

CHAPTER 1

The epidemiology and incidence of major incidents

Learning outcomes

After reading this chapter, you will be able to:

- Define and classify a major incident
- Identify the type of major incidents that can occur
- Describe the incidence of major incidents

1.1 Introduction

A major incident is said to have occurred when an incident requires an extraordinary response by the emergency services. While major incidents may affect any of the emergency services, the health service's focus is the resulting casualties. A major incident cannot, however, simply be defined in terms of the number of casualties – the resources available at the time of the incident are also relevant. For example, a road traffic accident in a remote area producing five multiply injured casualties may overwhelm the immediately available local resources. However, a similar incident in a major urban conurbation may require little or no additional resources. Thus, the same incident in different localities may produce a major incident in one but not in the other.

For the purposes of planning, major incidents have been defined as:

Events that owing to the number, severity, type or location of live casualties require special arrangements to be made by the health services.

Local highlights: Major incident definition

This definition is an operational one that recognises that major incidents occur when the resources available are unable to cope with the workload from the incident. The need to relate major incidents to the availability of resources is most clearly demonstrated when considering incidents that produce 'specialist' types of casualties. An incident producing paediatric, burned or chemically contaminated casualties may require the mobilisation of specialist services even when there are only a

few casualties. This is because the expertise and resources needed to deal with these types of casualties are limited and widely scattered around any country.

Incidents such as plane crashes may occur in which all casualties are dead at the scene. Whilst these are clearly major incidents for the police and fire service, there is often little requirement for the health service beyond mortuary and pathology services. An example of such an incident is an air crash where all passengers are killed and only a few people are injured on the ground.

1.2 Classifying major incidents

Whilst the health service definition is an adequate one for planners at a local level, it does not tell us anything about the size of the incident or the incident's effect on society as a whole.

Rutherford and de Boer (1983) have classified and defined major incidents with regard to their size and effect on the health service and society. This classification system is useful for emergency planners and researchers. Their system defines major incidents in three ways:

1. Simple or compound
2. Size – minor, moderate or severe
3. Compensated or uncompensated

Simple or compound

Compound incidents are those in which the incident destroys the infrastructure of society itself. Roads, communications and even the health services may be destroyed, inaccessible or unavailable. Compound incidents typically arise as the result of war, terrorism or natural disasters. A simple incident is an incident in which the infrastructure remains intact.

Size – minor/moderate/severe

While it is not possible to decide whether a major incident has occurred purely on the number of casualties involved, an appreciation of the size of the incident can assist in the planning process for a major incident response. Rutherford and de Boer (1983) divide incidents into minor, moderate or severe (Table 1.1).

Size	Total number of casualties (alive or dead)	Casualties admitted to hospital
Minor	25–100	10–50
Moderate	100–1000	50–250
Severe	>1000	>250

Compensated or uncompensated

By definition, major incidents require the additional mobilisation of resources in order to deal with the health service workload. Incidents may be considered to be compensated if the additional resources mobilised can cope with the additional workload. When an incident is such that even following the mobilisation of additional resources the emergency services are still unable to manage, it is said to be uncompensated.

Failure to compensate may occur in three circumstances. First, the absolute number of casualties may be so large as to overwhelm the available health service resources. Second, the resulting casualties may require such specialised (or rare) skills or equipment that any more than a few casualties overwhelm resources. Such incidents may require relatively few casualties to reach this point, as there may be scant resources available to deal with them. Third, incidents occurring in remote areas may remain decompensated as the health services may be unable to reach the casualties.

The point at which decompensation occurs is often difficult to define and in many respects depends on the perspective of the observer. Total failure of the response to a major incident (such as the absence of any medical care) is clearly failure to compensate, and is most likely to occur in natural disasters or war. However, failure to compensate may also be considered to have occurred when the care given to individual patients is of a standard less than that acceptable in day-to-day practice. For instance, if there are many seriously injured casualties, specialist trauma networks may be overwhelmed and patients may be treated in facilities unused to treating severe injury. Decompensation is only considered to have occurred when the system fails to such an extent that individual patient care is seriously compromised.

At the present time little is known about the effectiveness of the health services' response to major incidents as this information is rarely recorded or analysed. However, anecdotal evidence suggests that the care given to individual patients during major incidents is often below the standard that would be delivered in normal daily practice.

1.3 The all hazards approach and special major incidents

Major incident planning should follow an 'all hazards approach'. This means that one basic major incident plan should be able to cope with all types of major incident. This is necessary as it is impossible for any emergency planner to predict the nature of the next incident. In addition, maintenance of separate major incident plans for all possible eventualities would be impractical. The all hazards approach also allows planning to be kept as simple and as near to normal working practice as possible.

However, despite these guiding principles, there are still certain types of incident that require additional modifications to the basic plan. This is the only way to achieve the aim of optimal clinical management for as many casualties as possible.

Incidents involving chemicals, radiation, burns, infectious diseases or large numbers of children are considered by many emergency planners as 'special' types of major incidents. Whilst it may be necessary to alter or embellish major incident plans to deal with these specific types of incidents, the required modifications should be made without significant departure from the basic (all hazards) major incident plan. All these incidents are characterised by a type of casualty for which resources may be scarce. They may, therefore, result in a failure to compensate by the health services' response even though there are relatively few casualties. Although these types of incident are considered separately, the general principles of emergency planning must still apply.

