

CHAPTER 1

Introduction

Learning outcomes

After reading this chapter you will be able to:

- Describe what defines a major incident
- Discuss the classifications of a major incident

1.1 What is a major incident?

In health service terms a major incident can be defined as any incident where the location, number, severity or type of live casualties requires extraordinary resources. The *number of casualties* alone does not determine a major incident for the health services. Thirty minor injuries that self-evacuate from the scene may be managed effectively by one hospital without the requirement for additional pre-hospital or hospital resources. The same number of *severely injured* casualties will almost certainly require extraordinary resources. Certain *medical resources* may be very scarce (for example, intensive care beds) or regionalised (for example, burns surgery), and small incidents with relatively few casualties can therefore require early involvement of regional or national resources. Where there are *large numbers of dead with few or no survivors*, there is often no major incident for the health services. An *incident in a remote or difficult to access location* may also demand greater resources to effect the rescue of casualties.

Factors that influence the declaration of a major incident for the health service

- Number of casualties
- Severity of injury
- Numbers of medical responders
- Access to medical resources
- Location (urban vs rural)

In a similar vein, *a major incident for one emergency service may not be a major incident for all other services*. Where fire or chemical spillage is the predominant issue, without risk to life, a major incident response will be required from the fire and rescue service without the same level of response from other services. Where public disorder is the predominant problem, the principal response will be from the police. The following examples illustrate this point:

On 2 September 1666 a fire started in a baker's shop on Pudding Lane; it lasted 4 days and left 80% of London's buildings in ruins. A disaster on such a scale is hard to imagine and would certainly overwhelm the resources of the modern fire and rescue service. In fact, only a handful of people died in this, the Great Fire of London.

On 27 March 1977 a KLM (Royal Dutch Airlines) Boeing 747 collided with a PanAM Boeing 747 aircraft during take-off in fog. All passengers and members of the crew died (total 583). This is the worst aviation disaster in history but had very little impact on the health response as all the casualties were dead.

In January 1975 a large petrol tanker hit the Tasman Bridge, a major transport structure linking the suburbs of Hobart, Tasmania. Thirteen people died, no one was left injured.

In April 1990 the passenger ferry *M/S Scandinavian Star* caught fire on the Swedish west coast. Most passengers were asleep and smoke inhalation caused the death of 158 people. The surviving passengers were mostly uninjured.

A health service major incident is influenced by:

1. Number of live casualties.
2. Severity of injuries.
3. Access to medical resources (ITU beds, burns beds).
4. Incident location (remote vs urban).

Local highlights: Major incident definitions

A major incident requiring extraordinary resources occurred three or four times per year in the UK (with a range from 0 to 11 incidents per annum) in the 30 years from 1966 to 1996. Although there is a particular emphasis on terrorist-related incidents in the west over the last two decades, it must be remembered that non-terrorist-related incidents continue to occur and are frequently associated with greater morbidity and mortality.

1.2 Classification of major incidents

It is convenient to classify major incidents in three ways:

1. Natural or man-made.
2. Simple or compound.
3. Compensated or uncompensated.

Natural incidents

A *natural* major incident is the result of a natural event such as an earthquake, flood, fire, volcano, tsunami, drought, famine or pestilence (Table 1.1). To some extent, the natural disaster will be self-propagating: following a flood or earthquake those left homeless and starving will be vulnerable to the diseases associated with squalor.

Table 1.1 Natural incidents (number of injured not accurately known)

