polls indicated a further victory for the conservative party. But as it became increasingly more probable that Islamic forces lay behind the terrorist attacks, the attitude of much of the population changed. The government was heavily criticised for supporting the USA's war against Iraq and for withholding information on the terrorist attacks. On the Saturday before the election thousands of people demonstrated outside the Partido Popular headquarters in Madrid and other towns.

In July 2004 the prime minister, José María Anzar, said during a radio interview that he knew before the election that the police had dismissed ETA as a suspect and that he had withheld this information from the public. As the prime minister had considerable support for his hard line against the Basque terrorists, it would have been politically advantageous for the Partido Popular party had ETA been responsible for the attack. But as an Islamic movement was responsible, the public took the attacks as retribution brought about by Aznar's support for the USA in the Iraq war. The socialist party and its leader José Luis Rodríguez Zapatero won the election, condemned the occupation of Iraq and at the end of May recalled all Spanish military forces. Consequently the terrorist action in Madrid can, from the point of view of the terrorists, be considered a success, since it achieved the goal.

Medical services in Spain

Public healthcare in Spain is free for all residents. The cost of this tripled between 1982 and 1993, but was nevertheless still in 2004 below the EU average. As a result of increased costs, a limit has been put on medication subsidies. More than six million Spaniards have private healthcare insurance.

Social insurance encompasses essentially pensions, as well as sickness and parent allowance. This is financed through income tax, payroll tax and the national budget. The cost of the pension system is considerable and is increasing in line with the rapidly rising average age of the population. The EU has demanded that Spain reforms its pension system in order to keep its future economy in balance.

Madrid

The capital city at the heart of Spain

Madrid, the capital of Spain, lies at the heart of the peninsular, in the middle of the Castilian plain, 646 metres above sea level. Some 3.2 million people live here. This number is further increased every day by 1.5 million commuters. Madrid is a cosmopolitan city, a business centre, the headquarters for the Public Administration, the Government and the Spanish Parliament. The Spanish Royal Family also resides here.

In addition it plays an important role within the banking and industrial sectors. The industry is located mainly on the southern outskirts of the city, where the large textile and food processing factories lie along with engineering plants. Madrid is characterized by intense cultural and artistic activity and a very lively nightlife.

As it is the capital there are many buildings and institutes with large symbolic significance which are naturally of interest to dissidents who disagree with the country's political agenda.

The rail bound transport system

Madrid has a well developed rail bound transport system consisting of underground, commuter, regional and long-distance trains. Rail traffic is operated by the Spanish National Rail Network (Red Nacional de los Ferrocarriles Españoles, Renfe), which is the equivalent of SJ in Sweden. The underground system is operated by the city of Madrid. Buses complement the rail bound transport systems with routes both within and between sections of the town.

A consortium has been created to coordinate public transport. This is made up of Consorcio de Transportes de Madrid, which is responsible for traffic links between the surrounding districts, and the rail network Renfe, which is responsible for buses, the underground and the commuter train network in Madrid town. Regional trains in Spain traffic shorter distances, usually within the local region. Long-distance trains traffic the longer routes between the regions. These consist of the high-speed trains (Alta Velocidad, Ave) and the equivalent of intercity trains (Grandes Lineas).

On a normal working day the rail network in Madrid carries about 880,000 passengers via a total of 1,325 departures from 93 stations. The terrorists made use of the Corredor del Henares line, which, on a normal day, carries 200,000 passengers on 335 trains via 14 stations. By way of comparison we can say that Stockholm's rail system (SL) carries a total of about 600,000 passengers per day, of which some 100,000 are carried by the commuter train network's 292 carriages.

Healthcare in the Madrid region

Comunidad de Madrid is the administrative body for the healthcare of the 5.7 million inhabitants in the Madrid region. In addition to these numbers, there are also estimated to be about 800,000 illegal immigrants. The region is divided up into eleven districts with at least one emergency hospital in

each. In total there are 24 hospitals, with some 12,000 beds, and 399 health-care centres. Eight new hospitals are at present under construction. Again by way of comparison, the population of Stockholm county is 1.9 million (Stockholm Town, 0.8 million) and there are seven hospitals with some 3,000 beds. In addition there are 140 district healthcare centres and a number of local emergency care centres and local hospitals.

Serious incidents

Plan Territorial de Protección Civil de la Comunidad de Madrid (Platercam) is a response plan based on the legislation that regulates civil protection and emergency response in Spain. This legislation defines the areas of responsibility for the various governmental agencies, including the police, emergency and rescue service, and healthcare.

Platercam works on the basis that all responses are initiated at a local level (level 1). If the incident becomes so extensive that resources have to be called in from regional municipalities, a regional command is established (level 2). The regional command is run from the 112 centre and is manned by commanders and managers from the cooperating governmental agencies and organisations. Level 3, which is the highest national level, entails the involvement of the Ministry of Home Affairs and the setting up of a crisis cabinet to support the affected region.

The ETA terrorist organisation

The terrorist organisation ETA (Euskedi ta Askatasuna – the Basque Country and freedom) was founded in 1959 by a group of students. It was originally an underground resistance movement that fought for Basque independence. It worked mainly through propaganda and underground education in Basque – a language that was forbidden during Franco's dictatorship. ETA had considerable support when after some years it started to use violence. In 1968 ETA carried out its first political murder and in 1973 was responsible for the murder of the Spanish Prime Minister Luis Carrero Blanco, who had been appointed by Franco to succeed him. Even people who were opposed to violence had difficulty condemning the murder as it put a stop to Franco's plans for the continuation of the dictatorship after his death.

Still today ETA demands an independent Basque Country which would include Navarra and the Basque regions of France, where the group is also active. Since 1968 ETA has been responsible for 800 murders. The victims have in the main been police and military officers as well as politicians who have opposed ETA's demands. The movement has also targeted tourism in the country. Consequently Spain has considerable experience of terrorist activity, and it has plans of action in the event of terrorist attacks.

The event

Terrorist attack, 11 March 2004

At the time of the explosions 20 trains were in service along the affected Corredor del Henares line. The train stations hit by the explosions were the central station Atocha, and the stations Santa Eugenia and El Pozo as well as the area around Téllez. Information about the number of passengers on the trains that were attacked varies, but it is fairly clear that those at Téllez and El Pozo were carrying about 1,000 and 1,000 – 1,800 passengers respectively. Generally speaking a normal carriage holds a maximum of 250 passengers, seated and standing.

The explosive devices were put onboard the four trains at Alcalá de Henares station, to the east of Madrid. A total of 14 had been prepared and placed in rucksacks and sports bags. Each bomb contained explosive material and a detonator which was connected to the alarm function on a mobile phone.

A witness told of how, when he came to Alcalá de Henares at around 7 am, he was surprised to see three hooded young men standing by a van. One of the men walked off towards the trains carrying a rucksack and a bag while the other two remained by the van. When this van was later found by the authorities it contained both detonators and a video of Islamic readings.

Four bombs never exploded because the timing devices had been set twelve hours too late. The police took charge of one of the bags containing one of these four bombs and took it to a police station without being aware of the contents. In addition to explosives the bag contained a large amount of metal fragments including nails, with the purpose of inflicting as much harm as possible on the passengers in the vicinity of the explosion. The remaining three bombs were exploded by police bomb experts under controlled conditions.

The events of 11 March in Madrid are the most serious ever to have occurred during peacetime in Spain, and even in Europe, with 191 deaths and more than 1,500 injuries. The attack was so extensive that it was necessary to call in resources from several neighbouring municipalities. As a result of this, both regional and national levels of leadership became involved; this has never occurred previously. The Ministry of Home Affairs was drawn in and a crisis cabinet established to support the affected region.

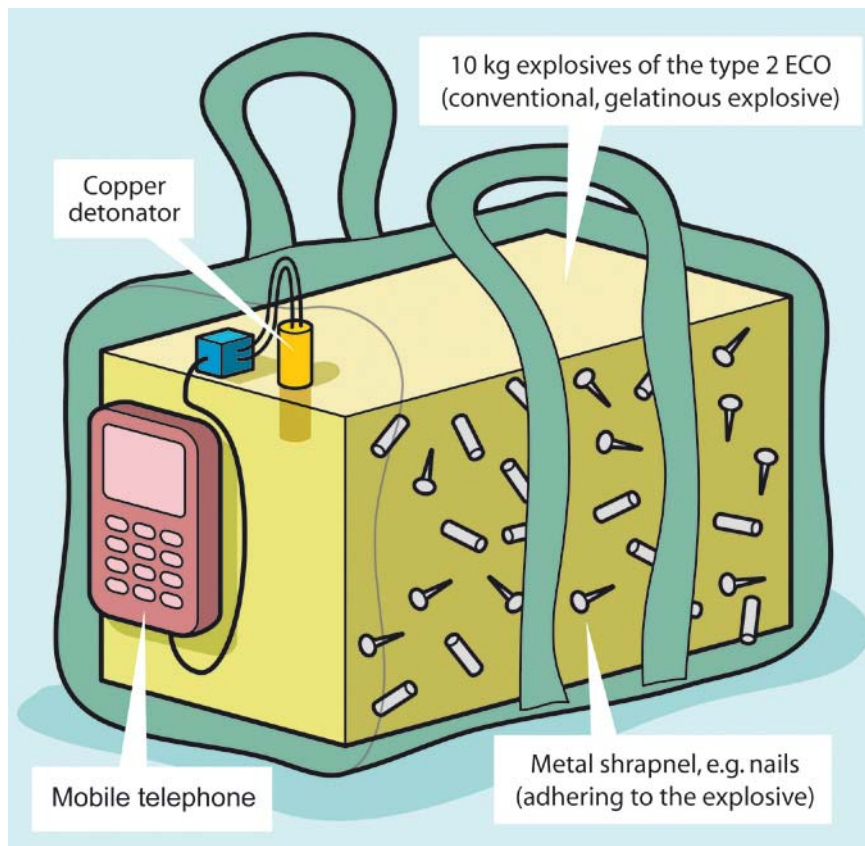


Figure 2. Bomb bag construction
 Illustration: Claes Stridsberg. Adaption of the original: SAMUR

Atocha Central Station

The train at Atocha station had bombs placed in carriages 3, 4 and 6. They exploded at 07.39 after the train had arrived at the platform and the doors had opened. The explosions immediately killed 29 people and injured 115. The effect of the blast was to an extent reduced by the doors being open, which in turn affected the casualty situation: there were more injuries here but fewer deaths in comparison to the other incident sites.

The first call regarding the incident was received by the emergency call centre Madrid 112 directly after the explosion; seven minutes later the first ambulance was at the incident site. Because the first bombs exploded at Atocha, it was to this site that most of the ambulances were sent. In total 102 ambulance transports were carried out. The incident site was evacuated after 1 hour and 41 minutes.

