

ADVANCED LIFE SUPPORT GROUP



Kevin Mackway-Jones
(editor)



MIMMS

Major Incident Medical Management and Support

Major Incident Medical Management and Support

**The Practical Approach at
the Scene**

THIRD EDITION

Advanced Life Support Group

EDITED BY

Kevin Mackway-Jones

 **WILEY-BLACKWELL**

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 Advanced
Life
Support
Group

A charity dedicated to saving life
by providing training

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Preface to the third edition

It doesn't seem 17 years since the first edition of this book was published – but it is, and many major incidents have occurred around the world during that time. One incident, the destruction of the twin towers in New York in 2001 has changed the way that we perceive the world and has, incidentally, catapulted major incident response into the big-time. Governments have put time, money, and effort into improving their response and much has been learned. It is, therefore, a good time to review this text and to take the opportunity to include this new knowledge and some new procedures into our teachings. I hope that readers will find that we have done just that, whilst retaining the core messages of MIMMS – particularly our structured approach (CSCATTT) that has become widely accepted itself and is now practised around the world. I am grateful to contributors old and new for their efforts, and to you, the readers and course participants, whose feedback has been most helpful and has, in the main, been incorporated here. Major incident response will always be hard. The harder you train the easier it will become.

Throughout this text the male gender is used, whether male or female applies. This is a typographical convenience.

K. Mackway-Jones
(Editor)
Manchester 2011

Preface to the first edition

'It couldn't happen to us' is not an acceptable excuse for being ill-prepared to deal with a major incident. A major incident may occur at anytime, anywhere.

Guidelines exist for the health services response to a major incident and these cover both the hospital and the scene. Each hospital must have its own Major Incident Plan and this should be regularly exercised. How well do we teach the principles of the major incident response to our medical and nursing staff? How much do we learn from our exercises? Are mistakes being repeated?

It is no longer acceptable to approach the scene of a major incident as an enthusiastic amateur. The transition from working in the emergency department to working at the scene does not simply involve putting on a reflective jacket and a pair of Wellington boots. The medical service must, like the police, fire, and ambulance services, be skilled in command and communications, and have experience of the pre-hospital environment. This is in addition to coping with the enormous strain that mass casualties will place on the medical resources. To do this requires knowledge and training.

This manual, although a stand-alone text, has been prepared to accompany a course structured to teach the principles of management and support at a major incident to health service staff. This course will prepare both the Incident Officers, and other members of the scene medical response for their duties in the event of a major incident.

T. J. Hodgetts
K. Mackway-Jones
(*Editorial Board*)
Manchester 1994

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PART I

Introduction

CHAPTER 1

Introduction

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. 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 Boeing of the Royal Dutch Airlines (KLM) collided with a PanAm aircraft during take-off. All passengers and members of the crew died (total 583).

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.

Local highlights: Major incident definitions

A major incident requiring extraordinary resources occurred three or four times per year in the United Kingdom (with a range from 0 to 11 incidents per annum) in the 30 years from 1966 to 1996.

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	Place	Estimated casualties
28 July 1976	T'angshan, China, earthquake	655,000 dead
February 1983	Australia, bushfires	76 dead, 1100 injured
19 September 1985	Mexico City, earthquake	40,000 dead
7 December 1988	Armenia, earthquake	55,000 dead
17 January 1995	Kobe, Japan, earthquake	6398 dead
27 June 1998	Adana-Ceyan, Turkey, earthquake	145 dead, 1500 injured
26 December 2004	Indian Ocean, tsunami	225,000 dead
12 May 2008	Great Sichuan, earthquake	69,000 dead, 375,000 injured
12 January 2010	Haiti, earthquake	220,000 dead, 300,000 injured
11 March 2011	Japan, earthquake and tsunami	21,000 dead, 5888 injured

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 an impressive 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 capsizes	Zeebrugge, Belgium	137 dead, 402 injured
22 December 1988	Aircraft bomb	Lockerbie, UK	270 dead
8 January 1989	Aircraft crash	Kegworth (M1), UK	47 dead, 79 injured
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	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

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, Netherlands	17 dead, 947 injured
23 March 2005	Explosion, oil refinery	Texas City, USA	15 dead, 100 injured

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 football stadia around the world (Table 1.4). 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.

Local highlights: Guidance for event planning

Table 1.4: Football stadia 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
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	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
16 October 1996	Crush	Mateo Flores, Guatemala	84 dead, 150 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

Terrorist incidents

The number of people killed or injured in the last two decades by terrorist bombs is so large that in some areas (e.g. 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 (see below).

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

Simple versus 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.

In December 1974, in Darwin, a remote city in the far north of Australia, cyclone Tracy wiped out major infrastructure: electricity, telecommunications, and most buildings; 65 died, 650 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.

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

SUMMARY

- A major incident has occurred for the Health Service when the location or 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.

CHAPTER 2

The structured approach to major incidents

After reading this chapter you should be able to answer the following questions:

- How can I prepare for a major incident?
- What is the structured approach to major incident scene management?
- What is the structured approach to medical support at the scene?
- How does recovery occur after a major incident?

INTRODUCTION

There are three distinct aspects to emergency preparedness. These are:

1. Preparation.
2. Response.
3. Recovery.

PREPARING FOR A MAJOR INCIDENT

While man-made major incidents (for example, transport and stadia incidents) may be prevented by legislation and vigilance, natural incidents can only be anticipated. There are three elements to the medical preparation for a major incident: planning, equipment, and training.

Planning

Failing to plan for a major incident is a sure way to increase the chances of failing on the day one actually occurs. 'It will never happen to us' is not an acceptable excuse for the absence of adequate planning.

The following plans must either be written by the Health Services themselves or must have appropriate links or health service input.

- An Ambulance Service major incident plan.
- Plans for each hospital that is likely to receive major incident casualties.
- Plans for high-risk venues (for example, major sports stadia).
- A regional/state/national plan for the coordination of resources on a wider scale.

All plans should be reviewed and updated if faults are detected when they are exercised.

Local highlights: Major incident plans**Equipment**

Personal protective equipment is required for all Health Service staff at the scene. There are also tools that may assist the Health Service Commanders. Medical equipment should be matched to the skills of the provider. Doctors and nurses should bring appropriate equipment to the scene and this should complement not duplicate Ambulance Service equipment. These issues are discussed in Chapters 7 and 8.

Training

There are two aspects to training: education and exercise. It is important that education precedes exercise to avoid the repeated fundamental errors that have been demonstrated on multiagency exercises.

Education

The principles of patient assessment and treatment are those taught on advanced life support courses. These skills will be essential to members of the medical team but must be applied appropriately to the pre-hospital setting.

Major Incident Medical Management and Support (MIMMS) is a structured course for doctors, nurses and ambulance clinicians that teaches a systematic approach. It has also been used to train emergency planning officers and some police, fire, and military staff who will benefit from an understanding of this system.

MIMMS has been evaluated in a published attitudinal survey to detect any perceived change in ability to function at a major incident. One hundred per cent of respondents believed that MIMMS provided adequate training and all recorded a perceived ability to perform practical skills (radio procedure and triage) and function as a commander. The change in degree of confidence was most pronounced amongst the doctors and nurses.

Exercise

Exercises can take a number of forms. Exercising components of the response independently may facilitate a smoother full exercise.

- Table-top exercises to highlight communication chains and management structures.
- Triage exercises with paper casualties or simulated live casualties.
- Communication exercises to test staff activation cascades.
- Practical exercises without casualties (PEWC), walking the ground, and responding to a developing virtual incident.
- Multi-agency exercises involving casualty handling, with or without processing casualties through the hospital, to test the hospital response.

THE STRUCTURED RESPONSE TO A MAJOR INCIDENT

MIMMS provides a structured ‘all-hazard’ approach to the major incident scene response (major incident medical *management*) and to dealing with multiple casualties (major incident medical *support*), irrespective of the nature of the incident.

The ‘all-hazard’ structured response to a major incident can be adopted by the Health Service Commanders at the scene and by all other members of the health services involved in the response. The approach involves seven key principles (Box 2.1). The principles have been shown to cross interservice, civilian–military, and international boundaries.

Box 2.1: Management and support priorities

Command
Safety
Communication
Assessment
Triage
Treatment
Transport

This is the ‘ABC’ of major incident medical response.

Command

Each emergency service at the scene has a commander. ‘Command’ runs up and down (vertically) in each service. Overall responsibility will be taken by one service at the scene and this service is said to have control. ‘Control’ therefore runs across (horizontally) the services.

The command structure of the Health Service is described in Chapter 3. The command structure and roles of the Police, Fire, and support services are described in Chapters 4 and 5.

Control at the scene is facilitated by the use of cordons, which identify tiers of command at the scene. These tiers (referred to as *Bronze*, *Silver*, and *Gold*) are described in Chapter 10.

Safety

The code of safety is remembered as the ‘1-2-3 of safety’ (Box 2.2).

Box 2.2: The 1-2-3 of safety

1 Self
2 Scene
3 Survivors

Personal safety is paramount and is achieved by wearing the appropriate personal protective equipment (Chapter 7). Where a hazard exists and either the training or the protective equipment of Health Service personnel is inadequate, then they should ‘get out, stay out, and call out’.

Safety of the scene is achieved by effective control of the cordons. The aim is to prevent those arriving to assist at the incident (or the media and public who will want to observe) from becoming part of the incident. Safety is discussed in more detail in Chapter 12.

Communication

Poor communication is the commonest failing at the scene of a major incident. Effective communication between the incident commanders must be established early and arrangements

should be made for regular liaison. Radios are a common tool and staff who do not use them regularly must become familiar with radio procedure prior to the incident. Communications are dealt with in Chapter 13 and Appendix E.

Key point

The commonest failing of major incident management is poor communications.

Declaring a major incident

Each emergency service and every hospital that is capable of receiving emergency admissions will have a major incident plan that allows the rapid mobilisation of additional resources. The problem is often not the execution of the plan but rather a reluctance to institute it. This may occur for reasons of professional pride, for fear of criticism of over-reacting, or out of ignorance. None of these is acceptable. If in any doubt, a major incident should be declared.

Confusion may arise at a hospital unless there is a clear message from the scene that a major incident has been declared and the hospital major incident plan is to be put into action. For this reason it is important that the notifying messages to the hospital are standardised (Box 2.3).