Date	Type	Place	Estimated casualties
28 July 1976	Earthquake	T'angshan, China	655 000 dead
February 1983	Bushfires	Australia	76 dead, 1100 injured
19 September 1985	Earthquake	Mexico City, Mexico	40 000 dead
7 December 1988	Earthquake	Armenia	55 000 dead
17 January 1995	Earthquake	Kobe, Japan	6398 dead
27 June 1998	Earthquake	Adana-Ceyan, Turkey	145 dead, 1500 injured
26 December 2004	Tsunami	Indian Ocean	225 000 dead
12 May 2008	Earthquake	Great Sichuan, China	69 000 dead, 375 000 injured
12 January 2010	Earthquake	Haiti	220 000 dead, 300 000 injured
22 February 2011	Earthquake	Christchurch, New Zealand	185 dead, 2000 injured
11 March 2011	Earthquake and tsunami	Japan	21 000 dead, 5888 injured
27 December 2011	Floods	Philippines	Over 1500 dead, 1.6 million affected
29 October 2012	Hurricane Sandy	North America	Over 209 dead
7 November 2013	Typhoon Haiyan	Philippines and Vietnam	6150 dead
June–November 2014	Ebola epidemic	West Africa	Over 11 000 dead
25 April 2015	Earthquakes	Nepal	8857 dead, 21 952 injured
6 February 2016	Earthquake	Southern Taiwan	117 dead, 550 injured
September 2017	Hurricane Irma	Caribbean and Florida	134 dead
7 and 19 September 2016	Earthquakes	Mexico	350 dead
28 September 2018	Earthquake	Sulawesi, Indonesia	4340 dead, 10 700 injured
June 2019–October 2020	Floods	India	Over 4000 dead
4 April 2021	Tropical cyclone	East Timor, Indonesia and Australia	229 dead

Man-made incidents

The range of man-made incidents is huge, but certain patterns are clear. A major incident can occur whenever large numbers of people gather together to travel, to work or for leisure. In some circumstances, the incident will be the result of deliberate terrorist activity.

Transport incidents

These are the commonest type of man-made major incidents. All forms of bulk transport of people are associated with a serious list of incidents (Table 1.2). The worst ever road traffic accident occurred in the Salang tunnel in Afghanistan in 1982 when a petrol tanker exploded. Such was the degree of destruction that only an estimate could be made of the number of dead of between 1100 and 2700.

Table 1.2 Transport incidents

Date	Type	Place	Casualties
28 February 1975	London Underground crash	Moorgate, UK	43 dead, 74 injured
18 January 1977	Rail crash/bridge collapse	Granville, NSW, Australia	83 dead, 213 injured
2 June 1980	Rail crash	Storsund, Sweden	11 dead, 40 injured
22 August 1985	Aircraft fire	Manchester, UK	55 dead, 80 injured
6 March 1987	Ferry capsized	Zeebrugge, Belgium	137 dead, 402 injured
18 November 1987	Underground fire	King's Cross St Pancras Tube Station, London, UK	31 dead, 100 injured
22 December 1988	Aircraft bomb	Lockerbie, UK	270 dead
8 January 1989	Aircraft crash	Kegworth (M1), UK	47 dead, 79 injured
22 December 1989	Bus collision	Cowper, NSW, Australia	35 dead, 41 injured
27 December 1991	Aircraft crash	Gottröra, Sweden	34 dead, 115 injured
4 October 1992	Aircraft crash	Amsterdam, the Netherlands	34 dead, 7 injured
28 September 1994	Ferry <i>Estonia</i> sunk	The Baltic	860 dead, 137 injured
3 June 1998	Train accident	Eschede, Germany	101 dead, 88 injured
13 July 2005	Train accident	Sindh Province, Pakistan	127 dead, 800 injured
20 August 2008	Aircraft accident	Madrid Airport, Spain	154 dead, 18 injured
31 May 2009	Air France crash	North Atlantic Ocean	228 dead
13 January 2012	Costa Concordia grounding	Isola del Giglio, Italy	32 dead, 64 injured
8 March 2014	Malaysian Airlines flight 370 crash	Unknown (missing)	239 dead
28 December 2014	Indonesia Air Asia Flight 8501 crash	Java Sea	162 dead
29 October 2018	Lion Air flight 602 crash	Jakarta, Indonesia	189 dead
10 March 2019	Ethiopian Air flight 302 crash	Addis Ababa, Ethiopia	157 dead
5 May 2019	Aeroflot Air flight 1492 crash	Moscow, Russia	41 dead, 37 injured
27 March 2020	Subway train fire	New York, USA	1 dead, 16 injured
15 July 2020	Train crash	Czech Republic	1 dead, 35 injured
3 May 2021	Train accident/metro overpass collapse	Mexico City, Mexico	24 dead, 70 injured
7 June 2021	Train accident	Pakistan	50 dead, over 120 injured

Industrial incidents

The mining industry has been the site of a series of serious industrial major incidents (Table 1.3), but perhaps the most frightening incident to date has been the explosion of a nuclear reactor at Chernobyl on 5 April 1986, which left much of Europe contaminated with radioactive material. Around 40 000 inhabitants of Chernobyl were exposed to phenomenal levels of radiation for 6 days. The official toll of 31 dead, 1000 injured and 6000 losing their lives to cancer in the subsequent 70 years seem likely to be gross underestimates.