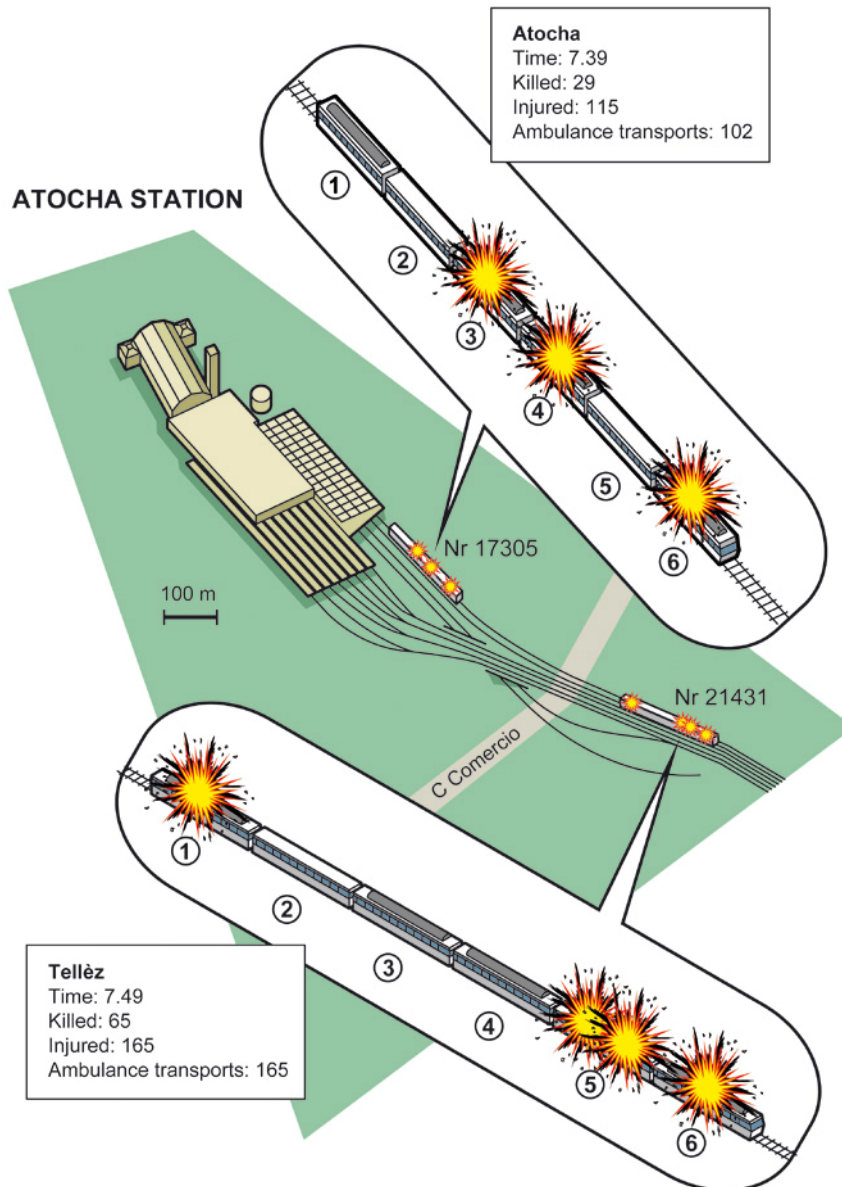


Figure 3. Three bombs exploded at Atocha station and four at Telléz.
 Illustration: Claes Stridsberg. Adaption of the original: Hospital general universitario Gregorio Maranon

Santa Eugenia

Only one bomb exploded at Santa Eugenia, at 07.43 in carriage 4 while the train was standing at the station with the doors closed. The explosion caused 17 deaths and 52 injuries, as well as damage to the station buildings. The first emergency call was received from Santa Eugenia station at 07.43; the first ambulance arrived there nine minutes later. 52 ambulance transports were carried out from here to various hospitals. All the injured had been transported from the incident site within 1 hour and 15 minutes.

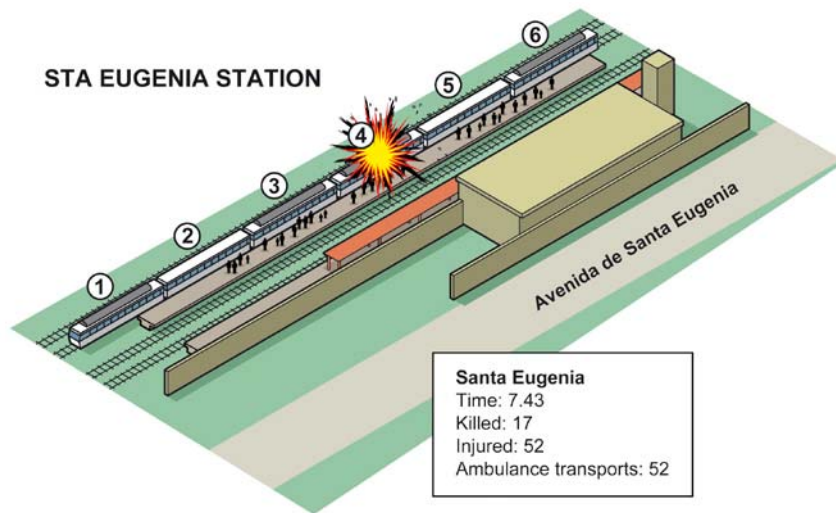


Figure 4. One bomb exploded at Santa Eugenia while the train was standing at the station.

Illustration: Claes Stridsberg Adaption of the Scene: Hospital general Universitario gregorio maranon

El Pozo

The train arriving at El Pozo was a double decker. Two bombs exploded in carriages 4 and 5 as the train arrived at the station. The double decker construction of the carriages and the fact that the doors were closed resulted in the injuries being extra severe. There were more fatalities at this incident site, 67, than any other. Few survived in the carriages containing the bombs and the 56 people that were injured were primarily on the platform.

Two additional unexploded bombs and a suspicious object were found during the rescue operation.

This meant that all personnel except the police bomb group (Tedax) were forced to interrupt the rescue work and evacuate the incident site on three occasions. The attack at El Pozo station was the third, which meant that it took longer to mobilize and direct adequate resources to the site. The first emergency call was received at 07.47; the first ambulance arrived at the incident site 15 minutes later. Within 1 hour and 10 minutes all the injured had been taken to hospital.

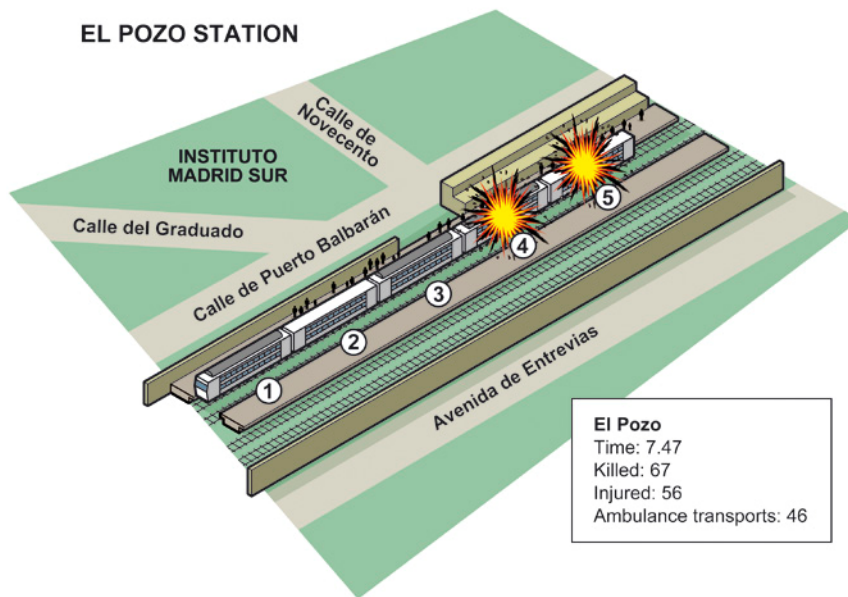


Figure 5. Two bombs exploded at El Pozo station.
 Illustration: Claes Stridsberg Adaption of the Scene: Hospital general Universitario gregorio maranon

Télez – outside Atocha Central Station (Figure 3, page 28)

The explosions at Télez occurred as the train was approaching Atocha station, some 500 metres from it. Two bombs exploded in carriage 5, one in carriage 1 and one in carriage 6. The doors were closed and many of the 65 people killed were thrown out of the train by the explosions. The bombs went off before the train reached the station because the train was running a few minutes late, and because of this nobody outside the train was injured. Nevertheless, there were 165 casualties, all passengers on the train.

The first emergency call from Télez to Madrid 112 was received at 07.49; eight minutes later the first ambulance was at the incident site.

Incident management was not initially aware of the fact that there were two incident sites at the central station. As a consequence, all the resources were at first directed to the central station building. Therefore there was initially a shortage of resources at Télez causing evacuation of the injured to be somewhat delayed. Many volunteers began rescue work of their own accord. After 2 hours and 28 minutes the 165 injured had been taken by ambulance to hospital and the evacuation completed. By 10.17 on 11 March 2004 all the incident sites had been evacuated.

Course of events, step by step

Thursday 11 March

Time	Event
07.00-07.17	All the trains involved leave Alcalá de Henares.
07.39	Explosions at Atocha station.
07.43	Explosion at Santa Eugenia station.
07.47	Explosions at Pozo station.
07.49	Explosions at Téllez.
07.56	The first two injured arrive on foot at Gregorio Marañón hospital.
08.00	Emergency response plan at Gregorio Marañón implemented. Planned operations cancelled. (Time 08.15).
08.30	Regional command set up at Madrid 112 centre.
08.57	All the injured attended to and transported from El Pozo. (1 hr. 10 min.)
08.58	All the injured attended to and transported from Santa Eugenia. (1 hr. 15 min.)
09.20	All the injured attended to and transported from Atocha. (1 hr. 41 min.)
09.30	112 centre establishes a central phone number for information about the dead and injured.
10.00	Regional command function (level 2) operative; soon after, national command (level 3) is operative, and all support functions active.
10.17	All the injured attended to and transported from Téllez. (2 hr. 28 min.)
11.00	Decision taken by the crisis cabinet to use the Ifema exhibition centre as a morgue.
13.00	Renfe returns to its normal role as the information centre at central station after the evacuations.
13.20	The first autopsy is begun.
14.00	The first official figures for dead and injured are announced (175 dead and 898 injured).
17.00	Clearing up operations at the four incident sites are begun.
18.00	Some trains are running again.
19.15	Rescue work completed at all the involved stations.

Friday 12 March

Time	Event
01.30	191 victims are identified.
04.30	The train wreck at El Pozo is removed. Central station Atocha begins to function again.
20.00	Atocha station fully functional. Almost all rail services restored during Friday evening. Huge manifestation decrying terrorism held throughout Madrid.

On Monday 15 March all the victims had been identified and all rail services in Madrid reported to be running normally.

Injuries caused by the explosions

The explosions

Discussions following the terrorist attack of 11 September 2001 have primarily concerned the use of weapons of mass destruction (CBRN/NBC) in terrorism. The most common way of carrying out terrorism is, however, by using explosive material, i.e. by detonating a bomb. Between 1991 and 2000 explosive devices were used in 83 of the 93 terrorist attacks, which injured more than 30 people in 27 countries.