Box 2.3: Major incident messages

- **Major incident – standby:** This alerts the hospital that a major incident is possible. A limited number of staff need to be informed
- **Major incident declared – activate plan:** In this case the incident has occurred and a full response is required
Either of these orders can be rescinded at any time by the following order:
- **Major incident – cancelled**

Local highlights: Incident activation

In some instances, casualties may arrive at the hospital before a clear message has been passed from the scene. In such cases the hospital should activate its own plan internally. For instance, in the Manchester bombing in 1996 only eight of 212 casualties arrived at hospital by ambulance and the decision to implement the major incident plan was made by the emergency departments.

Assessment

A rapid assessment of the scene is essential. The information gathered is used to determine the initial Health Service response to the scene.

The quality of the first information that is passed from the scene will be important in determining the speed and adequacy of the subsequent response. The acronym *METHANE* is recommended as a reminder of the key information to be passed (Box 2.4).

Box 2.4: First key information

M	Major incident	<i>Confirm call-sign. Advise major incident 'standby' or 'declared'</i>
E	Exact location	<i>Grid reference, road names, landmarks, etc.</i>
T	Type of incident	<i>Rail, chemical, road traffic collision, etc.</i>
H	Hazards	<i>Actual and potential</i>
A	Access/egress	<i>Safe direction to approach and depart</i>
N	Number of casualties	<i>An estimate in the first instance and then upgraded with their severity/type</i>
E	Emergency services	<i>Present and/or required</i>

Continuing assessment can use the *HANE* acronym (the second half of the *METHANE* message used earlier). By continually reassessing the hazards, access, number and nature of casualties, and the emergency services available to treat them, the incident commanders will ensure that they have the right people, with the right skills and equipment, to treat the casualties at the scene and the right transport to move the casualties to the right hospital for further care. This is discussed in Chapter 14.

Triage

This is the cornerstone of the medical support of casualties and involves the sorting of casualties into priorities for treatment. The process is dynamic (priorities may alter after treatment or while waiting for treatment) and must be repeated at every stage of the evacuation chain to detect changes. A simple system for triage is described in Chapter 15.

Treatment

The aim of treatment at a major incident is to 'do the most for the most', that is to maximize the benefit that can be achieved. The actual treatment delivered will reflect the skills of the providers, the severity of the injuries, and the time the patient spends on the scene. The nature of the environment and the casualty load may restrict a provider's ability to perform to best practice standards. Treatment is discussed in Chapter 16.

Transport

In a conventional major incident in a developed country, most casualties will be moved to hospital by emergency ambulance or will make their own way there. Other forms of transport can be used and it is the responsibility of the Health Service Commanders to ensure that patients are transported in an appropriate vehicle with the necessary in-transit care. The aim of evacuation at a major incident is to get 'the *right patient* to the *right place* in the *right time*'. Transport is dealt with in detail in Chapter 17.

RECOVERING FROM A MAJOR INCIDENT

The pre-hospital phase of a typical major incident (one that is man-made, simple, and compensated) will often only last several hours. The phrase 'casualty evacuation complete' may mark the end of the concentrated activity at the scene but the additional strain on an individual hospital will be felt for many days or even weeks in its effect on routine operating lists and outpatients. The rehabilitation of some patients can take years.

Most of the hospital staff and many of the emergency service personnel will never have experienced such an event and, understandably, some will show the signs of stress. This may be immediate and during the incident but an acute stress response is common immediately afterwards. Much less common is an insidious syndrome of reliving the events with flashbacks and nightmares resulting in anxiety, sleeplessness, and poor performance at work known as the post-traumatic stress disorder (PTSD).

There is a requirement in the immediate period following the incident to begin a combined process of operational debriefing to learn the lessons to improve future practice and psychological support to provide the necessary emotional support (and, rarely, formal psychiatric treatment) for those coming to terms with the event. The psychological aspects of major incidents are discussed in Appendix A.

SUMMARY

- A major incident has three phases: preparation, response, and recovery.
- Preparation involves planning, organisation of equipment, and training.
- An 'all-hazard' approach is required when planning for a major incident.
- Each incident can be managed with the same structured response.
- *Major Incident Medical Management and Support* provides a simple, structured, and effective approach to training Health Service personnel.



PART II

Organisation

CHAPTER 3

Health Service structure and roles

After reading this chapter you should be able to answer the following questions:

- How are the Health Services structured during a major incident?
- Who is in command of the Ambulance and Medical Services at the scene?
- Who is in control of the Health Service response?
- What are the responsibilities of the Ambulance Commander?
- What are the responsibilities of the Medical Commander?
- How is the Health Service response organised?
- What medical and nursing staff will be involved and what are their functions?

AMBULANCE SERVICES ORGANISATION

Ambulance personnel are, on the whole, trained to work singly or in pairs to give care to a single casualty. Each unit operates independently and is tasked by an ambulance communications centre. In day-to-day operations, each unit acts alone without the supervision of an ambulance officer. If working in pairs then one member of the team leads the provision of care and the other assists in care and drives the vehicle. These roles will be referred to as attendant and assistant, respectively, throughout the rest of the text.

Ambulance services use a variety of vehicles on a day-to-day basis including ambulances, rapid response cars, motorbikes, and helicopters. They may also have Major Incident Support Units and non-emergency vehicles that can be quickly deployed to an incident.

Ambulance Service Specialist Teams

Some ambulance services have specialist teams that may be deployed according to a 'pre-determined attendance' (PDA) procedure. This allows a number of highly equipped vehicles and trained personnel to be dispatched to specific types of incident based on hazard and risk assessments. An example of this would be the response to airport, rail, or hazardous materials incidents.

In the UK, the Hazardous Area Response Team (HART) is a specialist team trained in major incident response with the capability to operate in hazardous environments. Specific skills such as urban search and rescue (USAR), support to offshore incidents, and support to police firearms teams may feature as part of their role. Special Operations Response Teams (SORTs) are specialist teams trained in major incident response, including the decontamination of casualties.

MEDICAL SERVICES ORGANISATION

Acute hospital and primary care medical services are most often arranged around clinical teams and services. Each organisation will vary in the level of care that it will be able to provide in the event of a major incident.

Major Incident Medical Management and Support: The Practical Approach at the Scene, Third Edition. Edited by Kevin Mackway-Jones.

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In some areas, there may be organisations that are trained and experienced in providing medical care for emergencies in the pre-hospital environment. If available, their expertise should be incorporated into the planned attendance at any major incident.

Planning for a major incident is a vital part of overall organisational preparedness. Key elements of planning include the setting up of command and control structures within hospital services. This is dealt with in detail in *Major Incident Medical Management and Support: the practical approach in the hospital*.

COMMAND AND CONTROL OF THE HEALTH SERVICE RESPONSE

The health services response at the scene is led by the Ambulance Commander and the Medical Commander. These two officers liaise closely with each other and with the commanders from the Fire and Police Services. The particular title of these commanders will vary from country to country.

Local highlights: Title of commanders

Each commander wears a distinctive, chequered tabard inscribed front and back with their appointment, for example 'Police Commander'.

The Ambulance Commander and Medical Commander have distinct roles but must work closely together as a command team. This avoids duplicated or contradictory orders, reduces troublesome radio communications, and allows difficult decisions to be shared.

In the UK, the Ambulance Commander is *in control* of the response of the health services. Whereas in New South Wales, Australia, the State Disaster Plan clearly identifies that the Medical Commander has control of the health service response.

AMBULANCE SERVICES AT A MAJOR INCIDENT

Action of the first crew on the scene

The actions of the first ambulance crew at the scene of a major incident are critical in determining the speed of mobilisation of the health services and in ensuring that hospitals are given the maximum time to prepare to receive multiple casualties. Any delay in declaring a major incident by the initial Ambulance Service response may have a deleterious effect on the deployment of appropriate resources and the preparedness of the wider health services.

Usually, if the initial response is a double-crewed vehicle, the ambulance attendant will assume the role of Ambulance Commander and the assistant will remain with the vehicle to maintain communications with Ambulance Control (acting as the Communications Officer). The role of Ambulance Commander will be handed over to a more senior ambulance officer on their arrival.

Under no circumstances should the first crew on the scene become involved in casualty treatment since this will stop them liaising with other services, assessing the scene as a whole, and providing a continuous conduit of information as the incident develops.

The first substantial situation report (METHANE) will come from the *de facto* Ambulance Commander after a rapid assessment of the scene. The information that should be contained in this report is given in Box 3.1.

Box 3.1: Initial information to be passed from the scene of a major incident

M	Major incident	<i>Confirm call-sign. Advise major incident 'standby' or 'declared'</i>
E	Exact location	<i>Grid reference, road names, landmarks, etc.</i>
T	Type of incident	<i>Rail, chemical, road traffic collision, etc.</i>
H	Hazards	<i>Actual and potential</i>
A	Access/egress	<i>Safe direction to approach and depart</i>
N	Number of casualties	<i>An estimate in the first instance and then upgraded with their severity/type</i>
E	Emergency services	<i>Present and/or required</i>

The exact content of this initial report may vary. To ensure interoperability, local protocols should be followed.

Local highlights: Initial report

The first ambulance at the scene will become the Ambulance Control Point (ACP) and the rendezvous point for all Health Service resources arriving at the scene. In the UK, the ACP should be the only ambulance vehicle with its blue lights still operating. The use of this vehicle as the control point will be required until the Ambulance Service's designated control vehicle arrives.

The actions of the first ambulance crew on-scene are summarised in Box 3.2. The attendant should identify a suitable location for the Casualty Clearing Station(s). At this early phase of the incident, this may involve no more than identifying an area where the walking wounded and uninjured survivors should gather and wait.