1.4 Natural disasters

It is worthwhile reiterating the difference between man-made and natural disasters when considering the epidemiology of major incidents. Natural disasters result from earthquake, flood, tsunami, volcano, drought, famine and/or pestilence. The potential for suffering and loss of life is enormous (Table 1.2).

Date	Place	Event	Estimated casualties
2011	Japan	Earthquake and tsunami	21 000 dead, 5888 injured
2010	Haiti	Earthquake	220 000 dead, 300 000 injured
2008	Great Sichuan	Earthquake	69 000 dead, 375 000 injured
2004	Indian Ocean	Tsunami	Over 225 000 dead and injured
1998	Turkey	Earthquake	145 dead, 1500 injured

On a world scale, natural disasters are important but require a different type of response to the simple, compensated major incident more typical of those occurring in a developed society. Planners considering the response to a natural disaster in a foreign country face a challenge quite different from that presented in this book.

1.5 Epidemiology of major incidents in the UK

Historically, major incident planning has been based upon military experience. As a consequence of this, many major incident plans have been developed to cope with large numbers of traumatically injured adults. However, major incidents may occur for a variety of reasons and may produce many different types of casualties. Whilst it is impossible to predict the exact nature of the next major incident, there is little to be gained in planning for types of major incident that might never occur. By looking at the type of major incidents that have occurred in the recent past, planners can base their plans and major incident exercises on realistic scenarios.

Although some incidents are extensively investigated and reported (for example terrorist incidents), for the majority there is a paucity of accurate data on injury patterns or patient outcomes. Despite these limitations some information is available to planners to inform major incident planning through national and international guidance documents.

Incidence of major incidents

Many health care providers perceive major incidents to be extremely rare events. It is therefore not surprising that major incident planning has been accorded a low priority. If incidents are perceived as rare then emergency planners and health service staff may become complacent. It is perhaps no surprise that the most active time for major incident planning appears to be the period immediately after an incident has occurred. This is too late.

In order to examine the real need for major incident planning in Britain, a 28-year review of major incidents occurring between 1968 and 1996 was conducted (Carley et al., 1998). In this study a major incident was considered to have occurred when 25 or more people had attended hospital, more than 20 had attended of whom six or more had suffered serious injury (critical care unit admission or multiple injuries) or when a major incident was known to have been declared by the ambulance service or receiving hospital. A total of 108 major incidents were identified. Although major incidents are perceived as rare the overall incidence over this period was three or four major incidents per year. However, for many years the data were incomplete. In recent years data are more reliable, and an estimate of four or five major incidents occurred per year in years when data collection is known to have been good.

There are approximately 200 emergency departments in the UK. Any could receive casualties from a major incident. It follows that each hospital would expect a major incident every 28–30 years. However, as the majority of major incidents occur in population centres or along lines of mass transportation, hospitals in urban conurbations may expect a higher incidence. In addition, it is rare for only a single hospital to respond to a major incident (particularly in urban centres). The true estimate for any individual hospital is therefore difficult to calculate, but an estimate of one every 10 years for urban hospitals would appear reasonable, with a lesser incidence in more rural settings.

Local highlights: Number of major incidents per year

What types of major incidents occur?

The vast majority of incidents in the UK arise as the result of human activity. Incidents are usually characterised by large numbers of people gathered together for work, travel or leisure. Incidents can also occur as a result of terrorist attacks or from other forms of social disorder.

Although a wide variety of incidents occur, they can be broadly subdivided into civil disorder (including terrorist incidents), industrial accidents, transportation accidents, sports stadia events, and a variety of other miscellaneous types. In the UK between 1968 and 1996, 63/108 (58%) incidents involved transportation accidents, 22/108 (20%) resulted from civil

disturbances, and industrial accidents accounted for 15/108 (16%). Sports stadia and other miscellaneous incidents comprise the remaining 6%. All these types of major incident are likely to be encountered again.

Transport-related incidents form the majority of major incidents occurring in the UK, with rail crashes being the single largest cause. Surprisingly, air crashes, although perceived as a common cause, rarely result in major incidents. This is because they result in large numbers of deaths, but few survivors. Many major incident plans and exercises are tailored to receiving casualties from air crashes. Planners should look in particular at the response to all other forms of major incident when formulating plans.

Local highlights: Types of major incident

How many patients should we plan for?

There appears to be no clear consensus as to how to predict the number of casualties. A variety of estimates for major incident plans have been made previously; some of these have been extremely unrealistic.

There are several aspects to consider when estimating the expected patient workload. First, the total number of casualties requiring medical attention is important as they will need to be processed and treated by the health services. Second, an estimate of the likely number of patients with injuries severe enough to warrant hospital admission, surgery, critical care or specialist services would be useful.

Although the next major incident is unlikely to exactly replicate a previous one, an examination of past incidents can guide emergency planners as to the expected number of casualties that may result from major incidents. Figure 1.1 shows the total number of casualties in British major incidents.