Explosions are characterised by the release of energy upon rapid combustion resulting in a rapidly expanding, fiery sphere of gas. The increase in volume creates a shock wave directly proportional to the strength of the charge. If the blast is permitted to expand without restriction, its force decreases by the cube of the distance from the explosion centre. The force of a charge is usually specified in terms of the amount of trotyl (TNT – trinitrotoluene) required to obtain the same explosive force.

If the charge has some form of metal casing, the casing will be fragmented and spread in the form of shrapnel. This effect can be increased through the construction of the casing and by placing nails or metal fragments around the charge.

Explosive substances are manufactured commercially for both civilian and military use. There are also descriptions available on the Internet of how to make effective explosive substances from basic, easily available ingredients.

Injury mechanism

Physical injuries from explosions are divided into primary, secondary and tertiary injuries.

- *Primary blast injuries* mainly affect the body's gas-bearing cavities, i.e. the middle ear, lungs and intestines. Eardrum injuries occur with relatively weak blasts and are thus most common. Primary lung injuries caused by blasts (so-called blast injuries), however, require higher energy levels. These injuries consist of alveolar ruptures with haemorrhaging, sometimes complicated by pneumothorax. Symptoms can sometimes appear with up to a 48-hour delay, in the form of breathing difficulties, oxygen deficiency and coughing of blood. Treatment consists of intubation, assisted ventilation and possible insertion of pleural drains. Intestinal perforations primarily occur in connection with underwater explosions.
- *Secondary injuries* are inflicted by shrapnel from the charge, its casing or other solid parts.
- *Tertiary injuries* are caused by the blast throwing victims against objects in the surroundings. Moreover, thermal injuries occur among those who are closest to the explosion.

The injuries produced depend on the environment in which the explosion occurs. Generally speaking explosions in confined spaces cause more injury than those in open spaces, because the blast retains its strength longer and

because it can meet people's bodies several times through reflection. The most severe injuries occur when an explosion is followed by the collapse of a building. A subsequent fire could also cause thermal as well as smoke-inhalation injuries.

Rescue work organisations

Prehospital care

In the Madrid region responsibility for the ambulance service and prehospital emergency care is divided between three different organisations – Summa 112, Samur and the Red Cross. Acute prehospital care is carried out by Summa 112 and Samur. Less demanding transport is also carried out by other ambulance organisations, e.g. the Red Cross.

Summa 112 operates throughout the whole Madrid region, while Samur operates only in the city of Madrid. In the centre of Madrid, Summa is responsible for all emergency responses to private accommodation while Samur is responsible for responses to incidents occurring outdoors and in some public buildings.

Incoming emergency calls are first assessed by Madrid 112 – the common emergency call centre for the whole Madrid region. Madrid 112 is Europe's largest emergency call centre. It receives 1.2 million calls per year, of which 60,000 concern direct life threatening situations.

The 112-operators at Madrid 112 assess and distribute the tasks to the different organisations.

Summa 112

Summa 112 (Servicio de Urgencia Médica de Madrid) was created in 2003 by combining a number of already existing ambulance organisations. It coordinates emergency response and incident and accident response in the whole of the Madrid region, to the extent that it is responsible for all emergency care outside the city of Madrid; within the city of Madrid it is responsible only for emergency illness and incident response to private accommodation.

When the Madrid 112 emergency call centre judges that a response belongs to Summa 112, it sends a computerized alarm report to the Summa 112 emergency call centre. In some cases the call itself may also be transferred to Summa 112. Summa 112 is staffed by both 112-operators and several emergency care doctors.

In addition to the ambulance service, it also provides special home healthcare teams, is responsible for transportation between hospitals (including incubator transports) and provides healthcare advice. In total Summa 112 emergency call centre employs 100 switchboard operators, 31 doctors and 20 technicians.

The hospitals in Madrid report their patient loading situation to Summa 112 three times a day, i.e. the total number of available beds and the loading in the intensive care wards.

Summa 112 has a cooperation agreement with, among other organisations, Samur and the Red Cross. In total Summa 112 has about 800 employ-

ees, of which 240 are doctors, 150 nurses, 350 ambulance emergency medical technicians (EMT) and about 100 112-operators, communication technicians and administrative personnel. It has the following mobile units:

- 23 ambulances with doctor (ALS).
- 39 conventional ambulances (BLS).
- 8 fast response cars with doctor.
- 2 helicopters.

In addition it has at its disposal three command vehicles, one vehicle for the transportation of organs, a mountain rescue vehicle and a special ambulance for patients allergic to latex.

Samur

Samur (Servicio de Asistencia Municipal de Urgencia y Rescate) was created in 1991 to carry out prehospital emergency care in the city of Madrid. The organisational structure is hierarchical and all personnel wear a uniform with a badge of rank. Samur does not come under the public health service but under a special administration in Madrid municipality which is responsible for civil security. The municipal rescue service (Bomberos) and the local police (Policía Municipal) also come under this administration.

Samur is responsible for the care of the seriously ill or injured at incident sites outdoors. Services are carried out from 17 stations in Madrid. It has its own reporting staff in the underground system, taxis etc., that can report directly to it.

Samur is also responsible for medical care in public buildings and in connection with public events (about 100 times per year). If a serious incident occurs in connection with such, Samur has the overall responsibility for the medical response.

When Madrid 112 judges that a task belongs to Samur, the call is forwarded to the Samur call centre. The Madrid 112 call centre and the Samur call centre are actually located in the same premises.

Samur has in total around 600 employees, of which 76 are doctors, 63 nurses, 410 emergency medical technicians and 7 are psychologists. In addition there are administrative personnel. Since 1997 the organisation has been integrated with Madrid's voluntary organisations for civil protection, with some 1,400 volunteers.

Samur has access to the following mobile units:

- 33 ambulances with doctor (ALS)
- 60 conventional ambulances (BLS)
- 30 fast response cars with doctor
- 8 motor-cycle ambulances
- 7 disaster relief vehicles, of which one is always manned.

In addition there are vehicles for transporting personnel and equipment, special psychiatry ambulances for violent patients and mobile command posts, in total 210 vehicles.



Figure 6. Samur's vehicles (on the left – ALS, ambulance with doctor; on the right – disaster relief vehicle, bottom – mobile command post). Photo: Helge Brändström

Interestingly the major purpose of the rapid response vehicles with a doctor is to assess the quality of the work carried out by the responding ambulance crew. This rapid response vehicle is dispatched along with the actual response vehicle to assess the response, following a special assessment form. The quality of the response is then immediately upon return graded and feedback given to the crew.

Technically Samur is very advanced with, among other things, computerised, call handling, mobile automatic laboratory equipment for blood analysis and portable ultrasound equipment. It is the only ambulance organisation in the world that since 1995 has evaluated all cases of heart failure outside a hospital in accordance with a special protocol in preparation for a possible organ donation. During 2004 Samur responded to about 100,000 calls. There are continually between 6 and 11 ALS units, 8 and 14 BLS units and 3 rapid response vehicles in service.

ALS vehicles have a response time of eight minutes but the aim is to reduce this to seven minutes within two years. Samur carries out at least one large scale (120 casualty simulations) disaster training exercise per year in combination with other emergency services.

Comments: Both Summa 112 and Samur are on the front line in terms of prehospital care, and they have access to advanced technology and qualified personnel. The division of responsibility between two ambulance organisations on the grounds of whether an incident occurs at private accommodation or at a public place seems rather strange from a Swedish perspective. Representatives of the two organisations saw no problem with it.

The Red Cross

The Red Cross (Cruz Roja) operates throughout Spain and was established as long ago as 1863. The organisation works within many areas - from social care and support of the elderly to ambulance service (BLS) and rescue, as well as emergency care during major incidents, accidents or disasters.

Comments: The available mobile units in Stockholm are listed in Table 1 below. Bearing in mind the fact that the population of Madrid is three times that of Stockholm, the total resources per capita in Madrid are considerably greater. It is interesting to note that the major purpose of the rapid response vehicles with a doctor within Samur is to assess the work carried out by the responding ambulance crew. This provides an excellent tool for developing the quality of ambulance responses as well as providing an extra resource should it be called for.

Table 1. Mobile resources in Stockholm county

Number	Resource	Staffing	Availability
35	Emergency ambulance	Nurse and paramedic	24 hours
10	Emergency ambulance	Nurse and paramedic	Day
10	Transport ambulance	2 Paramedics	Day
2	Fast response car	Nurse anaesthetist and paramedic	24 hours
1	Helicopter	Anaesthetist, nurse anaesthetist and paramedic	24 hours
1	Intensive care ambulance	Nurse, paramedic and hospital personnel	24 hours
Approx 20	Stretcher case transports		
4	Emergency care with tents and other equipment		
2	Mobile decontamination unit		

The Madrid 112 emergency call centre

All 112 calls go to the Madrid 112 emergency call centre, which was opened in 1998. It receives and distributes emergency calls to the required services, i.e. police, rescue service or medical care. The centre receives an average of 11,500 calls per day. The normal answering time is six seconds.

There are 90 switchboards. On a normal day 30% of the switchboards are staffed; on 11 March this went up to 66%.



Figure 7. Alarm and command are coordinated at the 112 emergency call centre. 45 of the 90 switchboards are reserved for the police, rescue service, Samur and Summa 112 and Guardia Civil. Photo: Madrid 112

Half of the switchboards are reserved for incoming calls. These are in the middle of the call centre. The remaining 45 switchboards outside these are reserved for the police, rescue service, Samur, Summa 112 and Guardia Civil (see below), which can directly take over the processing of calls.

All incoming information is fed into a computerised alarm report by the 112-operator. This report is connected to a computerised support map. When a call is placed from a fixed subscription phone, the address from which the call is being made comes up automatically for the operator. If it is placed from a mobile phone the location of the phone, within 50 metres, comes up automatically (applies to central Madrid). In addition a history of the calls that have been placed from that number is shown – this, according to information given, is in order to trace false alarm callers.

Depending on the circumstances, the operator can choose, using the support map, to show a satellite image, raster graphics or a vectorised image of the area in question.

At the same time the alarm report is sent to one or more affected alarm centres, of which several are located in the same premises as, and are integrated with, Madrid 112 (others are in the process of being integrated). Thus the alarm centres of all the organisations involved know which units from their own and other organisations are involved in the response. However,

only Samur can directly forward information to its vehicles via its radio system (Tetra).

The centre is staffed on the basis of loading statistics plus a certain margin in order to be able to handle serious events. In addition there are extra switchboard operators on standby in their homes, and it is possible to integrate administrative personnel directly into the operative work.

The Madrid 112 centre has two separate electricity supplies, and, in addition to this, three reserve generators with 14 days' fuel supply. Two generators are sufficient to supply the whole building with electrical power. Two different phone companies provide the telephone services and there are thirty analogue phone lines in reserve.