Box 3.2: The actions of the first ambulance crew arriving on-scene**Assistant**

- Park as near to the scene as safety permits
- Leave the blue lights on (indicating the vehicle is acting as the ACP)
- Confirm arrival at scene with Ambulance Control and provide initial, brief situation report
- Maintain communications with the attendant/Ambulance Commander
- Stay with the vehicle until instructed by the Ambulance Commander
- Leave the ignition keys in the vehicle

Attendant

- Undertake the role of Ambulance Commander
- Wear appropriate Ambulance Commander identification, e.g. tabard
- Commence a record of actions taken (incident log)
- Carry out a scene assessment (including a dynamic risk assessment)
- Give substantial reports to Ambulance Control (METHANE message)
- Declare a major incident/standby
- Identify the need for additional ambulance resources, medical teams, or specialist/support equipment
- Identify key areas, e.g. Ambulance Parking Point, Casualty Clearing Station
- Liaise with other emergency services at scene

Ambulance Control actions

On receipt of a message at Ambulance Control declaring a major incident or standby, the duty control manager should refer to standard operating procedures. There are two primary tasks: coordinating the response of Ambulance Service resources to the scene and ensuring that all necessary organisations and individuals have been informed.

Ambulance Service responsibilities at the scene

The responsibilities of the Ambulance Service at the scene are listed in Box 3.3. Their objectives are to provide the best possible care for the injured at the scene and to arrange rapid transport of the right casualty to the right hospital. Ambulance Control will have information regarding the capability and capacity at each local 'receiving' hospital and their ability to provide a medical team to the scene.

Box 3.3: Roles and responsibilities of the Ambulance Service at a major incident

- Establishing a forward control
- Saving life
- Preventing further injury
- Relieving suffering
- Liaising with other emergency services
- Determining the receiving hospitals
- Mobilising necessary additional medical resources
- Providing communications for Health Service resources at the scene
- Providing a Casualty Clearing Station
- Providing the Ambulance Parking and Loading Points
- Determining priorities for treatment and evacuation using triage
- Arranging means of transporting the injured
- Documenting the movement of casualties

AMBULANCE SERVICE KEY ROLES

To facilitate command at a major incident, a structured 'key role' approach is required. Roles are initially filled by crews as they arrive on the scene. Subsequently, the roles are handed on to more senior ambulance officers as they arrive. The use of key roles, rather than the specific appointment of officers to jobs, avoids the problems that arise when particular officers are unavailable or cannot reach the scene. The key roles are listed in Box 3.4 and their relationships to each other in Figure 3.1.

Box 3.4: Ambulance Service key roles

- First crew on scene
- Ambulance Commander
- Ambulance Safety Officer
- Ambulance Communications Officer (on site)
- Forward Ambulance Commander
- Casualty Clearing Station Officer
- Ambulance Loading Officer
- Ambulance Parking Officer
- Primary Triage Officer
- Ambulance Equipment Officer

Ambulance Commander

The Ambulance Commander is in command of ambulance resources at the scene, must not be involved directly with patient care and is identified by a distinctive coloured tabard which is clearly labelled. They can move anywhere about the scene but will usually stay close to the command vehicles and the other emergency service commanders to facilitate regular liaison. The following are the Ambulance Commander's duties:

- To liaise with the Medical Commander, Police Commander, and Fire Commander.
- To ensure the safety of Ambulance and Health Service responders.
- To delegate key tasks to other ambulance officers/personnel.
- To ensure radio communications are provided to appropriate health personnel.
- To carry out an assessment of the scene.
- To determine where mobile medical teams are drawn from in liaison with the Medical Commander (if on site).
- To determine which hospitals will receive casualties in liaison with the Medical Commander.
- To oversee triage and treatment provided by ambulance personnel.
- To organise the most suitable transport for casualties.
- To confirm access and egress routes for Health Service vehicles with the Police.
- To determine the need for support from voluntary agencies in an ambulance aid role and to oversee treatment provided by these personnel.
- To arrange for replenishment of equipment.
- To liaise with the Police regarding media briefings.

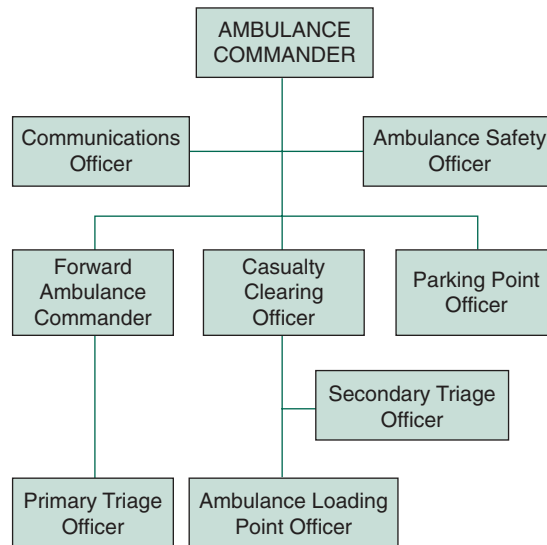


Figure 3.1: The Ambulance Service command structure

Local highlights: Ambulance Service command structure

Ambulance Safety Officer

The Ambulance Commander will delegate an officer to be responsible for the safety of all health personnel on site. Their duties include the following:

- To ensure that all health personnel are wearing suitable personal protective equipment.
- To monitor staff for fatigue or stress and to advise on the need to relieve staff.
- To identify hazards, evaluate risks, and ensure that appropriate control measures are undertaken.
- To liaise with the other emergency services on safety matters and procedures.
- To consider issues regarding contaminated casualties, staff, vehicles, and equipment.

Key point

Personnel that are not equipped with the correct personal protective equipment should be refused admission to the site.

Ambulance Communications Officer

This officer provides and coordinates all on-site and off-site communications for appropriate ambulance and medical staff and communications between the Ambulance Service and other emergency services. The Ambulance Communications Officer is located at the Ambulance Control Point. Duties include the following:

- To provide a link between the site and main Ambulance Control.
- To provide a link between the on-site Ambulance Command Vehicle and other emergency service incident control vehicles.
- To provide a link between the site and the receiving hospitals.
- To determine the most suitable communication mode for a particular message including radio, telephone land lines, cellular telephone, and fax.
- To maintain a log of all transmissions from the health personnel at the site.

Forward Ambulance Commander(s)

This officer is responsible to the Ambulance Commander for the management of ambulance resources in a specific sector/operational area. The Forward Ambulance Commander (FAC) works from the forward operational area/sector and is the eyes and ears of the Ambulance Commander in that area. There may be a number of FACs depending on the size or type of incident. Duties include the following:

- Directing resources to ensure adequate primary triage.
- Overseeing the treatment of trapped casualties.
- Supervising the evacuation of patients to the Casualty Clearing Station (CCS).

Casualty Clearing Officer

In liaison with the Ambulance Commander, this officer will site the CCS. The following factors should be considered:

- The CCS should be a safe distance from all hazards.
- The position should avoid long or difficult transport of patients from the incident site.
- Natural shelter or buildings should be used where available.
- There must be easy access for vehicles to load patients.

The priority when setting up an initial CCS is to provide a treatment facility. This means identifying a piece of ground and opening treatment packs, boxes, or rucksacks. There should be no delay in establishing this facility because of delays in erecting tents or any other temporary shelters.

The Casualty Clearing Officer will also:

- Establish and monitor secondary triage for casualties brought to the CCS.
- Maintain records of patient movements from the scene (in liaison with the Ambulance Loading Officer).
- Brief and monitor medical staff working in the CCS.
- Ensure there is adequate equipment within the CCS.
- Liaise with the Ambulance Loading Officer for transportation needs and priorities of evacuation.
- Keep the Ambulance Commander informed about casualty numbers, severity, and movements.

Ambulance Loading Officer

This officer supervises the Ambulance Loading Point. Duties include the following:

- Liaison with the Police to ensure a suitable in and out circuit for ambulances (see Chapter 11).
- Link with the Ambulance Parking Officer to call vehicles forward to the CCS as required.
- In liaison with the Casualty Clearing Officer, decide on the most appropriate form of transport (including public transport, fixed wing aircraft, helicopter, or boat).
- In conjunction with the Ambulance Equipment Officer, arrange the collection and return of all ambulance and medical equipment at the end of the incident.

Ambulance Parking Officer

This officer will work from the Ambulance Parking Point. They will:

- Ensure the best utilisation of vehicle resources.
- Maintain a log of staff and their vehicles attending the site (including the qualifications of attending ambulance staff).
- In conjunction with the Ambulance Commander, send the appropriate ambulance personnel to the desired location.

Ambulance Equipment Officer

This officer will receive and distribute additional equipment brought to the scene. Equipment should usually be dispensed from one supply vehicle at a time, as the vehicle can then be taken away (once depleted) and can be completely replenished from a supply depot.

Local highlights: Ambulance Service key roles**MEDICAL SERVICES AT A MAJOR INCIDENT**

The medical services can support and enhance the Ambulance Service response as shown in Box 3.5.

Box 3.5: Medical aid to the Ambulance Service

- Support for secondary triage (triage sort)
- Perform advanced clinical interventions
- Perform emergency surgical procedures to facilitate extrication
- Treat and discharge casualties with minor injuries only at scene

MEDICAL COMMAND APPOINTMENTS

The command appointments allocated to the medical services are shown in Figure 3.2. These are complementary to the Ambulance Service appointments. The responsibilities of the various appointees are described below.

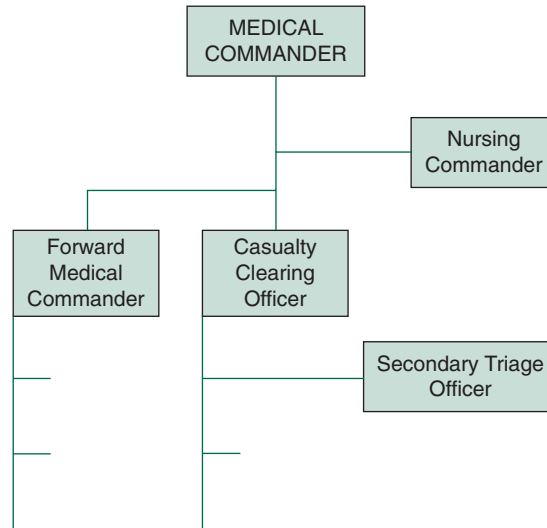


Figure 3.2: The Medical Service command structure

Local highlights: Medical Service command structure

Medical Commander

The Medical Commander is responsible for managing clinical care at the scene but, like the Ambulance Commander, must not be involved directly with this clinical care as this would compromise the command role. On arrival at the scene, the Medical Commander should liaise with the Ambulance Commander and receive a full briefing. The Medical Commander can move about the scene but to be most effective should work closely with the Ambulance Commander and other emergency service commanders.