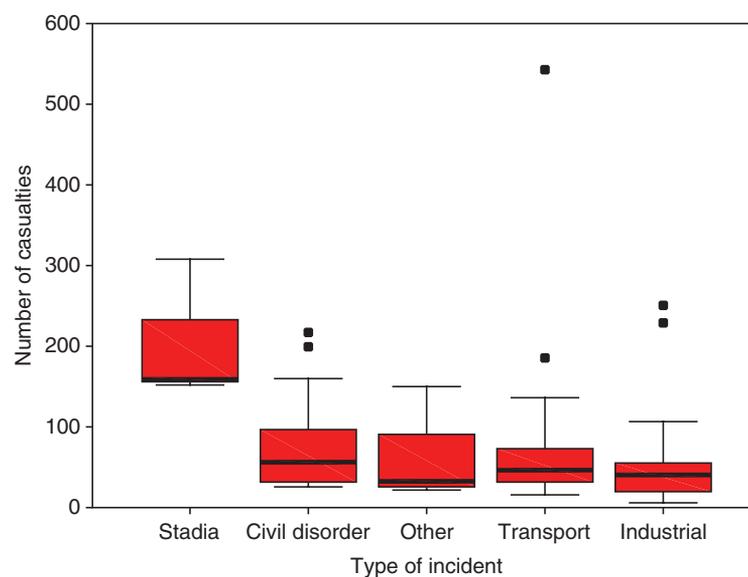


Figure 1.1 Box plot of total number of casualties by type of incident, 1968–96

The majority of major incidents result in fewer than 100 casualties. It is therefore reasonable for emergency planners to ensure that their major incident plans are capable of receiving this number of casualties. The exception to this is the disproportionately large number of casualties seen in stadia-related incidents when emergency planners might be expected to plan for up to 200 casualties.

Local highlights: Number of casualties per major incident

It is useful to look more closely at the number of live casualties, and in particular the number of casualties requiring admission to hospital. In 75 of the incidents studied between 1968 and 1996, it was possible to differentiate casualties into serious and minor. Serious casualties were those requiring admission to hospital, minor were those treated and allowed home. It is clear that, on average, the number of casualties with minor injuries is at least twice that of those seriously injured.

For hospital planners an estimate of the number of patients requiring admission is useful. Figure 1.2 shows the range of seriously injured casualties seen in different types of incident.

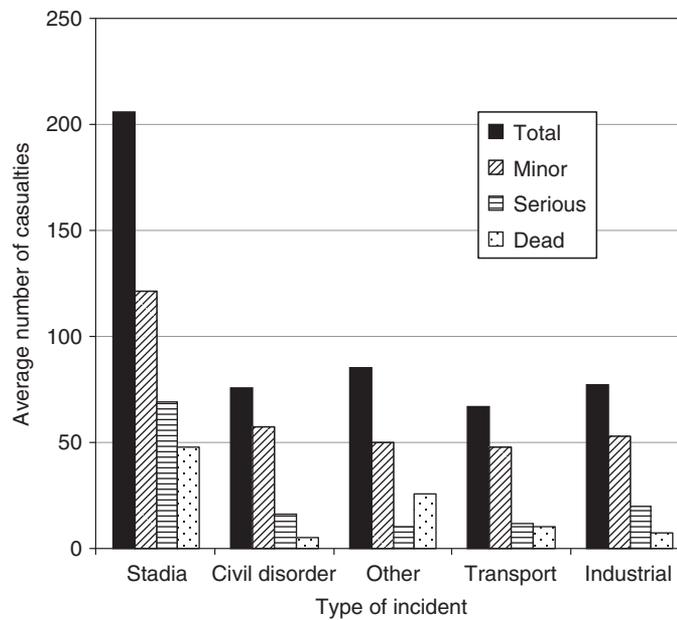


Figure 1.2 Box plot of casualty admissions by type

Local highlights: Number of serious casualties per major incident

These data suggest that hospitals in the UK should have major incident procedures that allow them to admit up to 40 patients for the majority of incidents. This equates to an average of two wards. Again, the exception is in sports stadia incidents where hospitals should prepare to admit up to 100 patients. Clearly, very few hospitals could receive and optimally treat the numbers of patients seen in sports stadia incidents on their own. Therefore, major incident plans for stadium incidents should include a multi-hospital response wherever possible.

Unfortunately, no data exist to suggest the need for surgical, critical care or specialist services. Empirically it would appear reasonable that all hospitals might plan to be able to receive and treat five multiply injured or severely ill casualties. If trauma services are concentrated in a smaller number of hospitals, this estimate may need to be increased.

1.6 Summary

- The definition and classification of major incidents must include an appreciation of the number, type and location of the casualties
- Particular types of major incident may require the mobilisation of specialist resources
- Emergency planners can learn from examining previous major incidents occurring in their country
- In the UK, hospital major incident plans should be designed to receive up to 100 casualties, and to admit 40 of them
- Hospitals close to stadia (or other mass gatherings) should plan to receive up to 200 casualties and admit 100 of them
- Large incidents will almost always require a co-ordinated multi-hospital response