All calls are recorded. There are even pre-recorded messages which automatically answer frequently asked questions in connection with serious incidents, in order to reduce the risk of overloading. It is possible to program the computer to call and leave a message for all subscribers within a certain area in the event of a serious incident in that area. Radio and other media are also engaged in the distribution of important messages. In addition, in the event of serious incidents the public is informed via the Internet.

In certain situations a special command room in the centre is used. Operators work eight hour shifts, with a break every two hours, in order to maintain full concentration.

The rescue service

The rescue service association Comunidad Madrid

The rescue service association Comunidad Madrid has a staff of 1,100 and covers the suburbs of Madrid as well as the satellite municipalities. The joint 112 centre for the region (Madrid 112) is owned by the rescue service association and is located in the suburb of Las Rozas.

Madrid city rescue service

The Madrid municipality rescue service has about 2,000 employees and covers an area of 608 sq. km. It responds to about 22,000 calls per year. The municipality is divided into four zones with a total of twelve fire stations.

The Police

There are two police organisations covering Madrid, one national and one municipal. The municipal organisation (Policía Municipal de Madrid) is responsible for the local police work in the form of, among other things, traffic policing, surveillance, patrolling and other security aspects.

If an incident is at national level, overall command is taken by the state police (Policía Nacional), which is responsible for combating terrorism and has its own anti-terrorist unit. Central bomb groups are included in the organisation Ucodox (Unidad Central Operativa de Desactivación de Explosivo), which operates through one of its 26 Tedex groups spread throughout Spain.

Tedax (Técnicos Especialistas en Desactivación de Artefactos Explosivos) is also responsible for CBRN/NBC incidents. To gain the capability for this work, personnel go on a special eight week training course.

In terms of equipment, Tedax issues some 15 staff with chemical protection clothing as well as detection and measuring equipment. In addition there is a special NBC vehicle available which can carry out sampling in contaminated areas without the personnel needing to leave it. The normal patrolling police officer has no protective equipment against CBRN incidents apart from a face mask (dust inhalation protection).

Tedax only has sufficient decontamination capacity for its own personnel, but in the event of incidents involving chemicals, it assists the rescue service. This is to say that the rescue service is primarily responsible for management of the response and for decontamination of the injured.

There is also a special police unit in Madrid trained and equipped to work in the tunnel systems there, i.e. the underground train system, sewerage system and energy tunnels.

Alarm and command

The alarm function

Madrid 112

The first call with information regarding the initial explosions at Atocha central station was received by Madrid 112 on 11 March at 07.39. At the same time as the person who placed the call was being questioned, the alarm report was sent to the emergency call centres at Summa 112 and Samur in accordance with established procedure. In addition the alarm was forwarded to the police and the rescue service and to other concerned authorities. As more calls were received regarding the other explosions, this information was also forwarded.

At about 08.30, Madrid 112 took the initiative to set up a regional command, i.e. level 2 in Platercam. Sometime later Platercam 3 was implemented by the Spanish government, which meant that coordination was after this organised at a national level.

During the first 16 hours over 22,000 incoming calls concerning the bombings were registered at Madrid 112. There was never a personnel shortage since the incidents occurred at the same time as a shift change: the shift that was leaving was ordered to remain. About 2/3 of the available switchboards at the centre were manned.

During that day Madrid 112 functioned as an information centre to which the authorities and relatives could call for information about which hospitals the injured had been taken to.

Comments: Platercam. i.e. the plan for raising the level of preparedness from local to regional to national level, enables extremely rapid intervention and the taking of command at a national level. From a Swedish perspective one should consider establishing forms for a similar plan to rapidly raise the level of emergency preparedness and shift the command of the rescue and medical response services to the optimal level, based on the character and scope of the incident.

Summa 112

At the Summa 112 control centre a physician was appointed to coordinate the responses to the four incidents sites. Specially appointed physicians were sent to the sites to report back to the coordinating physician, who remained at the control centre. Summa 112 alerted the hospitals at 07.50. In the cases of the Gregorio Marañón hospital and the Doce Octubre Hospital the calls went directly to the hospital directors.

Samur

The first alarm concerning the explosions at Atocha central station was received at Samur at 07.39. This resulted in all immediately available personnel and equipment being sent there. When the alarm regarding a further incident site was received all the available resources that could be spared were sent there. It soon became apparent that there were four incident sites in total and as can be seen in the above description, the last site, Téllez, received the least resources.

Samur was also undergoing a shift change at the time of the explosions. At 07.43 a telephone chain was started in which eleven people called in 400 staff within 30 minutes. In addition six people from voluntary organisations started calling in their colleagues and through this 900 volunteers were mobilised within 90 minutes.

One officer received the task of directing arriving personnel to the different incident sites as vehicles were manned. Samur's chief officer went to Atocha. At least two less senior commanders were sent to each incident site to direct operations.

Command at the incident sites

The first unit from Samur arrived at Atocha seven minutes after the alarm was given and the first critically injured were transported from there 23 minutes after that. Prior to this a large number of injured had taken themselves to hospital by taxi or private vehicle. Samur's control centre held contact with the incident sites and the hospitals via a radio system which is used on a daily basis; there is radio equipment at several hospitals placed in intensive care units, emergency wards etc. There was no direct contact with hospital management, however. The reports coming in showed that the hospitals always had the capacity to receive more casualties.

Both Summa 112 and Samur each considered themselves in charge of leading and coordinating the medical work at the incident sites. However, the management of the mobile medical teams lay with Samur, in accordance with the regulations. The physicians that were sent out by Summa 112 were not given management roles by Samur as they were working for an organisation that was not integrated with Samur. Instead, they were allocated medical tasks with individual patients.

All the injured were evacuated from all the incident sites by 10.17, i.e. 2 hours and 38 minutes after the first explosion. The situations at the respective hospitals were reported three times a day (intensive care capacity twice a day), and the management at Summa 112 felt that it had good insight into the availability situation at the beginning of events. It did not come to light until later that distribution to the hospitals had been somewhat uneven and that the daily reporting had not worked optimally.

Following the response operation Samur considered that a combined operation command (police, rescue service and medical care) should have been assembled in a single command vehicle; during the operation coordination was based more on personal initiative than organisational structure.

Comments: The direct transfer of alarms was shown to be advantageous for the rapid transfer of the alarm to the concerned organisations. The interface between Samur and Summa 112 in terms of coordination was however not optimal since both organisations felt that they led and coordinated the operations at the incident sites. According to information we have received, Summa 112 only coordinated the alarm phase for medical responses (with the exception of the alarm to Samur). On the other hand Samur had, in accordance with the organisational structure, responsibility for command at the incident sites, which it took, to the extent that it allocated tasks to Summa 112 personnel for the direct care of patients.

The importance of recognising and following regulations that control areas of responsibility between coordinating organisations is obvious. From a Swedish perspective this applies mostly to coordination between the rescue service, the police and the medical service but could also include the Swedish Civil Aviation Administration, Swedish Maritime Administration and the mountain rescue service if incidents occur within their respective areas of responsibility.

Hospital management

We visited two hospitals – Gregorio Marañón Hospital (GM) and Doce Octubre Hospital (12 October Hospital). These are both university hospitals with large capacity and provision for all forms of emergency care; their respective emergency departments receive 750 emergency cases per day, routinely. They were the hospitals closest to the incident sites and were therefore the most used. Information on the events reached the hospitals partly via normal radio broadcasts and partly via information sent directly to the duty hospital director.

The first patients arrived of their own accord (walking wounded) at 07.50 to 12 O and 07.56 to GM, i.e. 11 and 17 minutes respectively after the first explosions. GM estimated that about 30 percent of the total patients arrived by taxi, police car or private vehicle. The first order from GM's hospital management to implement its disaster plan was given at 08.00. The following measures were taken:

- Access routes were ensured.
- Emergency wards were ensured and extended.
- Management and coordination function was established.
- Intensive care capacity was made available.
- Logistics were ensured.

Both hospitals were managed by their normal management personnel. Personnel we spoke to said that they received no information directly from the incident sites, only via the patients and the ambulance crews, and that when the stream of patients decreased they understood that shortly no more would arrive.

During the most intense period, about 120 patients arrived per hour. Of these, several were critically injured and some were intubated. However,

at no stage did the management at either hospital feel that they were short of beds or personnel.

The management of the psychological support that was required was not planned in advance but was adapted to suit the course of events. There was no supporting information system in place either; this was organised during the course of the day. This involved, among other things, some aspects of the laws concerning confidentiality being deliberately broken.

No resources were sent out from the hospitals for use at the incident sites.

Comments: The hospitals were managed by their normal management personnel. This is interesting from a Swedish perspective since in exceptional circumstances we would normally establish a special administrative team with special training and extensive experience in emergency care and logistics.

It is also of interest that the management of psychological support was not planned or trained for in advance. There was also no supporting information system in place but this was developed during the course of event and deliberate deviations from the law concerning confidentiality were made. In Sweden, it is important that a special, trained administration is set up, that psychological care is prepared for and that an information support system is available.

Prehospital care

The events in Madrid affected four different locations almost simultaneously, and the work at the incident sites was organised on the principle that only rescue service personnel could enter the trains, and then for as short a time as possible. This was in order to minimize the time spent in the risk zone. Because of the risk of further explosions, the injured were evacuated as quickly as possible to casualty assembly points.

The incident sites

Atocha central station (07.39)

Charges placed in carriages 3, 4 and 6 detonated after the train had arrived at the station and the doors opened. These resulted in 29 deaths and 115 injuries, of which 15 were critical, 30 serious and 70 minor.

The first medical aid given at Atocha, as at the other incident sites, was carried out by passers-by. Samur engaged 156 staff and 36 vehicles, and erected a tent casualty assembly point within 30 minutes. All the injured were evacuated within 1 hour and 41 minutes.

Santa Eugenia station (07.43)

When the train arrived at the platform, a bomb exploded in carriage 4 before the doors opened. 17 people were killed instantly and 52 were injured, four critically, 16 seriously and 32 slightly. Samur engaged 30 staff and ten vehicles. A tented casualty assembly point was also set up. Patients were cared for here for 1 hour and 15 minutes.

El Pozo station (07.47)

This train was double decked and bombs were placed in carriages 4 and 5. These detonated after the train had arrived at the station. 67 people were killed instantly and 56 were injured, 6 critically, 20 seriously and 30 slightly. Samur engaged 77 staff and 22 vehicles.



Figure 8. The train had two decks and the doors were closed – therefore most deaths occurred here. Photo: Rescue service Madrid.

The rescue work was complicated by the fact that two undetonated bombs and a further suspicious object were found, which led to the work being broken off three times and the site evacuated while police removed them. Work was also hampered by a wall between the road and the railway area, which led to a number of complicated lifting operations.

A casualty assembly point tent was erected. There was, on this occasion, a shortage of stretchers, so it was necessary to improvise with park benches and other objects. In many cases transportation to hospital was via taxi or police car in which only basic life-sustaining care could be administered. The incident site was evacuated after 1 hour and 10 minutes.