The Medical Commander should be identified by a clearly labelled tabard. Personal protective equipment for the Medical Commander may be held by the Ambulance Service in their equipment vehicle or within a hospital major incident storeroom and may be issued in advance to individuals on a Medical Commander's rota.

Local highlights: Command equipment provision

The following are the Medical Commander's duties:

- To liaise with the Ambulance Commander, Police Commander, and Fire Commander.
- To delegate key tasks to other clinical personnel.
- To establish and maintain a flow of information to receiving hospitals.
- To carry out a clinical assessment of the scene.
- To establish specialist medical equipment needs and liaise with the Ambulance Commander to ensure supply.
- To determine the need for medical and nursing personnel at the scene.
- To determine which hospitals will receive casualties in liaison with the Ambulance Commander.
- To ensure effective secondary triage is established.
- To oversee the management of treatment provided by medical teams at the scene.
- To liaise with the Police and Ambulance Commanders regarding media briefings.

The background of the individual acting as Medical Commander is less important than the fact they have been adequately trained and have exercised in the role. The important competencies for a medical commander are:

- Major incident management training and experience.
- Pre-hospital training and experience.
- An understanding of the logistics of the local Ambulance Service.
- Local knowledge of hospital facilities and capabilities.

All clinical staff arriving on-scene should be briefed and tasked by the Medical Commander. The Medical Commander must ensure that clinicians understand and use the correct routes of communication. On completion of specific tasks, personnel should report to the Medical Commander or a nominated representative for redeployment. A failure to ensure that this happens will allow other emergency service personnel to direct the clinical staff where they perceive the need. This will rapidly cause failure of medical command and ultimately be deleterious for casualties.

Although the Medical Commander has overall responsibility for the safety of clinical personnel, this will usually be delegated to the Ambulance Safety Officer. An initial assessment of the scene, made with the Ambulance Commander, will help to determine the scale and nature of the clinical resources that are needed. Where resources allow it, the Medical Commander may release clinicians to assist in primary triage. The Medical Commander must ensure that effective secondary triage is performed at the Casualty Clearing Station and repeated appropriately. By providing adequate personnel with the right skill mix, they will oversee the delivery of the best possible treatment for all casualties.

Forward Medical Commander(s)

Depending on available resources, this role may or may not feature as part of the incident management structure. This doctor is the eyes and ears of the Medical Commander within the forward operational area/sector. There should be no direct involvement in patient treatment.

The principal task is the supervision of clinicians working in the forward area. Requests for a clinician or medical team to attend a casualty who is trapped must be directed through the Forward Ambulance Commander to the Forward Medical Commander and by no other route. It follows that the Forward Medical Commanders should work in close collaboration with the Forward Ambulance Commanders within each sector/operational area.

Key point

Ambulance and Medical Commanders must *never* become involved with treating individual casualties.

CLINICAL STAFF AT THE SCENE

Hospital teams

Medical teams are often requested to attend the scene to assist the Ambulance Service. It is often an Ambulance Service responsibility to arrange transport to the scene, which will be by marked emergency vehicle. If no ambulance is available, the Police may be requested to assist with transport.

The team leader of each medical team is responsible for the team's safety. This responsibility will have started in the hospital prior to leaving for the scene and will end only after each team member has been debriefed both operationally and emotionally. Only the team leader should accept tasks and team members should be tasked by their leader.

Hospital-based medical teams will usually deploy with no capability to sustain themselves in the field. They are reliant on the Health Service's command structure for transport, communications, food and water, shelter, and any other personal needs. While this may cause few problems for incidents of short duration, natural incidents that require a protracted response with rest and rotation of staff in the field will unmask the lack of field-craft in such personnel. A degradation of clinical effectiveness is inevitable.

The medical team may be broken up and allocated a number of tasks or may be kept together and allocated to a treatment area. If personnel are deployed forward to the site of the incident, they will be under the immediate control of the Forward Medical Commander; if they are working in the Casualty Clearing Station, then the Casualty Clearing Officer will oversee them. Since all incidents are different, the exact nature of the team tasks and their relative priority will change. Tasks that may be undertaken, depending on the circumstances, include those shown in Box 3.6.

Box 3.6: Mobile medical team tasks

- Primary triage at the site
- Treatment of live casualties at the site
- Secondary triage in the Casualty Clearing Station
- Treatment in the Casualty Clearing Station
- Triage for transport
- Treatment of casualties from other rescue services
- Assistance to a mobile surgical team if present
- Treatment of minor injuries at the scene
- Confirming death and labelling of the dead at the scene

The request for a mobile medical team will be a rare occurrence in most hospitals, and an action card is an effective prompt in this situation. This may include a reminder of who should be in the team, what immediate preparations are required, what equipment is needed (and where it can be found), how the team should move to the scene, and what their initial actions are on arrival. An example of an action card listing the immediate actions of a mobile medical team is shown in Box 3.7.

Key point

It is an Ambulance Service responsibility to arrange transport to the scene for the mobile medical teams.

Box 3.7: Mobile medical team action card**Immediate actions**

- 1 On being nominated as a member of the mobile medical team, proceed immediately to the emergency department
- 2 Collect medical equipment and clothing from the major incident store. One nurse should obtain and sign for the major incident controlled drugs
- 3 Once an ambulance arrives to transport the team to the scene, the team should load it with all the major incident equipment except that for the mobile surgical team
- 4 Check that no special orders for equipment have been made by the Medical Commander and then proceed to the incident site in the ambulance
- 5 On arrival at the site, report to the Medical Commander at the Ambulance Control Point (usually indicated by a green steady light) for orders
- 6 Under the direction of the Medical Commander undertake treatment of casualties as necessary

The doctors and nurses in these teams form a small but highly skilled part of the Health Service response. It is essential that their skills are used effectively and that they complement rather than challenge the role of ambulance personnel.

Nursing in the Casualty Clearing Station

When two or more medical teams containing nurses are present at the scene, there may be a need for one of the nurses to undertake the role of CCS Lead Nurse. The CCS Lead Nurse should have experience in team leadership, the coordination of staff, and be able to delegate tasks to team members through determining the skills of the group and assigning them to suitable treatment areas. It should be borne in mind that the nurses may have a diversity of backgrounds (including emergency nursing, operating theatre, intensive care, general ward work, and community), a range of experience, and different qualifications.

While the title CCS Lead Nurse is rarely employed, the role described above is essential. The nurse taking this responsibility should report to the Casualty Clearing Officer. Additionally, this senior nurse can be responsible for the allocation of controlled drugs to staff, keeping a signed record of the number of ampoules issued to each individual.

Key point

Clinical staff at the scene should complement the role of ambulance personnel.

Clinicians deployed to treat patients at the scene must be properly equipped to work in the pre-hospital environment (both personally and medically), and must have the right clinical skills and experience for the role they have to fulfil. If these criteria are met, the extra skills available will benefit the casualties immensely. If they are ill equipped, inexperienced, inadequately skilled, or undisciplined then they may pose a threat to the welfare of the casualties and other rescuers.

Local highlights: Mobile medical team capacity and provision

The need for a surgeon at the scene is rare, but occasions do occur (for example, when amputation or disarticulation is necessary to facilitate extrication). Surgical capability should only be summoned at the request of the Ambulance or Medical Commander. A mobile surgical team, consisting of a capable senior surgeon, a similarly capable anaesthetist, and appropriate scrub and anaesthetic nurse support, may be formed at a receiving hospital and dispatched via ambulance to the scene. This team will work under the close supervision of the Forward Ambulance Commander (or Forward Medical Commander when present) and should return to the hospital with the patient after the surgical procedure is completed.

Local highlights: Mobile surgical team capacity and provision**Other health workers****Voluntary aid societies**

Clinicians who are members of voluntary aid societies may be working at the scene either because they were already deployed (for example at a mass gathering) or because they are mobilised to assist by the statutory Ambulance Service. These individuals will operate under the Health Service's command structure.

Local highlights: Voluntary aid societies**Health workers involved incidentally**

In most incidents there will be some health workers who become involved, either because they were survivors of the incident or because they were passing in the early stages. It is most unlikely that these staff will be equipped to provide anything more than basic first aid; furthermore their lack of proper personal protective equipment means that they are at considerable extra personal risk. The emergency service and medical staff who have been mobilised to the scene should therefore take over as soon as possible. Health care staff who were involved in the incident should be treated like any other casualty, and those who have become incidentally involved should be given tasks away from the dangers of the scene itself.

SUMMARY

- The Ambulance and Medical Commanders are in charge of the Health Service response at the scene and must work closely together.
- Ambulance personnel and medical teams will work within the key areas and will be under the command of the forward commanders in those areas.
- Clinical staff have skills that are complementary to the Ambulance Service.
- Immediate care doctors and hospital-based teams must be properly equipped, trained, experienced, and disciplined.
- The exact nature and priority of tasks for a medical team will vary with each incident. In general they will involve triage, treatment, and preparation for transport.
- Surgical input at the scene should be limited, and should be task specific.

CHAPTER 4

Emergency service organisation and roles

After reading this chapter you should be able to answer the following questions:

- What is the role and organisation of the Police Service at a major incident?
- What is the role and organisation of the Fire and Rescue Service at a major incident?
- What is the role and organisation of the Maritime and Coastguard Services at a major incident?

ORGANISATION

It is essential that health service staff understand the organisation and roles of the other emergency services. As with the Ambulance Service, the Police and Fire and Rescue Services are hierarchical with clear command and control systems and rank structures.

ROLE OF THE POLICE AT A MAJOR INCIDENT

In many domains, the Police Service have overall control at the scene of a major incident. When a hazard is present (such as fire or chemical spillage), the Police will surrender control of the *immediate* scene area within the inner cordon (Bronze area) to the Fire and Rescue Service.

Police Control, in line with all other emergency controls, has a responsibility to inform other emergency services when the major incident plan is activated.

The initial responsibilities of the Police are given in Box 4.1.