To some extent, the consequences of an industrial incident can be predicted. Local and national guidelines should exist for emergency planning at fixed chemical and nuclear installations and for the management of contaminated casualties.

Table 1.3 Industrial incidents

Date	Type	Place	Casualties
14 October 1913	Explosion	Senghenydd coal mine, Wales	439 dead
21 October 1966	Land slide (slag heap)	Aberfan, Wales	147 dead
3 December 1982	Methyl isocyanate leak	Bhopal, India	8000 dead, 170 000 injured
6 July 1988	Explosion	Piper Alpha rig, North Sea	164 dead, 25 injured
2 August 1993	Chlorine gas leak	Stockholm, Sweden	0 dead, 33 injured
February 1996	Chemical truck fire	Sydney, NSW, Australia	0 dead, 60 injured
13 May 2000	Blast, fireworks factory	Enschede, the Netherlands	17 dead, 947 injured
23 March 2005	Explosion, oil refinery	Texas City, USA	15 dead, 100 injured
11 July 2011	Gun powder explosion	Evangelos Florakis Naval Base, Cyprus	13 dead, 62 injured
17 April 2013	Fertiliser plant explosion	West, Texas, USA	14 dead, 160 injured
24 April 2013	Rana Plaza garment factory collapse	Bangladesh	1134 dead, 2500 injured
12 August 2015	Storage plant explosion	Port of Tianjin, China	173 dead
23 July 2018	Laos dam collapse	Champasak Province, Laos	40 dead, 98 missing, 6600 displaced
25 January 2019	Mining dam collapse	Chittagong, Bangladesh	233 dead

Mass gathering incidents

'Mass gathering' is difficult to properly define – but a working definition of the presence of a crowd in excess of 1000 people is in general use. Some of the worst tragedies have occurred at stadia around the world. Precipitating factors have included an overfilled stadium (Bolton, UK, 1946; Hillsborough, UK, 1989; Johannesburg, 2001), a crowd surge back into the stadium with a last-minute goal (Moscow, 1982), and a rush for shelter to escape a hailstorm (Kathmandu, 1988).

Events involving football fans prompted reviews of the safety of stadia and the statutory medical cover for such events. Reports have been published that give practical guidance for planning such events. More recently mass gathering public events such as pop concerts or religious festivals have led to incidents (Table 1.4).

Local highlights: Guidance for event planning

Table 1.4 Mass gathering event incidents

Date	Type	Place	Casualties
24 May 1964	Crush	Lima, Peru	318 dead, 500 injured
2 January 1971	Crush	Glasgow, UK	66 dead, 100 injured
3 December 1979	Crush	The Who concert, Cincinnati, USA	11 dead, 8 injured
20 October 1982	Crush	Moscow, Russia	340 dead, unknown injured
11 May 1985	Fire	Bradford, UK	55 dead, 200 injured
29 May 1985	Crush	Brussels, Belgium	41 dead, 437 injured
March 1988	Crush	Kathmandu, Nepal	100 dead, 300 injured
15 April 1989	Crush	Sheffield, UK	96 dead, 200 injured
13 January 1991	Riot	Orkney, South Africa	40 dead, 50 injured
12 October 1996	Seating collapse	Pink Floyd concert, London, UK	43 injured
16 October 1996	Crush	Mateo Flores, Guatemala	84 dead, 150 injured
30 June 2000	Overcrowding	Roskilde, Denmark	9 dead, 26 injured
11 April 2001	Collapse	Johannesburg, South Africa	43 dead, 155 injured
9 May 2001	Crush	Accra, Ghana	123 dead, unknown injured
29 March 2009	Crush	Abidjan, Ivory Coast	22 dead, 130 injured
24 July 2010	Crush	Love Parade, Duisburg, Germany	21 dead, 500 injured
13 August 2011	Stage collapse	Indiana State Fair, USA	7 dead, 58 injured
1 February 2012	Riot	Port Said Stadium, Egypt	79 dead, 500 injured
27 January 2012	Fire and crush	Kiss nightclub, Brazil	242 dead, 168 injured
11 May 2014	Stampede	Stade Tata Raphaël, Kinshasa, Democratic Republic of Congo	15 dead, 24 injured
21 November 2014	Stampede	Mbizo Stadium, Zimbabwe	11 dead, 40 injured
8 February 2015	Riot	30 June Stadium, Cairo, Egypt	20 dead
3 June 2017	Stampede	UEFA screening, Turin, Italy	1 dead, 1500 injured
22 August 2020	Stampede	Thomas Restobar nightclub, Lima, Peru	13 dead, 6 injured
30 April 2021	Stampede	Meron pilgrimage, Israel	45 dead