Télez – outside Atocha central station (07.49)

On this train one bomb had been placed in carriages 1 and 6 respectively and two in carriage 5.

65 people lost their lives instantly and 165 were injured, 25 critically, 30 seriously and 110 slightly. Many of the dead and injured lay outside the train but there were many in the carriages also. The distribution of resources to Télez was somewhat delayed because initially command was under the impression that this and the Atocha station incident sites were one and the same. Samur engaged 126 staff and 26 vehicles. A tent was erected close to the incident site and a casualty assembly point was established in a nearby sports hall, Daoiz y Velarde. The response operation took 2 hours and 28 minutes.

Organisation of prehospital work

Incident sites

Atocha is the incident site that lies closest to Samur's main station, Legazpi, and it was here that the first bombs exploded. Consequently it was also here that most units from Samur were sent. The first ambulance crew to arrive had the task of immediately reporting the number of injured and the degree of seriousness to Samur control centre. Following this, the incident site work was organised, and then first after this, the treatment of the injured was begun. Medical teams from Samur and Summa 112, with support from the Red Cross and the civil defence, worked at all the incident sites.

One of the problems at the incident sites and casualty assembly points was that of identifying the functional roles of the different organisations. Personnel were familiar with authoritative structure and roles within their own organisations but lacked detailed knowledge of the others.

Staff

Following the second explosion a staff group at Samur was allocated the task of calling in extra personnel to answer enquiries. Within 30 minutes 400 staff had been called in. At the same time 50 medical care personnel and 30 volunteers offered their assistance at the Samur main centre at Legazpi. During the next half an hour a further 500 volunteers came to Samur.

Two commanders were sent to each incident site and the Chief Officer for Samur went to Atocha.

Casualty assembly points

Casualty assembly points and emergency care tents were set up extremely quickly, within 30 minutes, at all four incident sites.



Figure 9. The casualty assembly point at Atocha was set up within the risk zone for possible further explosions. Photo: SAMUR/ Helge Brändström

A sports hall was also used for the purpose at Téllez. At one incident site at least a casualty assembly point tent was erected in close proximity to the demolished railway carriage, i.e. within the risk zone for further explosions.

All the injured attended to by Samur passed through the casualty assembly points and were then transported from these via different types of ambulances. A large number of less seriously injured took themselves to hospital without passing through a casualty assembly point.

The flow-through of casualties at the casualty assembly points was very fast – from 1 hour and 10 minutes to, at the most, 2 hours and 28 minutes. Nevertheless, advanced medical care was administered at all of them, with intravenous cannulation, intubation and pleural drainage; life threatening haemorrhage was stopped by applying compression bandages and tourniquets.

Samur has NBC equipment in its rapid response cars, for the protection of its own personnel. On this particular day, however, it never occurred to anybody that the attack concerned anything other than bombs, and consequently the equipment was never taken out.

No triage

No triage in the form of colour markings or similar was applied, neither at the incident sites nor at the casualty assembly points despite the fact that the equipment for this was available. This was because it was felt that the seriousness of the injuries was so easily recognisable that no categorisation system was called for.

Communication and command

Communication from the incident sites concerning the situation and the extent and types of injuries went directly to Samur's control centre, which processed the information and forwarded it to all the hospitals. This was done via the Tetra radio system, the system used on a daily basis for communication between the hospitals and Samur. Communication between the units at the incident sites and casualty assembly points, as well as within Samur and between Samur and the police also went via Tetra. On the other hand it was not available for the rescue service.

On-scene command was executed jointly by Samur, the police and the rescue service – not via a communication system but directly from person to person. The media aspect was also handled jointly by specially appointed resources from the three organisations.

The reflections of the response operation personnel

Response personnel have assessed the work carried out that day and pointed out the following weaknesses in the system:

- Many of the injured were transported in taxis and police cars.
- Mobile phones stopped working.
- There was no plan for calling in off-duty personnel.

- Both medical care personnel and casualty assembly points were within risk zones.
- The ambulance helicopter capacity was not used optimally.
- There was no supervision at the incident sites until 20 minutes after the explosions.
- Coordination problems occurred within teams comprised of members from different organisations.

Comments: According to Swedish disaster medicine the first priority in city environments, with many ambulances available and with short driving distances, is to move the wounded to hospital as quickly as possible, in line with the scoop and run principle. In Madrid, however, the decision was made to set up casualty assembly points and to stabilise patients, despite a large number of ambulances and close proximity of many large hospitals.

Both ambulance organisations consider that success lies in stabilising critically injured patients prior to transportation. In this instance they considered it to have been directly life-saving in many cases, in addition to relieving the pressure on the emergency wards. Nevertheless, emergency wards were under extreme pressure since many of the less seriously injured went directly to the hospitals via taxi, police car or private vehicle, without being medically prioritised.

From a Swedish perspective the above should be something to reflect upon. It is the opinion of the observers that casualty assembly points with protection and warmth should always be used for major disasters in remote areas with few ambulances and long transportation distances. There is perhaps also good reason to reconsider the scoop and run doctrine for highly populated areas in cases involving many and seriously injured. The time factor is, of course, critical in both situations, i.e. how long it takes to set up a tent or gain access to a building.

For a response operation to be successful, it is important that decisions are made at an early stage and measures taken quickly.

Triage tags were not used in Madrid despite the fact that the equipment was available. It was felt that it was sufficiently easy to see how seriously injured the casualties were. Within Swedish disaster medicine the priority principle is applied and trained for; triage tags are a self-evident part of this. In Madrid there were no special disaster medical records or casualty cards available either; instead the normal carbon paper ambulance medical records were used. The weather was favourable at the time, but if it had been raining or snowing this would not have worked. In Swedish conditions triage, triage tags and casualty cards should continue to be used to facilitate fast and adequate care and provide a part of the quality control system during disaster medication exercises.

Medical transport

Directly after the explosions many casualties with less serious injuries made their own way to Gregorio Marañón and Doce Octubre hospitals. When the

organisation at the incident sites had been established, the casualty assembly point supervisors decided which casualties were sufficiently stabilised. The medical transport officers then decided on which hospitals to send these to.

There was no distribution system or updating of the loading at the various hospitals available at the incident sites. However, Samur's control centre knew that all the hospitals were prepared to accept more casualties. This information came from various district health care centres that had been in contact with the hospitals.

There are eight hospitals in Madrid with extensive emergency ward capacity. Each medical transport officer tried to distribute their patients equally between the hospitals. In total 927 casualties, of whom 165 were considered seriously injured, were taken to hospital by ambulance.

The reflections of the ambulance organisations

Below is an account of the positive and negative aspects of the response operation from the point of view of the ambulance organisations.

Summa 112

Positive aspects

- Twice the normal amount of personnel was available since the event occurred at the time of a shift change, before the night shift had left.
- Most of the casualties could be treated at the casualty assembly points.
- All the ambulances in the Madrid area could be called in immediately.
- Different units co-operated well.
- Work was facilitated by the temperature, around 10-15 degrees.

Negative aspects

- Too many calls came into Summa 112.
- There was no control over the evacuation of the incident sites.
- Many of the injured, also very seriously injured, were taken to hospital in private vehicles and police cars.
- Some teams could not agree on how to carry out treatment as they worked for different organisations with different work methods.
- There were no plans or lists compiled for calling in off duty personnel.
- The phone system failed, and it was difficult to contact personnel. Many reported in to work anyway despite not being ordered.
- Helicopters could have been used more extensively, e.g. to transport patients to hospitals further a field and make better use of national resources. This was overlooked in the stressful situation.
- The casualty assembly points were set up much too close to the incident sites.

- There were too many rescue service personnel at the incident sites, which was inefficient and also dangerous because of the risk of further explosions.
- There was only radio contact with the hospitals.

Samur

Positive and negative aspects.

- A major disaster with four incident sites represents a new challenge in terms of serious events.
- It is important to gain an overview of the whole event and not deal with it as four separate incidents.
- There has to be cooperation between the incident site commanders.
- It is important that the commander at each incident site is easily recognisable.
- It is important that the commander has an assistant commander directly under him/her.
- The activation of personnel must be improved, among other ways, through group messages.
- The arrival and departure of personnel working at incident sites must be controlled.
- It is doubtful whether casualty cards can be used in some situations.
- Personal protective equipment must be available for the protection of personnel in such situations.
- More of the casualties should have been taken to Central de la Defensa hospital, which was not used enough.
- It is important to have disaster rucksacks in the ambulances.
- All the incident sites were evacuated quickly.
- There was an equal distribution of casualties from all the incident sites apart from one.
- The critically injured received satisfactory care.
- Co-operation between personnel was excellent.
- Previous training of major disasters with simulations proved to be extremely beneficial.

Comments: *An overall plan for the distribution of the casualties to Madrid's hospitals was never established. Despite the fact that a regional command was quickly activated, three of four incident sites had been evacuated by the time the command function was fully operational. The unequal distribution of casualties to the different hospitals was largely compensated for by Madrid's extensive health care capacity and by the fact that the hospitals were alerted at a very early stage.*

The distribution of patients to the hospitals was not optimal. The spontaneous evacuation of casualties, (about 30 percent) combined with the large

influx to the closest; large hospitals caused the loading on their key functions to change by the minute.

The tools needed to easily provide a central report of the load situation, in order to improve the distribution aspect, were not available. In a situation involving extremely high loading, the normal IT system was not used to, for instance, report the number of beds available. This indicates that the normal system was unwieldy and not suitable for a disaster situation. Not all the casualties were registered either. There are reports of people with less serious injuries being turned away from hospital emergency wards on arrival and directed to district health care centres. Some patients with less serious injuries were attended to and sent home without being registered. Consequently, a comprehensive picture of the casualty situation is not available.

Conditions are the same in Sweden and if a similar incident were to occur here in one of our large towns, the outcome would probably be the same. In Sweden though, which often has less medical care capacity immediately available, an even greater demand would be placed on command and coordination – both at incidents sites and regarding health care resources generally.

Hospital care

The casualties of the attacks were transported to at least 15 different hospitals and clinics in Madrid (see table 2).

Below is the information we received; one must bear in mind that the information given by different sources on the numbers of casualties is in some cases conflicting. This is probably due to shortcomings in the registration of patients, primarily those with less serious injuries (see page 52). The number of patients registered at the different hospitals varies between 927 and 980, depending on the reporting organisation.

Table 2. Distribution of the casualties between Madrid's hospitals

Hospital	Poly-clinical	Critically injured	Very seriously injured	Seriously injured	Slightly injured	TOTAL injured
Gregorio Marañón	60	29		63	93	312
Clínico San Carlos	50	4	5	4	4	68
Doce de Octubre	149		10	27	7	255
H Central de la Defensa	25	6		24		57
Ramón y Cajal	9	1	1	3	1	15
La Paz	20	6		10	1	38
Jiménez Díaz	4	1	2	2	1	10
Princesa	10		8	5	4	47
Getafe	25	1	1	10	3	40
Móstoles	6					6
Alcorcón	10			2	1	13
Severo Ochoa	22					25
Niño Jesús	9			1		12
Príncipe de Asturias	55			2	4	63
Puerta de Hierro	3	1				5
Total	457	49	27	153	119	966

SOURCE: SRV OBSERVER REPORT – TERRORIST ATTACK MADRID, ISBN 91-7253-236-X.