Box 4.1: Initial responsibilities of the Police

- Command and control of the incident and establishing a forward control
- Commencing and maintaining an incident log
- Saving life in conjunction with other emergency services
- Preventing escalation of the incident
- Evacuating those still in danger
- Ensuring the activation of other emergency services
- Providing traffic management and identifying access and egress for emergency services
- Liaising with and facilitating other emergency services
- Maintaining records of the casualties and uninjured survivors
- Identifying the dead and liaising with the coronial services
- Maintaining public order
- Protecting property
- Criminal investigation and assisting with official enquiries
- Liaising with the media

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Members of the public who are in imminent danger after the incident (for instance from fire, chemical exposure, or radioactive contamination) must be evacuated to safety by the emergency services. Police officers will establish an outer cordon at a position that limits access by the general public but supports the access and egress of the emergency services responding. They will also record the names of emergency service workers requiring access; it is usually a police responsibility to confirm the identity of those who claim to be qualified to give help.

Management of uninjured survivors

The Police Service may request that the local authority establish a Survivor Reception Centre at an appropriate location that will provide basic welfare needs. The local civil authority will provide food and refreshment at this location while health services need to provide clinical care.

Survivors are regarded as witnesses to what often becomes a criminal enquiry. At first it may only be appropriate to take names and addresses at the Survivor Reception Centre as individuals may be too distressed to provide a full statement. The requirements for a Survivor Reception Centre are listed in Box 4.2.

Box 4.2: Requirements for a Survivor Reception Centre

- Secure area away from the public and press
- Food
- Water
- Sanitation
- Dry clothing
- Documentation
- Social care
- Clinical care

Management of friends and relatives

Friends and relatives who were not involved in the incident may make their way to the scene. They should receive appropriate advice from the Police and local authorities which may include casualty bureau contact numbers, helpline numbers, etc.

Management of the dead

In most countries death can only be diagnosed by a trained clinician. Identification of the dead is a key role often overseen by the Police Commander. The Police are responsible for informing the next of kin when the deceased has been identified.

When authority is granted to move a body, it is the responsibility of the Police Service to do this. It is the decision of the Coroner (England) as to whether a temporary mortuary is established. The purpose of a *temporary mortuary* is for the forensic pathological examination and formal identification of the dead. Items of jewellery and other valuables may be key in this process.

Traffic management

The maintenance of free traffic flow and the organisation of vehicle marshalling areas ensure the continued smooth running of the incident. This is a responsibility of the Police Service.

Law and order

The scene of a major incident is a potential scene of crime. Evidence must be protected for use in later criminal investigations. In the case of a large-scale evacuation of the public, empty properties present easy targets for opportunist thieves and looters. Police officers are responsible for the protection of property.

Police aid to the health services

The Police can assist the medical services at the scene of a major incident in the ways shown in Box 4.3.

Box 4.3: Police aid to the medical services

- Assist with the transport of medical personnel either directly or by providing an escort (local agreement)
- Maintain clear transport routes to ensure the uninhibited movement of ambulances
- Provide escorts for individual casualties to hospital (local agreement)
- Collate information on the whereabouts of the injured and their condition
- Request the establishment of a Survivor Reception Centre
- Liaise with friends and relatives of casualties and survivors
- Provide conference facilities for briefings or media statements by incident commanders
- May be able to provide a helicopter(s) for the aerial assessment of the scene

ROLE OF THE FIRE AND RESCUE SERVICE AT A MAJOR INCIDENT

The Fire and Rescue Service has a major role in the management of hazards at the scene. As stated previously, they often retain control of the immediate site. The initial responsibilities of the Fire and Rescue Service are given in Box 4.4.

Box 4.4: Fire and Rescue Service initial responsibilities

- Establishing a forward control point
- Commencing an incident log
- Saving life
- Preventing escalation of the incident
- Fighting fires
- Reducing or eliminating hazards
- Extricating trapped casualties
- Clearing routes in and out of the wreckage
- Liaising with other emergency services
- Providing specialist equipment (lighting, lifting, tentage)
- Providing mass decontamination equipment under the control of the Ambulance Service
- Extricating the dead

Fire and Rescue Service predetermined attendance

Fire and rescue services across the world are required to ensure that all incidents are attended by appliances within a specified time. The number of vehicles initially dispatched is determined by a risk assessment and is termed the 'predetermined attendance' (PDA). For example, risk assessment may show that a single appliance arriving within 20 minutes is sufficient response in a rural area, while a call to a city centre fire might require two appliances on the scene within 5 minutes with a third arriving no more than 3 minutes later. The PDA will often also determine the rank of the initial officer to be mobilised.

In any given geographical area there will be a number of high-risk areas such as an airport or petrochemical works. These are potential sites for major incidents; with predetermined plans the initial response to a call from such an area is likely to be above the standard requirement.

The Fire and Rescue Service have a number of special appliances that are operationally available and that may form part of the PDA to a specific incident.

Duties of the senior fire officer

When a major incident is declared a senior officer is required to take command of the Fire and Rescue Service resources at the scene. The command responsibilities of this officer are shown in Box 4.5.

Box 4.5: Duties of the Fire Commander

- Assume command of all Fire and Rescue Service resources, taking charge of all operations concerned with fire fighting, saving life from fire, and rescue of trapped persons
- Establish a command post in the control unit near to the Police and Ambulance Control units
- Nominate officers to take charge of various sectors of the incident, and nominate safety officers
- Provide special equipment such as high-volume pumps and rescue equipment
- Where fire is not involved, deploy personnel and equipment in liaison with the Police and Ambulance Commanders, and generally assist the other services
- Provide or obtain specialist assistance where hazardous substances are involved

Two problems may beset the Fire and Rescue Service early in the major incident – access and a continuing supply of water. Access may be difficult if the incident occurs away from a main road (such as on a railway line or in a tunnel). The water carried by a pumping appliance can be rapidly consumed in a severe fire. It is then necessary to take water from hydrants, streams, rivers, ponds, and any other sources that are available locally.

Fire and Rescue Service aid to the health services

The Fire and Rescue Service can assist the medical services at the scene of a major incident as shown in Box 4.6.

Box 4.6: Fire and Rescue Service aid to the medical services

- Provide a safe area to work by removing fire, chemical, electrical or other hazards and by clearing routes into and out of the immediate scene
- Provide an improved area to work with lighting, shelter and improved access to the trapped patient
- Provide skills and equipment to extricate entrapped casualties
- Provide personnel to lift and carry casualties from the incident to the Casualty Clearing Station
- Provide triage and first aid

ROLE OF THE MARITIME AND COASTGUARD SERVICES AT A MAJOR INCIDENT

Maritime and Coastguard Services (MCS) will have a principal role in coordinating the rescue of casualties from an offshore incident. The initial responsibilities of any MCS are indicated in Box 4.7.

Box 4.7: Initial responsibilities of the Maritime and Coastguard Services

- Coordinating incidents when offshore and in territorial waters
- Plotting the position of the incident
- Broadcasting to alert vessels in the area
- Establishing communication (if possible) with the person in charge to ascertain assistance required and intentions
- Requesting the despatch of air assets immediately to the scene
- Tasking specialists for transport to the vessel/installation (including Fire and Health Services)
- Launching appropriate lifeboat assistance
- Contacting Naval Command for available naval units

SUMMARY

- The Police are usually in control of a major incident.
- All emergency services have special responsibilities at a major incident.
- All emergency services will assist health services to save lives.

CHAPTER 5

Support service organisation and roles

After reading this chapter you should be able to answer the following questions:

- What support services are available to assist in a major incident response?
- How can these agencies assist the health services at the scene of a major incident?

DEFINITION

The support services are those agencies that are not part of the health or emergency services that may be requested to provide assistance at the scene of a major incident. They include the following:

- The local civil authority.
- Voluntary aid societies.
- Voluntary ambulance services.
- The military.

SPECIFIC SERVICES

Local civil authority

In the acute phase of a major incident response, a local civil authority can provide assistance to the emergency services and can provide support to the community. In the longer term the local civil authority will have a primary role in the recovery of the community.

Support to the emergency services

Initially, the response may be to provide machinery and equipment to assist in the rescue operation. Earth-moving equipment may be needed to clear routes, steps may be laid on embankments, and additional lighting can be provided. Public transport may be used for casualty evacuation. Shelter may be provided to establish rest centres with provision for food and drinks; those who require temporary accommodation will be housed.

Long-term recovery

Over weeks or months, the local civil authority will continue to support survivors. Cleansing, environmental health, housing, public works, and building departments may all be involved in the restoration of normality for the community.

Voluntary aid societies

Voluntary aid societies can provide practical support such as basic life support and victim support. In the context of a major incident this support for the emergency services and survivors at the scene should not be undervalued.

Voluntary ambulance services

There are voluntary ambulance services in most developed countries. These may be mobilised as part of the Health Service major incident plan, or by the Police following a request from the Ambulance Commander. The aid offered by these services is listed in Box 5.1.

Box 5.1: Aid offered by the voluntary ambulance services

- Staff to resource a first aid post in the Survivor Reception Centre and rest centres
- Transport of patients with minor injuries to definitive care facilities
- Staff for stretcher-bearing duties

In addition, organisations such as the Red Cross, the Red Crescent, St John Ambulance Service, and St Andrew Ambulance Association can often provide vehicle resources that are able to respond under the direction and direct control of the Ambulance Service.

Military

The Armed Forces are a potential source of large numbers of organised, trained, and disciplined personnel. In addition to this simple manpower resource, the Armed Forces have skills and equipment that may be especially useful when the incident is compound (Chapter 1). Skills include the building of temporary bridges, the preparation of aircraft landing sites, and the provision of field kitchens, shelter, clean water, and hygiene. Military medical services may be able to erect field hospitals in such circumstances.

The response by the Armed Forces may depend upon the geographical location of the incident, the time scale and, most critically, the availability of military personnel and equipment subject to existing operational commitments. With the exception of a few specialist capabilities, the Armed Forces are generally unable to guarantee a specific response and therefore should not be relied on in civil emergency plans.

Specialist parts of the military can be of specific assistance to the civil community. For example, military search and rescue (SAR) helicopters are used for both off-shore and in-shore rescue. In terrorist incidents, explosive ordnance disposal (EOD) teams will be required to neutralise any explosive devices or to confirm that devices have been destroyed. Where there is a special risk, such as that posed by a chemical, biological, radiological, or nuclear (CBRN) device, the Armed Forces can provide some expertise in planning and response that would not be available from a civilian source.