Terrorist incidents

The number of people killed or injured in the last two decades by terrorist bombs is so large that in some areas (for example, Iraq, Afghanistan) the toll is inestimable (Table 1.5). Secondary devices are frequently targeted at the emergency services, including the health service. Hospitals have also been the primary target. Any involvement of the health services that reduces the capability to manage the injured will result in a *compound* major incident.

Table 1.5 Terrorist incidents

Date	Place	Casualties
8 November 1987	Enniskillen, Northern Ireland	11 dead, 60 injured
26 February 1993	World Trade Centre, USA	5 dead, 1000 injured
20 April 1995	Oklahoma, USA	300 dead
30 July 1997	Jerusalem, Israel	15 dead, 170 injured
7 August 1998	American Embassy, Tanzania	5 dead, 72 injured
11 September 2001	World Trade Centre, USA	7700 dead, unknown injured
12 October 2002	Kuta, Bali	202 dead, 209 injured
11 March 2004	Madrid, Spain	191 dead, 1800 injured
7 July 2005	London, UK	52 dead, 700 injured
13 May 2008	Jaipur, India	63 dead, 216 injured
29 March 2010	Moscow metro system, Russia	40 dead, 100 injured
24 January 2011	Domodedovo Airport, Moscow, Russia	38 dead, 180 injured
22 July 2011	Oslo and Utoya Island attacks, Norway	77 dead, 319 injured
3–7 January 2015	Baga, Nigeria	Over 2000 dead
7 January 2015	Charlie Hebdo, Paris, France	12 dead, 11 injured
2 April 2015	Garissa University attack, Kenya	148 dead, 79 injured
31 October 2015	Metrojet, Russia, bombing	224 dead
13 November 2015	Paris attacks, France	35 dead, 340 injured
2 December 2015	San Bernardino, California, USA, shootings	16 dead, 24 injured
22 March 2016	Brussels Airport, Belgium, bombing	35 dead, 340 injured
1 June 2016	Dhaka, Bangladesh	29 dead, 50 injured
12 June 2016	Pulse nightclub, Florida, USA	50 dead, 53 injured
28 June 2016	Istanbul's Ataturk Airport attack, Turkey	42 dead, 230 injured
14 July 2016	Nice, France, truck attack	87 dead, 434 injured
19 December 2016	Berlin Christmas Market attack, Germany	12 dead, 49 injured
22 May 2017	Manchester Arena, Manchester, UK, bombing	22 dead, 500 injured
31 May 2017	Kabul, Afghanistan, car bombing	Over 150 dead, 413 injured
14 October 2017	Mogadishu, Somalia, suicide truck bomb	Over 500 dead, 316 injured
11–13 December 2018	Strasbourg, France, shooting/stabbing	6 dead, 12 injured
15 March 2019	Christchurch, New Zealand, shooting	51 dead, 49 injured
21 April 2019	Batticaola, Negombo and Colombo, Sri Lanka, bombing/shooting	258 dead, over 500 injured
3 August 2019	Texas, USA, shooting	23 dead, 23 injured
19 February 2020	Hanau, Germany, shooting	11 dead, 5 injured
2 November 2020	Vienna, Austria, shooting	5 dead, 23 injured

Simple and compound incidents

In a *simple* incident the infrastructure, that is the roads, the hospitals and the lines of communication, remain intact. When this infrastructure is damaged then the incident is said to be *compound*. The reasons for a compound major incident include:

- Damaged lines of transportation: roads disrupted by flood, earthquake or public disorder; poor weather preventing support helicopters from flying
- Damaged lines of communication: radio or cellular telephone 'black spot' at the scene; disruption of fixed communication lines
- Ineffective health services: services damaged by natural incident, as a result of terrorism or secondary contamination from casualties of a chemical incident

On 13 January 2010 a 7.0 magnitude earthquake hit Haiti. Significant damage to major infrastructure was sustained including: electricity, telecommunications, hospitals, transport (air, land and sea) and a large number of buildings, including the National Assembly, 60% of government buildings and the United Nations Stabilisation Mission buildings. The international aid effort was complicated significantly by the infrastructure damage. 3.5 million people were affected, 220 000 died and 300 000 were injured.

Compensated versus uncompensated incidents

A *compensated* incident is one in which the casualties can be dealt with by mobilising additional resources; that is, the 'load is less than the extraordinary capacity'.

In the Manchester bombing in 1996 the 212 injured were managed by paramedics and hospital mobile medical teams at the scene and transported to a number of hospitals for definitive treatment.

An *uncompensated* incident occurs when the additional medical resources mobilised by instituting major incident plans are still inadequate to cope with the number of casualties; that is, the 'load exceeds the extraordinary capacity'. This frequently occurs after *natural* major incidents such as an earthquake or flood (and these incidents are also often *compound*). *Man-made* incidents may occasionally be of such a magnitude that they exceed the capacity of the health resources.

The terms 'major incident', 'disaster' and 'catastrophe' are used interchangeably by some agencies and the media. Using the terminology discussed here, a 'disaster' or 'catastrophe' is synonymous with an *uncompensated* major incident.

Key point

In an *uncompensated* incident, the load of live casualties is greater than the surge capacity of the system.

Incidents involving children

Most major incidents involve a proportion of children and some predominantly involve children (Table 1.6). It is critical that major incident plans make appropriate provision for the effective triage, treatment and distribution of injured children to appropriate facilities. Preparation should ensure availability of an adequate and age-appropriate range of medical equipment/supplies to manage incidents involving children.

Table 1.6 Incidents involving children

Date	Place	Casualties
25 January 1990	Avianca plane, USA	73 dead, 159 injured
13 March 1996	Dunblane, Scotland, UK	18 dead, 15 injured
24 March 1998	Jonesboro, USA	5 dead, 15 injured
30 October 1998	Dance hall, Sweden	60 dead, 170 injured
22 July 2011	Oslo and Utoya Island attacks, Norway	77 dead, 319 injured
14 December 2012	Sandy Hook Elementary School, Connecticut, USA	28 dead, 2 injured
22 May 2017	Manchester Arena, Manchester, UK, bombing	22 dead, 500 injured
20 March 2019	Crema, Italy, bus hijack and arson	0 dead, 12 injured

Incidents involving burns

Mass casualty burns incidents can prove a significant challenge in that most expertise in relation to management of burns, particularly in the long-term management, resides in specialist burns centres. Coupled with this, there is a very limited number of specialist burns critical care beds available. It is likely that in a large burns major incident, mutual aid would be required across international borders. Major incident plans should incorporate how to access specialist advice for the management of burns patients, as in a major incident there may be a need for treatment of these patients in non-specialist burns centres. Table 1.7 shows incidents involving mass casualty burns.

Table 1.7 Incidents involving mass casualty burns

Date	Place	Casualties
14 February 1981	Stardust nightclub fire, Dublin, Ireland	48 dead, 214 injured
11 September 2001	World Trade Centre, USA	7700 dead, unknown injured
12 October 2002	Bali bombings	204 dead, 209 injured
20 February 2003	Station nightclub fire, Rhode Island, USA	100 dead, 230 injured
1 January 2009	Santika club, Bangkok, Thailand	66 dead, 222 injured
14 June 2017	Grenfell Tower, West London, UK	72 dead, 70 injured
2020–2021	India, 24 hospital fires	93 dead, unknown injured

1.3 Summary

- A major incident has occurred for the health service when the location, number, severity or type of live casualties requires extraordinary resources
- Major incidents can be natural or man-made, simple or compound and compensated or uncompensated
- Most major incidents in developed countries are man-made, simple and compensated