Note: The above table fails to account for the degree of injury to 161 patients.

The Gregorio Marañón University Hospital

Gregorio Marañón Hospital is located in Madrid's district 1, where almost 700,000 of Madrid's inhabitants live. The hospital has 1,800 beds and 8,000 staff. It has roots as far back as the 16th century, and today some 35,000 operations per year are carried out here. 265,000 people pass through its emergency wards every year, i.e. 726 per day. This is the hospital closest to Atocha station and on the day of the attacks it received 312 casualties within a period of two hours, 119 of these were held.

Shortage of information

The first information to reach the hospital came via radio and TV news broadcasts at 07.45. The first casualty arrived at 07.46.

During the management group's routine morning meeting, at 08.00, snippets of information were received from Madrid 112 advising the hospital to implement its disaster plan and "prepare itself for something terrible". The hospital's disaster plan has only one level and had not been practiced for two years.

The emergency department was emptied and operations cancelled

The first decision taken by the management, at 08.15, was to cancel the 66 operations planned for the day, which immediately made 22 fully staffed operating theatres available. Following this the release of inpatients was begun. Within two hours 161 beds had been made available and within six hours, 438. The majority of intensive care patients could be transferred to a lower care level – intermediate care or postoperative care.

At 08.00 there were 123 patients in the casualty department. By 09.15, 30 of these had been taken in, 83 had been sent home and ten remained.

The attacks occurred at the time of a shift change and already at 08.00, it was felt that there was more staff available than required.

Triage carried out

The work at the emergency ward was organised so that casualties were categorised at the ambulance entrance. The worst injured were taken into the trauma room, which has space for four patients at a time. From here these were taken in for surgery, to intensive care units or to a special section that had been opened in connection with the disaster. Thirty-seven emergency operations were carried out during the course of the day.

The slightly injured were moved to another room where they were diagnosed again; from here they were transferred to departments in the hospital. Of the 312 casualties (there is no information on seven of them) who came to the hospital, 62 came on foot and 243 on stretchers. Of the stretcher cases 119 were held longer than 24 hours and 29 were in critical condition. Four of these died soon after arrival at the hospital and one died after a week in hospital.

Eardrum perforation was common among the casualties. This was a problem in itself as these suffer from extreme deafness and cannot therefore understand verbal instructions.

Relatives attended to

The relatives of the victims were gathered in the hospital assembly hall, where a list of the casualties was read out every 30 minutes. There were several illegal immigrants involved who did not want to give their names. Within 24 hours all the victims, apart from one woman with severe burns, had been identified.

Personal experiences

One problem was that both the fixed and mobile phone systems became overloaded and consequently unusable during the first 2-3 hours. In addition excessive triage became a problem since slightly injured casualties were prioritised as seriously injured, and the unequal distribution of casualties to the different hospitals caused further problems. There was also no system for ID marking incoming patients; instead a serial number was painted on them.

Table 3. The most common injuries among 245 patients who were treated at Gregorio Marañón hospital on 11 March

Type of injury	Total		Of which critically injured (n=29)
	Number	Percentage	Number
<i>Perforated eardrums:</i>	99	41	18
One ear	27	11	1
Both ears	72	29	17
<i>Thorax:</i>	97	40	24
Fractured ribs	18	7	7
Blast injured lungs	17	7	17
Air in the pleura (Pneumothorax)	11	4	10
Haemorrhaging in the pleura (Haemothorax)	6	2	6
<i>Shrapnel injuries:</i>	89	36	23
Head/neck	53	21	
Trunk	11	4	
Extremities	25	10	
<i>Fractures:</i>	44	18	15
Extremities/long bones	18	7	9
Upper jaw-bone	16	6	8
Metatarsal bones	8	3	
Spine	5	2	5
<i>Burn injuries:</i>	45	18	16
First degree	16	6	
Second degree	29	12	
<i>Eyes</i>	41	16	4
<i>Brain trauma:</i>	29	12	14
Skull base fracture			5
Contusion or crush injury			4
Bleeding under the hard brain membrane (Subdural haematoma)			4
Other			12

<i>Abdomen:</i>	12	5	10
Liver	5		4
Spleen	4		4
Intestines	3		3
Kidneys	3		2
<i>Amputations:</i>	13	5	9
Ear	11		8
Fingers	1		
Extremities	1		1
Post-traumatic stress syndrome	22		9

Note: If a person had several different injuries, they are all accounted for.

University hospital Doce de Octubre (12 October)

The Doce Octubre is a university hospital specialising in all areas. It is located in Madrid's district 11, which lies in southeast Madrid and has a catchment area covering some 926,000 inhabitants.

The hospital has 1,266 beds and 6,300 staff. It takes in about 42,000 patients per year and the emergency ward receives about 283,000 emergency cases per year, 800 per day.

The disaster plan was followed

The hospital disaster plan works at three levels and was most recently revised in 2002. On the day of the attacks, the plan was implemented at the highest level by the hospital manager at 07.45, following the alarm from Summa 112. The measure immediately taken by the hospital management was to contact the local police in order to ensure easy access to the hospital for ambulances. The road blocks set up were so effective that the hospital staff called in could not make their way to the hospital if they could not show identity papers.

The emergency ward was strengthened and operations cancelled

Internally the hospital prepared itself by strengthening the emergency ward and cancelling all operations not yet started. In addition a ward with 30 beds was opened directly next to the intensive care and surgery departments.

Between 07.50 and 11.00, 242 casualties were attended to, of which 106 were held, 23 of these were released the same day. Twenty-two emergency operations were carried out during the course of the day. Only one death was recorded – a casualty who was declared dead on arrival at the hospital.

Triage carried out

The casualties transported by ambulance had been stabilised, but many others arrived via taxi, police car or private vehicle. Their condition therefore had not been assessed by medical staff at the incident sites.

A triage system was set up at the entrance. The walking were shown to a waiting room, while those on stretchers were taken in for treatment directly. Triage tags were never used with the explanation that, "We didn't have that many tags".

From the point of view of available beds the hospital was actually already full at 08.00. Despite this by 12.30, 106 patients had been taken in and there were still 150 available beds. This was because many inpatients released themselves when they heard about the incident, since they felt that the victims of this needed the places more than they did.

Relatives attended to

The hospital set up a reception area for relatives in the assembly hall, where information on the casualties arriving at the hospital and their condition was read out. At around midday contact with the other hospitals had been established and thus lists from these could supplement their own information.

Spanish law concerning confidentiality within health care is similar to Swedish. However, a decision was taken to deliberately break this law. Initially this decision was taken by the individual hospitals, but it was later sanctioned at a regional level.

Personal experiences

The difficulties experienced at the hospital concerned the internal and external transfer of information. Communication was a problem all day, with overloading of both the fixed and mobile phone networks, which failed both internally and externally. As a result of this a new type of digital and truncated telephone system is now being installed at the hospital.

Free beds were not reported to a central point in the hospital when patients were released. Consequently nobody had an overall view of the hospital's available beds. In addition, the lack of disaster journals resulted in a time consuming writing out of referrals to both X-ray units and laboratories.

It appears that all the involved hospitals used written lists that day instead of their computerised patient register systems. The computer systems were felt to be much too time consuming in this stressful situation.

Voluntary help was not coordinated, and it was difficult to forward information to affected relatives. Requests via the mass media for blood donations (that were not required) resulted in many people arriving at the hospital to give blood, a situation that was difficult to handle.

During the three days it took for the hospital to return to normal operation, there was never a shortage of necessities. Several VIPs visited the hospital in the days directly following the event. This was received positively by the staff and hospital management, even if it distracted from the work at hand.

Comments: At both hospitals the disaster plans were followed – emergency departments were strengthened, operations cancelled and a triage system organised. What they had not predicted was the influx of relatives. This was resolved at both hospitals by opening the assembly halls, where the relatives could be gathered and given information. The confidentiality aspect with regard to issuing information proved to be problematic and the laws concerning this were broken. Both fixed and mobile phone systems were overloaded, which impaired information transfer both internally and externally.

All these functions would be equally significant in Sweden, and similar difficulties would probably occur here also in a disaster of equal proportion. It is therefore particularly important that these aspects are taken into account in our disaster plans.

Psychosocial support

General approach

At 08.00 on 11 March the regional office for mental health was alerted and informed that there had been a number of explosions on Madrid's railway network. All the social services units in Madrid were immediately alerted via fax and asked to prepare to receive people injured in the explosions. The directions issued stated that the hospitals would treat the directly injured while the Office of Mental Health would be responsible for the care of the relatives of the dead and injured.

In the work carried out from 11 March onwards one of the principle guidelines was that those directly affected were designated as injured – not as victims. Victims often are, or become, in need of help on a long term or permanent basis, while the injured recover and are able to cope with most things themselves. Patients treated in connection with the Madrid bombings were considered as mentally healthy people that had been injured mentally by a traumatic, external event.

The point of departure for the social care was to, "give highest priority to saving lives but then to apply all possible means to the protection and recovery of mental health". Another point of departure was to prioritise the injured first, then the relatives and thirdly the teams working with the dead and injured.

There were three phases to the care provided:

- Zero phase, i.e. prior to the event.
- The initial phase, i.e. during the event.
- The second phase, i.e. following the event.

Nine days before the incident, i.e. zero phase, representatives for Gregorio Marañón hospital and various voluntary teams, with no prior knowledge of what was to happen, had held a meeting to discuss how to tackle a disaster situation.

The actual event, i.e. the initial phase, was characterised by the efforts of volunteers at the incident sites. This consisted of help and support provided by passers-by and people living close by. At this stage there was no organised, professional help in place.

After the event, i.e. the second phase, Madrid's psychosocial services took over the work.

Treatment at Gregorio Marañón Hospital

Psychosocial support was not included in the disaster plan

It soon became apparent during the psychosocial support of the injured and their relatives at Gregorio Marañón Hospital that this aspect had not been taken into account in the disaster plan. The hospital management, though,

speedily appointed an older, experienced psychologist to take responsibility for it.

The psychologist quickly decided to gather all the relatives of victims in the Aula Magna assembly hall, a large hall in an educational building in the hospital grounds. At the time of taking this decision some 600 relatives had gathered outside the hospital. Within an hour of the event the care of the victims in the hospital and their relatives in the assembly hall had begun.

In this chaotic situation it was felt that the most important conditions to establish were calm and nearness. The guidelines one should follow, according to crises management literature, include gathering the close family members of the victims together separately from other relatives. But this was not possible on this occasion since there were such large numbers involved.

Accurate information and clear leadership were important

The need for information became apparent at a very early stage. Consequently, an announcement was made via the PA system in the assembly hall that all available information concerning the injured would be issued. The compilation of information was very difficult, especially during the first hours, since both the fixed and mobile phone networks had collapsed. Instead groups of people were appointed to visit the other hospitals in search of information.