A request for the provision of military aid to the scene is usually directed through the Police Commander, although authorisation may already exist as part of an agreed planned response to an anticipated incident. In an emergency, the military commander of any local unit can usually respond directly to a request for military aid under his own authority if the need is urgent and life or property is at immediate risk. Most other requests for military aid will require high-level approval.

SUMMARY

- Support services are available to complement the regular emergency and Health Service responses to a major incident.



PART III

Preparation

CHAPTER 6

Planning

After reading this chapter you should be able to answer the following questions:

- What guidance is available for the emergency services and other agencies?
- What specific guidance exists for the Health Service?

INTRODUCTION

Although each of the emergency services has different responsibilities and priorities in the event of a major incident, saving life is the primary aim of all agencies. Many other responsibilities are common to all services (Box 6.1). To achieve an efficient response, it is important that multi-agency planning, education, and exercising have taken place so that each service is aware of the roles and priorities of others. Most national emergency planning guidance explicitly encourages this multi-agency approach.

Box 6.1: Combined response objectives

- Save life
- Prevent escalation of the incident
- Relieve suffering
- Protect the environment
- Protect property
- Rapidly restore normality
- Facilitate enquiries

GUIDANCE

In most countries, major incident guidance is published by the national government. In the United Kingdom, for example, guidance is available for England and also for each devolved administration. This guidance may be supplemented by web publications outlining policy and practice, and is often underpinned by statutory responsibilities. More often than not nowadays, major incident response is placed within a framework of business continuity management (BCM). The guidance available allocates responsibility for various necessary functions or services at the scene of the incident to different responding organisations. One such scheme is shown in Table 6.1.

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Table 6.1: Agency responsibilities

Task	Agencies responsible
Care of the uninjured survivor	Police Social Services Local Authority
Care of the injured	Health Service Police Fire Service
Dealing with fatalities (identification)	Police
Dealing with fatalities (confirmation)	Health Service
Running information centres	Police
Dealing with friends/relatives	Police Social Services Local Authority Health Service
Evacuation and providing temporary shelter	Police Local Authority
Social support	Social Services Local Authority

GENERAL PRINCIPLES

Emergency planning guidance usually requires that an ‘all-hazards’ approach to planning is adopted by all the services involved. This means that assumptions, for instance, that a major incident will arise from a traumatic incident affecting less than 200 people that leaves the infrastructure intact cannot be made. The planning approach must accommodate incidents of major, mass, and catastrophic proportion with a variety of causes (Box 6.2).

Box 6.2: The planning approach

Major	Individual hospitals handle the incident within current and long-established major incident plans. Number of casualties: tens
Mass	Larger scale incident with possibility of involving the closure or evacuation of a major health facility, or persistent disruption over many days. Collective mutual aid response required from neighbouring trusts. Number of casualties: hundreds
Catastrophic	An incident that is of such proportions that it severely disrupts health and social care and other support functions (e.g. water, electricity, transport). The required response exceeds collective local capacity. Number of casualties: thousands

Plans must also include arrangements to deal with large numbers of specific injury types, such as major burns, and population groups such as children. In addition, a strategy for protraction (potentially requiring casualty care on-scene extending over many hours or even days) needs to be thought through.

Planning must take place in conjunction with the other agencies involved. A multi-agency approach is essential if a cohesive and effective response is to succeed. Both the voluntary sector

and (potentially) private sector agencies within the locality need to be fully engaged in the process.

INCORPORATING THE STRUCTURED APPROACH INTO THE RESPONSE

Command and control

Health Service command structures and levels need to correlate with those of all the emergency services at the scene of an incident. The standard agreed levels of operational (Bronze), tactical (Silver), and strategic (Gold) are used widely by the Health Service both at the scene and in hospitals. It is essential that Health Service plans incorporate the role and requirements of each level; and detail the command and reporting structures to be followed locally, regionally, and nationally.

Safety

Risk assessment and management is encouraged throughout all current guidance and should form the basis for local planning activity. Significant local risks (such as airports, sports stadia, etc.) must be assessed and multi-agency plans for their management should be developed. Incident-specific plans need to identify clear safety precautions and procedures for staff, together with training requirements.

Communications

Standardised alert messages must be included in all plans and used to avoid any confusion. The plans must clearly identify what these messages are; what response is required when they are received and that staff are aware of them, their meaning, and the implications.

The communications section of plans must also include arrangements for liaison with, and the provision of information to, the Police Casualty Bureau. Media impact should not be underestimated and media management should be included as a specific sub-section of the communications plan.

Assessment

Plans should detail the amount and type of information required by senior officers/staff when scene assessment has been undertaken. Health Service Commanders should give early warning of any health issues as they arise using the HANE format (Chapter 14).

Triage

The triage algorithms used in a major incident setting differ from those used in normal health services emergency care. It is essential that plans identify which algorithms are to be used and that, wherever possible, validated and universally accepted systems are used to ensure consistency and accuracy. Staff must be regularly trained in their use to ensure skill retention, although the use of aide memoires for any algorithms not used on standard triage labelling systems should be encouraged.

Treatment

Major incident plans should be based on the premise that the standard of care will mirror the treatment that would be used in normal practice wherever possible. Medical equipment supplied to the scene should match that in regular daily use, although there may also be items specific to mass casualty emergency care. Training for staff should include an awareness of what equipment can be supplied to the scene, how to activate resupply, and the scope of the care that should be provided to ensure safe and appropriate initial resuscitation and transfer from the scene.

Transport

Arrangements for the transfer of casualties from the scene to receiving hospitals, and the provision of transport for health staff to the scene, must be clearly stated.

RECOVERY

Plans should not only cover the initial response phase of any incident. The recovery phase needs to be considered early during the response, and clear instructions need to be given to ensure that staff can initiate appropriate business continuity arrangements.

The aims are to ensure that normal service provision is resumed as early as is practicable; that staff get the necessary support, rest, and recuperation and that equipment and supplies are replenished promptly. Health service organisations need to consider the impact of the incident on their critical and core services and plan for the medium and long-term staffing, resources, and financial needs accordingly.

SUMMARY

- A multi-agency, 'all-hazards' approach to planning for a major incident is essential for a coordinated and effective response.
- Plans will only be effective if staff have been appropriately trained and the necessary equipment is provided.
- Plans should cover the recovery phase.

CHAPTER 7

Personal equipment

After reading this chapter you should be able to answer the following questions:

- What are the minimum safe clothing requirements for pre-hospital health care?
- What additional items of clothing and personal equipment are desirable in order to improve comfort and efficiency?

MINIMUM CLOTHING

The most important considerations for pre-hospital care clothing are:

- Personal safety.
- Function and durability.
- Comfort.

Personal safety

Personal safety for the rescuers is paramount. Any ambulance or medical personnel attending the scene should be equipped with appropriate personal protective clothing. A doctor in theatre scrubs or a nurse in uniform is a liability both to themselves and to others. Individuals who are inappropriately dressed should be refused entry to the scene. As this may mean turning away potentially useful personnel, compromise may be necessary. If there is a supply of protective clothing carried on the Ambulance Service equipment vehicle, then appropriate clothing can be issued. Otherwise, these staff may be able to work safely within the confines of the Casualty Clearing Station without the need for full protective equipment.

Key point

Individuals who are inappropriately dressed should be denied access to the site.

The responsibility for the safety of all Health Service personnel at the scene is delegated to the Ambulance Safety Officer. Medical teams will usually arrive at the Ambulance Parking Point, which is an appropriate place to check personal protective equipment.

Personal safety implies protection against predictable hazards. The hazards and their solutions are listed in Table 7.1.

Table 7.1: Protective clothing solutions for predictable hazards

Hazard	Protective clothing solution
Emergency vehicles	High visibility jacket or tabard
Elements (rain, wind, snow)	Waterproof and insulated full body protection
Injury to head	Hard hat with three-point chinstrap
Injury to eyes	Safety glasses or goggles, or visor
Injury to face	Visor
Noise	Ear defenders
Injury to hands	Heavy duty gloves (debris gloves)
Blood and body fluid exposure	Standard clinical precaution and equipment
Injury to feet	Heavy duty oil- and acid-resistant boots with protective toecaps

Function and durability

Visibility

A high-visibility reflective jacket or tabard should be worn. For the Ambulance Service these will normally be green and yellow as recommended in the international identifications policy.

Local highlights: Colour schemes for emergency service clothing

Identification

The jacket or tabard should be clearly labelled on the front and back and read 'Doctor' or 'Nurse' for medical staff. Ambulance staff may use 'Ambulance' or 'Paramedic'.

Health Service Commanders should be separately identified. The Ambulance Commander wears a green and white chequered tabard labelled 'Ambulance Commander' (or local term). The Medical Commander wears a conventional tabard labelled 'Medical Commander' (or local term). The colour of lettering for all Health Service name banners is green on white.

It may also be useful for staff in other key appointments to be clearly labelled with tabards to enable identification from a distance.

Local highlights: Local clothing requirements

Key point

Standardisation of clothing is important to prevent confusion between emergency service personnel, and to aid identification from a distance.

Warmth and waterproofing

In cold weather warm underclothing is important. This is particularly an issue for staff deployed from hospital who may wear a jacket and over-trousers on top of their everyday working clothes. In hot weather a balance of visibility and protection against potential heat stress is necessary and flexibility is required and layers of protective clothing should be available.

Key point

In hot climates a degree of protection may have to be sacrificed for comfort.

Protection against injury

A hard hat is mandatory. Hats have the tendency to fall off and a helmet that has a secure chin strap (three-point strap) is recommended. The helmet should be of high specification (for example, Kevlar® composite). A torch can be mounted on the helmet, which will allow both hands to remain free. The colour of both the helmet and any lettering may be specified.

Local highlights: Helmet markings and colours

A visor is required to protect the face and, unless it is close fitting, separate goggles or safety glasses must protect the eyes independently. Ear defenders are required to protect the ears from the background noise. These can be fitted to the helmet, or carried separately. Both a heavy duty pair of gloves (to protect against glass and sharp metal) and patient treatment gloves (to protect against blood) are needed. Strong, correctly fitting footwear with metal toecaps are needed. Boots should also be oil and acid resistant. Wellington boots are commonly stocked by hospitals for pre-hospital use, but must be of high specification if they are to fulfil the requirements of a major incident scene and may be inappropriate for walking on uneven ground.