The importance of clear leadership was also apparent, and the appointed psychologist received full support from the hospital management both to lead the psychosocial aspects and to implement working methods, as there was no plan for these.

When information on the injuries was received by the management for the psychosocial work, the names were read out together with information on their whereabouts. This involved an infringement on the law concerning confidentiality. Information was sometimes issued every 30 minutes. In order to ensure that the information was as accurate as possible, it was checked by a control group before being issued.

After two days a special website was set up showing lists of the injured. The Ministry of Home Affairs took the decision to publish the lists and also took responsibility for the website. This also involved an infringement of confidentiality regulations. A list of the dead, on the other hand, was never published.

Efforts were also made, within the sphere of the psychosocial work, to minimise the spreading of rumours. For this reason ensuring that the media received correct information became important.

For the first 24 hours both relatives and personnel occupied the assembly hall. Subsequent to this, therapeutic work was carried out daily between 08.00 and 22.00 for a period of two months by teams of two who provided psychosocial support for the inpatients and others. A year after the event, there were still twelve patients receiving psychiatric care.

Treatment at Doce de Octubre (12 October) Hospital

The casualties and their relatives were received and treated in a similar way at Doce de Octubre Hospital as at Gregorio Marañón. An assembly hall to accommodate 300 to 400 relatives was provided, and an online system with information on relevant patients in Doce de Octubre Hospital and the other hospitals was set up.

Psychosocial support was provided through answering questions, and providing refreshments, telephones and therapy. When casualties were identified, the names of their relatives were read out. These were then provided with information which, in each case, was given by a doctor.

The issuing of information to the media was also the responsibility of psychosocial support. The hospital has a staff member with a journalistic background who was appointed to meet the press and provide accurate information.

During the first morning, each separate hospital issued information on the total casualties received, deaths, admitted patients and critical patients. Later in the day the information source was centralized and issued to the media via just one hospital.

Psychosocial work outside the hospitals

Relief and information

The Red Cross opened its telecentre on 11 March to assist the hospitals and Madrid 112 by providing information, primarily to relatives, but also to others who wished to help in some way. During some periods the telecentre was addressing 50 calls at a time.

Because of the overloading of the mobile phone network, the Red Cross also provided an sms service when the normal phone system was out of order. In addition it provided 3,000 people with support and help and carried out international searches to ascertain the identities of missing persons.

The relatives of the dead

The *Office of Mental Health* was responsible for the care of the relatives of the dead. Following a decision by the Institute of Forensic Medicine, the bodies and body parts of the dead were taken to Madrid's exhibition centre, Ifema. Teams of psychiatrists, psychologists, social workers and secretaries worked around the clock during 11 – 13 March to provide support for the relatives. Parallel to this Summa 112 organised voluntary psychologists who provided support between 11 and 22 March.

The process of identifying the dead went very quickly. On 12 March, i.e. 24 hours after the event, 155 of the total of 191 bodies had been identified. Most of the relatives received information via Ifema during the initial 24 hours. Others who were still waiting to get information were provided with hotel accommodation, and a special reception centre was opened offering psychosocial support.

On 13 March the continued identification work was moved to a cemetery and morgue. Psychosocial support was also provided here for relatives being told of their losses. This work was completed 15 March when all of the dead had been identified.

Focused support

Psychosocial support then moved on to a phase of focused support on the below basis

- all those affected
- children and young people affected
- personnel who worked with the injured and the dead.

All those affected

All those affected were given a special phone number to which they could call if and when they felt in need of help and support. The call centre was staffed by psychiatrists and psychologists and was open until the end of June 2004. In total 36 reception centres were provided in addition to the normal centres within Madrid's organisation for mental health care. Three months after the event 9,108 people had requested psychological support and advice. In total, treatment had been prescribed for 2,715 people.

Affected children and young people

Many of the children and young people that had been affected by the event initially showed no signs of needing psychological support. However when mobile units began to visit schools the numbers increased significantly, and a clear internalisation of the children's anxiety and suffering was uncovered. In two of the worst affected areas afternoon reception centres were opened for children; these were still open a year after the event.

Interestingly, the visiting of the mobile units to schools was in many cases resisted by the schools' headmasters and teachers because they felt, wrongly as it turned out, that there was no need at their particular school.

Relieving and debriefing of personnel

The relieving and debriefing of personnel that had worked in the operation was carried out partly via the health care service's own channels, partly through strengthening district health care centres and psychiatric care units.

The *Office of Mental Health* offered help and debriefing to police and rescue service personnel, but participation on the part of these groups was surprisingly low. Both organisations said that they provided psychosocial relief via their own channels, but they had not made it easy for their personnel to obtain help. Some within the Office of Mental Health felt the resistance on the part of the management within these groups was due to their feeling that it could result in absence due to illness and undermine morale within their units.

Comments: The psychosocial support aspect had not been included in the disaster plan at Gregorio Marañón Hospital. However the situation was quickly resolved. This was actually due to the initiative of one person and should not be considered as a valid reason for not planning for the care of relatives in the event of a major disaster. These problems are most likely underestimated from both the aspect of suitable premises for receiving relatives and also the need for information.

From a Swedish point of view it is very important that psychosocial crisis management is trained for and that locations and methods of issuing information to relatives are taken into account in the disaster plans. It is also important to consider how to obtain correct and pertinent information if the phone networks should become overloaded.

Focussed support for the most vulnerable groups should be planned for; children and young people should be given special consideration, bearing in mind the developments in Madrid. The care of personnel is often neglected and special attention should be given to the fact that members of some professions can have difficulty accepting that they are in need of psychosocial support, instead regarding such as weakness on their part.

Identification

Conditions and work methods

In Spain forensic pathologists are employed by the judiciary and are completely independent of the police. Following an acceptance test there is a trial period of employment including practical work; the pathologist is then employed by a specialised magistrate to assist in all the forensic issues dealt with by that magistrate.

When unidentified, injured or dead come to a hospital in Spain, it is reported to a duty court and the police. Following identification, the police are responsible for notifying the family.

At the incident site

The director of Madrid's forensic medicine institute heard about the bombings at about 08.00 on her radio while on her way to work. She very soon realised that many deaths were involved and that identification of the bodies would in many cases be difficult.

Her first task, at about 09.00, was to contact all the forensic pathologists in Madrid. Incident site groups were then formed consisting of a magistrate, a forensic pathologist and a secretary. These all received instructions on how the dead should be marked at the incident sites and how the collection of material should be carried out. At the same time the equipment required for the coming forensic autopsies was being organised.

When all the injured had been evacuated from the incident sites the teams were allowed in. Each body and body part was photographed by a forensic pathologist before being taken to the temporary morgue (see below). By around 11.00 it became clear that there were so many fatalities that the facilities at the forensic medicine institute would be inadequate. The crisis cabinet (the national management) was informed via the police technical division on the requirements of a temporary morgue with regard to area, cooling facilities, privacy, transportation links and that it should be located outside central Madrid.

Temporary morgue at the exhibition centre

The crisis cabinet assigned Hall C at Ifema, an extensive exhibition area on the outskirts of Madrid, as a temporary morgue. The hall has a ceiling height of 15 metres and floor space totalling 10,800 square metres, of which about 4,200 was used. The whole building was held at a temperature of four degrees during the working period there.

Identification was carried out together with the police technical division. As the bodies started to arrive at Ifema, the police ensured that each one was marked in the correct way. The bodies were then placed in lines, one line for

each incident site. The first autopsies were begun at 13.20 on five portable autopsy tables. About 30 minutes later seven tables had been made available.

The identification protocol developed by Interpol was applied. In addition to undergoing autopsy each body that could not be conclusively identified was photographed and a sample taken for DNA analysis.

Equipment for dental X-rays was also available. The benefit of this was very limited, however, as it proved to be extremely difficult to obtain previous dental x-rays. The police also took DNA tests of the injured in hospital who had undergone amputation. This made it possible to identify isolated body parts also. The results were compiled manually against information gathered concerning missing persons.

At 01.30 on 12 March the last of the 191 autopsies was completed. It was clear that the cause of death in most cases was multitrauma. In only two or three cases was it apparent that lung injury caused by the blast (blast injury) was the single cause of death.

By 21.00 the same day 155 bodies had been passed on to their families. This was done in a separate area at Ifema, after the bodies had been prepared. Psychosocial personnel were on hand to support relatives.

Relatives were encouraged, if they could, to look at some of the photographs taken of the bodies. Personnel were also careful to return any private belongings found on the bodies, such as a ring or some other piece of jewellery. The purpose was to convince the relatives that there was absolutely no doubt that the person concerned had been identified among the dead.

In 37 cases DNA analysis was required to certify identification.

After 155 of the bodies had been taken from Ifema, there was too much space there. The work was then continued at a cemetery in Madrid which had access to a cold storage room. The identification work was carried out in a tent. All the bodies had been identified by 17 March and the work base was returned to the Institute of Forensic Medicine in Madrid.

68 forensic pathologists had worked in shifts to carry out the work. The majority of them were based in Madrid but some had been brought in from other parts of Spain.

Comments: The identification of the dead must be considered as having been extremely fast and efficient. In events involving many deaths, particularly in hot climates, it can be very difficult to apply the appropriate care satisfactorily. This was very apparent in the tsunami disaster in southeast Asia 2004, and should be taken into account in disaster plans.

Police work

The work of the national police

On 11 March 2004 ten bombs were detonated on four trains. Since the locations of the bombings were relatively close together, it was initially thought that a single incident site was concerned.

The largest of the stations involved, Atocha, is located close to the centre of Madrid and is partly underground. This is where the first bomb exploded, closely followed by the nine others. Four bombs never went off. The police did not in any way act on the premise that there could be CBRN contamination at the incident sites.

The police bomb group, Tedax, sent teams of four to each incident site and also retained an inner command function. The rescue service and the police had already begun work at the incident sites. There were also a large number of volunteers at the sites, which impaired work as the police suspected that there could be more bombs involved. For this reason the police wished to evacuate the sites as quickly as possible.

At a later stage, two unexploded bombs were found on the train at Atocha. In addition, a bag containing 10 kg of explosives including a detonator was taken to a police station, where it and its contents were later discovered among the retrieved items.

The hunt for perpetrators of the attacks took some time. On 3 April, seven of the suspected terrorists were tracked down to an apartment in the suburb of Leganés. Response forces cordoned off the property and neighbours were evacuated.

Inner and outer cordons were set up in accordance with a previously practiced model. Only Tedax, technicians and the response force personnel were at the inner cordon. The remaining police, the rescue service, medical orderlies and a section for the media were outside the outer cordon. One person was appointed the task of continually updating the media.

The terrorists knew that the police were there, and they called their families to tell them that they would carry out a suicide attack.

Neither during the planning of this assault did the police consider the possibility of other material than explosives. They also did not consider the fact that extremists can be prepared to offer their own lives.

The assault resulted in shots being fired, after which the terrorist blew-up themselves and the apartment. Afterwards it could be established that they had belts of explosives on themselves and that bombs were placed everywhere. There was extensive damage and half the building was demolished. One police officer was killed and several were seriously injured.