Chemical resistance

It must be possible to protect Health Service personnel in a chemical environment. This requires additional training to use the necessary personal protective equipment, which will invariably include a respirator with a chemical filter. Special incidents are discussed in more detail in Chapter 18.

Equipment storage

Clothing should have enough pockets to store essential personal items.

Durability

Some protective clothing is reinforced at the knee and elbow. This is useful when working on the floor. The fabric must be durable against rip hazards at the scene. Again there may need to be a compromise in hot climates between durability and comfort.

Fire-retardant properties

Basic standards of fire retardancy should be specified in all protective clothing for the health services.

Comfort

If clothing is not issued on a personal basis, then a range of sizes of personal protective equipment must be available. Potential responders should make sure they have tried on the clothing in training prior to mobilisation so they can quickly find the size that fits them.

ADDITIONAL ITEMS

Additional items of personal equipment that may be carried are listed below.

Personal identification

This is essential for any staff who travel independently to the scene since access may be denied if they are unable to prove their identity. It is less critical for staff arriving in marked emergency vehicles, though still desirable.

Mobile telephone

The use of cellular telephones at the scene of a major incident will be unavoidable and in some circumstances may be more important for commanders than a radio (Chapter 13). A spare battery is useful.

Notebook

A log of actions and events is essential. Not only will it aid confirmation that requests for assistance have been actioned, but it is increasingly necessary to justify decisions in the setting of the inevitable public inquiry. Any notes made must be kept.

Dictaphone

Some individuals prefer a dictaphone to a notebook. While this may be faster to record, it is more difficult to review the entries and background noise may mask the dictation.

Aide-memoires and action cards

All personnel in key Health Service appointments should be provided with action cards listing their responsibilities. Commercially designed, waterproof, major incident aide-memoires are available.

Camera

It is not a legal requirement to obtain consent before photography for evidence or communication purposes and any photograph taken should be available for investigation and legal proceedings. A photograph can accompany a patient to hospital if this will help in their further management (it may assist the hospital staff appreciate the mechanism and severity of an injury).

Torch

A helmet torch is recommended.

Whistle

A whistle is commonly employed by the Fire Service to indicate an escalating threat requiring immediate evacuation. This generally precludes its use by other personnel.

Money and credit or debit cards

It is unlikely that there will be any charge for refreshments at the scene for working staff, but doctors and nurses can find themselves stranded in a distant hospital if they have acted as an escort for an individual patient. Even in a major incident, they may need to cover their own expenses.

Incident management system

Commercially available incident management systems have been used by civilian and military personnel. They are often contained in a specially designed rucksack and may include:

- Packs of triage labels, with an algorithm for the triage sieve (Chapter 15) and a tally card of patients triaged.
- Incident sketch board and casualty state board.
- Major incident aide-memoire.
- Camera.
- Dictaphone.
- Torch and chemi-luminescent light sticks.
- Tabards for key appointments (Medical or Ambulance Commanders, Triage).
- Field rations for one and water bottle.
- Local maps.

Computer

Computer-based management support systems with the potential for on-line remote advice have been developed, and this level of technology is likely to become more prominent.

SUMMARY

- All Health Service staff must adhere to minimum clothing requirements.
- The Health Service commanders (or delegated representative) should refuse entry to the scene of any personnel who are incorrectly dressed.
- Clothing colours should conform to national standards and conventions in order to aid recognition and prevent confusion.
- Clothing should be functional, durable, and comfortable, but above all should provide protection against the predictable hazards.
- The basic requirements may be enhanced by a number of additional items of personal equipment.

CHAPTER 8

Medical equipment

After reading this chapter you should be able to answer the following questions:

- Why is extra medical equipment necessary?
- What equipment is required for triage, first aid, or advanced life support?
- What equipment is required for specialist medical skills by medical teams?
- What equipment is required when packaging for transport?
- What is the best way to store equipment?
- How is medical equipment resupplied to the scene?
- What is the role of the Ambulance Equipment Officer?

INTRODUCTION

Like all aspects of major incident care, the provision of medical equipment requires forward planning. Equipment requirements are different from normal pre-hospital care for two main reasons. First, the number of casualties will be much larger than under normal circumstances. Second, the time elapsed before casualties arrive at hospital (and therefore the time spent on-scene providing treatment) may be greatly increased. This is not only due to entrapment, but also because casualty numbers can exceed the transport capacity for evacuation. Emergency ambulances deployed to a major incident will have insufficient equipment to treat all the casualties and therefore extra provision must be made by the Ambulance Service and any attending medical teams.

Key point

Extra equipment must be provided by both the Ambulance Service and individual medical teams.

The equipment provided to support a major incident should reflect the levels of intervention that are available. There are five levels of medical intervention at the scene:

1. Triage.
2. Life-saving first aid.
3. Advanced life support.
4. Specialist medical support.
5. Packaging for transport.

LEVELS OF MEDICAL INTERVENTION

Triage

Proper performance of triage requires both a triage system to be in place and a labelling system to indicate that triage has been performed. Triage labels should be easily and securely attached to the patient, must be marked and colour coded for priority, must be durable and weather resistant but still be able to be written on and must facilitate rapid and clear re-categorisation. Folding triage labels best fit this specification. Triage labels should be carried on all emergency ambulances so that there is no delay in initiating this process. Triage is discussed in detail in Chapter 15.

Key point

Triage labels are required on each emergency ambulance.

Special equipment may be necessary to encourage appropriate triage of children.

Life-saving first aid

The type of equipment used for first aid is similar to that used by the Ambulance Service on a day-to-day basis. The principal difference in a major incident is the quantity that will be required. Equipment should allow immediate intervention in life-threatening conditions affecting the airway, breathing, or circulation (ABC). The equipment requirements for life-saving first aid are listed in Table 8.1.

Table 8.1: Equipment to support life-saving first aid

Life-saving intervention	Equipment
Control of catastrophic haemorrhage	Dressings, tourniquet
Clear the airway	Manual suction apparatus
Maintain the airway	Oropharyngeal airway Nasopharyngeal airway
Support ventilation	Face shield Pocket mask Bag and mask
Seal open pneumothorax	Asherman chest seal
Arrest compressible haemorrhage	Absorbent pressure dressings

It is debatable whether equipment should be provided to support ventilation in the first aid phase. If a major incident casualty fails to breathe after the airway has been opened, the triage sieve will categorise the patient as 'dead'. However, particular circumstances may arise where a more active approach is appropriate. Judgement will be required.

Key point

First aid requires simple equipment to support life-threatening conditions affecting the airway, breathing, or circulation.

Advanced life support

Advanced life support will predominantly be provided at the Casualty Clearing Station, although some interventions will be required on site for trapped patients. The equipment needs of the Casualty Clearing Station are familiar to those who work in emergency medicine, since the main requirement is for resources to stabilise the ABCs. There are a number of ways of arranging the supply and resupply of this area.

One way is to arrange items in patient sets with one complete set of equipment for the control of ABC per patient. In this scheme a primary treatment box or rucksack stays by each patient and equipment is consequently close at hand if required urgently. Although this system will result in a degree of overprovision, it avoids the confusion that can arise when searching for equipment from a central storage area. Resupply is simple because the set of equipment can be returned to the equipment vehicle for replenishment once the casualty leaves the scene.

An alternative scheme is to keep non-disposable items (such as self-inflating bags and laryngoscopes) in a central area, and issue boxes or rucksacks of disposable items (such as dressings, airways, intravenous cannulas, and fluids) either in single or multi-patient packs. This avoids the problem of supplying expensive items to each individual casualty area. Resupply of the disposable item sets is from a central store.

The additional equipment requirements for advanced life support are listed in Table 8.2. All the capabilities listed in first aid can also be delivered at the advanced life support level.

As previously discussed, equipment to support breathing may not be needed but is usually carried. The underlying dilemma is that the use of limited resources to support a continuing need for ventilation in an individual may not be in the best interest of the majority.

It is not appropriate to treat cardiac arrest at the site – patients in cardiac arrest should be labelled as dead. Where cardiac arrest occurs in the Casualty Clearing Station it is appropriate to follow treatment algorithms, including defibrillation, but the patient load may dictate the final extent of the resuscitation attempt.

Table 8.2: Additional equipment to support advanced life support

Intervention	Equipment
Secure the airway	Laryngeal mask airway (LMA) Endotracheal tube (single or multi patient)
Deliver oxygen	Portable oxygen source and mask with reservoir delivery system for spontaneously breathing patients
Support ventilation	Bag–valve–mask set
Decompress tension pneumothorax	Needle for thoracocentesis
Splintage for haemorrhage control	Traction splint
Spinal immobilisation	Semi-rigid cervical collar Long spinal board
Replace fluid volume	Intravenous cannula and fluid Intraosseous needle
Relief of pain	Simple splint Entonox Analgesics Burns dressings, e.g. cling film

Spinal immobilisation should be reserved for high-risk patients. Precautionary immobilisation for mechanism alone will be inappropriate where several hundred patients may have been exposed to the same mechanism (for example, a high-energy train crash). Equipment for spinal immobilisation will normally be carried by the individual ambulance or helicopter transporting the patient to hospital.

Equipment must also be supplied to treat any children involved in a major incident. The paediatric triage tape along with colour-coded packs of equipment according to weight may enable rapid selection of the appropriate size of equipment for the child.

Where any sharps are to be used for clinical care, facilities for safe disposal must be available.

Local highlights: Equipment needed for extended paramedic skills

Specialist medical support

Any medical team must supply the equipment necessary for advanced procedures not normally performed by paramedics. Their equipment must supplement that carried by the Ambulance Service rather than duplicate it. It is also important that any medical team equipment is compatible with that supplied by the Ambulance Service.

Key point

Medical team equipment should be compatible with Ambulance Service equipment. It should supplement rather than duplicate, and must reflect the extended skills of the team.

Medical teams will usually carry their own equipment to the scene, but may make arrangements for it to be stored by the Ambulance Service in equipment vehicles. Any medical team should be prepared to undertake the procedures that are likely to be required in the first hour of on-site care. Of particular importance is the need to carry sufficient analgesia for parenteral administration, appropriate drugs for sedation for procedures on, or extrication of, trapped patients and local anaesthetic agents for use in regional blocks. It is important that the contents of the equipment containers for the major incident medical teams are clearly distinguishable from those used for day-to-day pre-hospital work. This can be achieved either by appropriate written marking, or by using a different colour of container. Overall, it is probably better to have a single system for use in both circumstances since the response is more likely to be effective in a crisis when individuals are familiar with the organisation and content of equipment.