Despite the fact that almost everything was destroyed, technicians could gain considerable information in the apartment, in the form of documentation which showed that the organisation had cells in several European coun-

tries. A number of telephones were found containing information, and it was possible to analyse information on computers found there.

Among other things the police found plans for an attack against Jewish interests in Hoyo de Manzanares, 37 km from Madrid. The target, which consists of large grounds with a Jewish school and one of the few Jewish graveyards in the Madrid area, is an important meeting place for the Jewish community.

Documentation revealed that there were also plans to attack the shopping centre, Parquesur, in Leganés.

During the same weekend as the assault on the apartment, the police disarmed a bomb that had been placed on the Madrid-Seville railway. It contained the same type of explosive material as was used in the Madrid bombings.

Following these events the police have begun to review their response plans, taking into account an increased CBRN threat. There is a degree of satisfaction in that the police work achieved a result within a relatively short time after the attacks; this has had a positive effect on the Spanish people and decreased anxiety. In August 2004 more than 20 suspected terrorists had been arrested, of which 14 were held in custody. Most of these are from Morocco. In June the Italian police arrested an Egyptian who is suspected of being one of the brains behind the Madrid attack and a link between the terrorists in Madrid and the Moroccan leader for the terror network al-Quaida in Europe. The Spanish police suspected that an Egyptian had planned the Madrid attack together with a Tunisian terrorist who blew himself up during the assault on the apartment in April 2004.

Comments: The main purpose of terrorist activity is to strike terror into and paralyse the community against which the attack is made. Consequently, terror bombings are usually carried out in places where large numbers of people are gathered. Experience shows that the most difficult type of terrorist attack to protect oneself against is suicide bombing, i.e. when the perpetrator is carrying the bomb on their person when it is detonated. In addition these bombs, know as antipersonnel bombs, are often constructed to cause the victims as much injury as possible.

The emergency care of physical injury does not differ depending on whether it is inflicted by an accident or an act of terrorism. However, there is every reason for supervisory staff to pay special attention to the safety of personnel. One should lead the response bearing in mind that several explosions may occur and buildings can collapse.

There is in Sweden today a rather naïve approach to the possibility of such an incident happening here and also to a speculation that terrorist activity is built up in stages, that an initial bomb is detonated to draw in response personnel and then another is detonated in order to cause maximum injury and paralyse society's rescue organisations.

Discussion

The terrorist attacks in Madrid 2004 entailed the perpetrators causing four separate disasters in the capital of Spain within a period of twelve minutes. This placed enormous demands on the rescue service organisations.

Pin pointing the exact locations of the incidents proved to be difficult. Initially, for example, it was thought that the alarm calls concerning the explosions at Téllez were about the explosions at Atocha station. The same kind of difficulty in exactly pin pointing the incident sites during simultaneous events is also recorded in accounts of the terrorist attacks in London during the summer of 2005.

Clearly this difficulty is increased further if the incidents occur underground (in an underground railway system) with several exit routes.

The distribution of available rescue units to the different incident sites is obviously also a problem since during the initial stages of such an event an operator at an emergency service centre cannot possibly predict the total number of sites or their locations. In addition there is a need to hold some resources in reserve to respond to other more routine incidents that may occur at the same time.

When a major incident occurs, the emergency service centre operators play a key role with regard to the initial assessment and the forwarding of alarms. Obviously they should be educated and trained for such eventualities – something which probably occurs too little.

Strategic decisions, e.g. preparedness for simultaneous events or the distribution of injured to different hospitals, should be addressed at a regional level. But experience shows that towns with large ambulance capacity can often evacuate one or even several incident sites so quickly that it is completed before regional leadership is established. This was the case in Madrid.

Despite the fact that the paramedics worked on the principle that casualties should be stabilised prior to transportation, and that the decision to activate regional leadership was taken early, three of the four incident sites were evacuated before the regional leadership was fully functional. The fact that 30 percent of the injured in Madrid reached hospital via spontaneous evacuation also tallies with information concerning other incidents in a city environment.

Considered together these aspects indicate that the distribution of injured to different hospitals is very difficult to influence from a higher management level, at least during the early stages of an incident. A solution could be to work with fixed distribution keys for the capacities of the hospitals, at least initially.

Spontaneous evacuation of injured with different types of vehicles leads to a rapid influx of patients to the hospitals, the first to arrive being the least seriously injured. This is a well known phenomenon in cases of incident sites close to hospitals but something that is often disregarded when plan-

ning or training for major incidents or accidents. Rather it is seen as something that should be discouraged as much as possible as it causes disorder concerning triage prior to transportation to and treatment at the hospitals. However, the phenomenon is in practice difficult if not impossible to influence. It should then perhaps even be viewed as an asset, particularly when ambulance resources are limited in relation to the number of injuries. What is important is that the hospitals are aware of the situation and plan for it.

In practice spontaneous evacuation entails hospital casualty departments quickly receiving a surge of patients that have not been diagnosed and consequently not prioritised. Because of this the emergency wards become in practical terms an extension of the incident site. This was obviously the case in Madrid, where almost 1/3 of patients arrived at hospitals without being transported by ambulance.

Communication problems, caused by the collapse of both the fixed and mobile phone systems, resulted in lack of information. This is also a normal occurrence with major incidents and is documented in many previous KAMEDO reports. One way of avoiding the problem is to use priority phone lines, which do not pass through the hospital exchange. Using the Internet and TV to get a picture of the situation at incident sites can be another solution, as the larger media organisations are soon in place to report directly from the scene of the event.

Table 4. Numbers of dead and injured at the respective incident sites

	Dead		Wounded			Type of detonation	Percentage dead at incident site
	Critical		Serious	Slight	Total		
Atocha	29	15	30	70	115	Open	20
Santa Eugenia	17	4	16	32	52	Closed	24
El Pozo	67	6	20	30	56	Closed	54
Télez	65	25	30	110	165	Closed	28
In hospital	13						
Total	191	50	96	242	388		

The proportion of injured that died in hospital was 3.3 percent. Previous KAMEDO reports on the bombings in Finland (Myyrmanni) and Bali show that the proportions who died in hospital on those occasions were 4.0 and 3.6 percent respectively. When an injured person comes into hospital there is a good chance of them surviving.

The ambulance medical care in both Madrid and Helsingfors is advanced. On Bali, on the other hand, it is very basic. In addition, a large number of the injured there, even seriously injured, were transported to hospital by other means than ambulance.

The above comparison is interesting from the point of view that it indicates that the death rate in bomb attacks is primarily affected by the type and location of the bomb (outside or inside etc., see the above table), while the type of care provided outside the hospitals does not appear to have much effect – at least when prehospital time is short.

The heads of ambulance medical care in Madrid pointed out that the key to a successful response in cases of bomb attacks was advanced medical care at the incident site, to stabilise the patients prior to transportation to hospital. This strategy is built on the premise that stabilisation, together with the extended prehospital time that it entails, can be carried out without increasing the risk of death or disability.

This assumption has, however, not been verified, and when the medical care provided is less advanced (routine care), advanced prehospital care appears to increase rather than decrease the total mortalities. In other words there is good reason to contest the statement, "the key to a successful response ...".

Were the same amount of damage to occur in Stockholm as occurred in Madrid, almost 1000 casualties, it could be questioned how the health care in Stockholm would cope. There are seven hospitals in Stockholm; in Madrid the casualties were distributed between 15 of the 24 available hospitals.

Registers of the injured (page 53) show that a total of 76 were diagnosed as critical or serious. If we consider that these would require intensive care, this would mean that every emergency care hospital in Stockholm would need to take in eleven extra intensive care patients. Bearing in mind that the majority of intensive care units in Sweden normally have a very high loading percentage, such a requirement would be difficult to meet.

Certainly post-operative surveillance beds can be transformed into intensive care beds on a temporary basis (compare *The fire disaster in Gothenburg the night October 29-30 1998*, KAMEDO report 75), but staff availability is not dimensioned to cope with such loading for more than 24 hours or at the utmost a couple of days.

In addition, such a loading would considerably disrupt the normal running of the hospital and its capacity to receive other emergency cases. One way of handling such a situation would be to redistribute patients, particularly the intensive care cases, to other hospitals, both relatively close to Stockholm (transportation by road) and more distant (transportation by air).

The capacity for the transportation of intensive care patients is limited, however. Not many ambulances in Sweden are large enough and have the equipment that is needed to transport a seriously injured patient while providing full intensive care, i.e. on a ventilator, with injection pumps etc.

The routine with such transportation is that the dispatching hospital provides accompanying medical staff to guarantee the correct medical care during the transfer. This would drain the hospitals primarily receiving these patients, of key personnel, e.g. anaesthetists and intensive care nurses. Consequently there is good reason to reconsider this procedure.

With respect to air transportation, the circumstances are better as most of the ambulance helicopters have the equipment and the medical crews to provide intensive care during the transfer. The Swedish National Air Medevac (SNAM) is an asset in situations where seriously injured patients need to be transferred over long distances, both nationally and internationally. The management and coordination of such a large scale transfer has, however, never been trained for. Such a scenario should be considered from a national perspective.

Theoretically it would be possible to strengthen the capacity of a receiving hospital by transferring staff from other hospitals.

This solution would probably not be very effective though as transferred staff lack familiarity with the conditions in a strange working environment and therefore hinder more than help. In addition there are the problems of travel, accommodation, working conditions, expenses etc.

The care and identification of the dead in Madrid can be considered to have been carried out exceptionally quickly and effectively. How an incident of this scale with so many fatalities would be managed in Sweden cannot be ascertained, but it is certainly a scenario that should be addressed.

References

Verbal sources

Dr Pedro Martinez Tenorio, Director Gerente Summa 112.

Dr Joaquin Martinez Hernández, Director Gerente Hospital Universitario 12 de Octubre.

Dr Francisco Ferre Navarette, Coordinator de la Oficina Regional de Coordinación de Salud Mental.

Francisco Duque Colina, Psicólogo del Hospital Gregorio Marañón.

Dr Carmen Baladia Olmedo, Directora del Instituto Anatómico Forense.

Rosa de Andrés de Colsa, Dirección General de Coordinación Sanitaria, Comunidad de Madrid.

Dr Jose Antonio Serra, Medical director, Hospital Gregorio Marañón.

Published sources

Gutierrez de Ceballos JP, Turégano-Fuentes F, Perez-Diaz D, Sanz-Sanchez M, Martin-Llorente C, Guerrero-Sanz JE. 11 March 2004: The terrorist bomb explosions in Madrid, Spain – an analysis of the logistics, injuries sustained and clinical management of casualties treated at the closest hospital. *Critical Care* 2004.

Eriksson T, Domingues M, Jidling S. Terroristattackarna i Madrid 11 mars 2004. Karlstad: Department of emergency response operations support, SRV; 2004.

Foreign Policy Institute, Spain. Countries in pocket format. Stockholm: Hallvigs Reklam AB; 2004.