The *additional* equipment requirements for specialist medical support are listed in Table 8.3. All the capabilities listed in 'first aid' and 'advanced aid' can also be delivered at the specialist medical level.

Table 8.3: Additional equipment to support the medical team

Intervention	Equipment
Secure the airway	Surgical cricothyroidotomy
Support ventilation	Automatic ventilator Chest drain set with drainage bag
Treat cardiac disease	12 lead electrocardiogram External pacing
Replace fluid volume	Rapid infusion device/pressure infuser Adult/paediatric intraosseous device
Amputate/disarticulate limb	Amputation set
Advanced drugs	Drug-assisted intubation and maintenance of anaesthesia Anaesthesia, local Analgesia, intravenous Sedation, intravenous or intramuscular Medical emergencies Cardiac arrest

In some areas the responsibility for medical care at major incidents may rest with voluntary immediate-care doctors. They usually only carry equipment for the treatment of a relatively small number of casualties. In such circumstances, arrangements may need to be made with local hospitals or with the Ambulance Service to supply equipment that would otherwise be brought by the hospital-based medical teams.

Packaging for transport

Patients must be packaged for transport prior to leaving the scene for hospital and additional equipment may be required for this. Examples are listed in Table 8.4.

Table 8.4: Additional equipment to support packaging for transport

Intervention	Equipment
Secure intravenous cannulas	Splints
Immobilise fractured femur	Traction splint
Spinal immobilisation	Vacuum mattress

Where rigid spinal immobilisation is required, and particularly where there is a delay in transfer to hospital for clinical spinal injury, it may be preferable to immobilise the patient within a vacuum mattress rather than on a long spinal board. This may reduce the likelihood of developing pressure sores.

EQUIPMENT CONTAINERS

Various types of container can be considered to carry medical equipment. Key factors in choosing the design are:

- Ease with which they can be carried over uneven terrain and over long distances (rucksacks are suited to this, and leave both hands free to assist in movement).
- Ease with which contents can be accessed (top loading where access to equipment at the bottom requires all other equipment to be removed first is not a good solution, while rucksacks that have multiple pockets/pouches with clear fronts are popular).
- Security of the contents (if you drop the container, it does not spill its contents).
- Visibility (if you put it down, you can find it again).

Key point

Containers should be easy to carry and keep equipment visible, accessible, and secure.

All medical team equipment should be checked regularly for completeness and to ensure that all items are serviceable and in date. It should be stored in a controlled location with 24-hour immediate access.

Key point

Medical team equipment must be checked and serviced regularly.

All potential users have a responsibility to be familiar with the equipment and the way it is stored. Regular checking of the equipment by the staff that will use it or regular use in training improves familiarity.

Standardisation of equipment sets is desirable as a number of different organisations will often share equipment in a major incident.

Key point

Standardisation of equipment allows interoperability between rescuers, and easy resupply.

The best arrangement is to have a universally agreed type of equipment bag organised in a standard manner. All personnel can use this, and should supplies run short, a full bag can be delivered. Ideally, major incident equipment sets should be standardised nationally.

The actual equipment provided for a major incident needs to be agreed on at regional level as it will depend on:

- The predefined capabilities of the attending clinicians in terms of clinical skills provided.
- The anticipated clinical capacity of the health services on the scene.

EQUIPMENT RESUPPLY

Resupply by the Ambulance Service

Each Ambulance Service must plan to rapidly deploy additional equipment to the scene of a major incident; most have one or more equipment vehicles ('emergency/incident support units') for this purpose. The exact number and distribution of these varies but in the United Kingdom many services would aim to have the equipment vehicle to the scene within 20 minutes.

Some services use trailer units, whilst others use specifically designed vehicles. Local conditions will determine which is most appropriate. Whatever the design, it is important that the vehicle is clearly marked as the central equipment supply.

Equipment carried on these units will resupply triage, first aid, and advanced life support capabilities. The exact amount of equipment that should be made available depends on both the incidents that might occur and the number of vehicles deployed. In the case of prolonged incidents, arrangements must be made for additional supplies to be brought to the scene either by replenishing the equipment vehicle or by replacing them.

In addition to resupply of disposable medical supplies the equipment vehicle is likely to carry:

- Portable shelter, with a heating system in appropriate climates.
- Portable lighting with generator.
- Signs (Casualty Clearing Station, Parking Point, Loading Point, etc.).
- Folding stretchers.
- Blankets.
- Oxygen resupply with multiple valve outlets.

Occasionally, an unexpected clinical procedure may be necessary. In this circumstance, the Medical Commander will need to make contact with a local hospital to arrange the supply of the equipment or drug. Ideally, prearranged procedures should be in place to guarantee the timely delivery of the correct item to the correct person.

As medical teams are rotated, further specialist medical equipment will be brought to the scene. Rucksacks can be very similar and should be clearly identified by the name of the hospital or organisation. This will ensure the return of all equipment sets to the right unit following the incident.

Blood

Blood will only be required at-scene in exceptional circumstances. The Medical Commander should liaise with the local blood transfusion services. If a facility for donation is required this would normally be established at regular donor centres.

Supply from national stocks

In many countries strategically located stocks of equipment are maintained for use in the event of a major incident or mass casualty situation. Plans should include the ability to rapidly deploy this equipment to the site following a request to the Ambulance Control Centre.

This equipment may include:

- ABC equipment for resuscitation, plus mass wound and burns dressings.
- Modesty equipment for patients post chemical decontamination, e.g. paper suits and space blankets.
- Antidotes, treatments, and vaccine for specific chemical, biological, nerve, and poisoning agents.

Resources may also be supplemented by mutual aid from other regions and organisations.

EQUIPMENT OFFICER

If there is more than one equipment vehicle at the scene, it is important that an ambulance officer is designated as the Ambulance Equipment Officer. Medical teams may leave their resupply and surplus specialist equipment with this officer.

Key point

An Ambulance Equipment Officer should be nominated to ensure the appropriate use of stores.

The Ambulance Equipment Officer must ensure that stores are issued appropriately and in a controlled fashion. Certain items (such as the Ambulance Commander's tabard) must be strictly controlled if a scene is to be effectively managed. Other items (such as drugs) should only be issued to appropriately qualified and trained staff. If more than one equipment vehicle is present, then only one vehicle should be used at a time; this facilitates resupply as the other vehicle can then be sent for restocking once empty.

The Ambulance Equipment Officer's most difficult task is ensuring that equipment supply is coordinated. Several requests may arrive from varying sources for the same equipment for one patient, leading to waste. On other occasions equipment can get diverted *en route*.

SUMMARY

- Extra equipment will be necessary to deal with major incidents.
- This equipment is required for triage, first aid, advanced life support, and packaging for transport.
- The Ambulance Service will usually provide equipment vehicles at the scene and should also nominate an Ambulance Equipment Officer to coordinate distribution and resupply.
- Medical teams should bring their own specialist equipment to the scene for advanced procedures.
- Any equipment stored for use in the event of a major incident should be regularly checked, serviced, and used in practice scenarios by the potential users.
- Equipment resupply may occur from the Ambulance Service, from hospitals, or from pre-determined national stocks.

CHAPTER 9

Training

After reading this chapter you should be able to answer the following questions:

- What is the place of MIMMS education in health emergency planning?
- What is the range of exercises used to support major incident education?

INTRODUCTION

It is not usual to expect anyone to be able to operate in a different situation or environment without experience. However, major incidents are (fortunately) infrequent occurrences. Very few Health Service personnel will be involved in such an event more than once or twice during their career. In such circumstances, training becomes very important. As in all areas, good performance must be built on sound foundations. The *Major Incident Medical Management and Support* (MIMMS) approach provides this.

EDUCATION

The MIMMS principles are the fundamental building blocks for major incident education (Figure 9.1). They can be enhanced by practical skills training, table-top exercises, and practical exercises without casualties (PEWCS), progressing to single service exercises and ultimately a multiagency exercises with casualties.

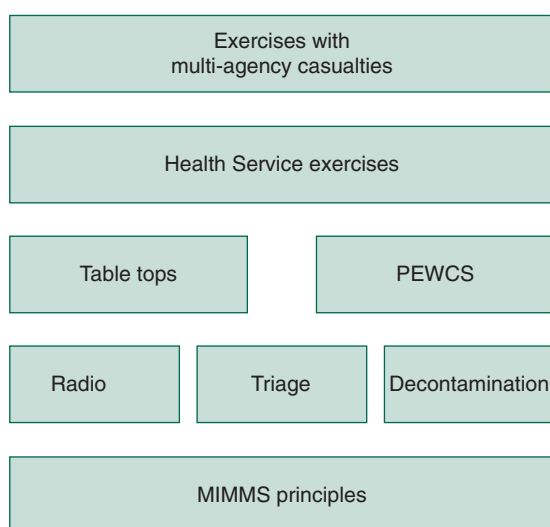


Figure 9.1: Building blocks of major incident education

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MIMMS provides a structured educational approach for Ambulance and Medical Commanders. It can also provide valuable education about the pre-hospital environment at a major incident scene for hospital staff likely to be deployed to an incident. The 3-day advanced MIMMS course delivers specific education and assessment at Silver and Bronze Commander level. Education for wider roles and processes in major incident planning and delivery should also be to accredited standards and integrated into an educational emergency planning governance programme for health organisations.

Completion of a MIMMS course alone does not fulfil all requirements for Health Service major incident training. Each health organisation will have a complete programme of continuing professional development (CPD) and every opportunity must be taken to participate in exercises to practically apply and develop those skills.

Exercises

In most domains, emergency services have a statutory obligation to test and validate emergency plans and procedures. This can be done by exercising.

Three distinct levels of exercises have been identified and are as follows:

- *Level A exercise:* A major *live* multi-agency exercise, requiring a relatively large degree of commitment and possibly funding from a number of organisations.
- *Level B exercise:* A major *table-top* multi-agency exercise, requiring a relatively large degree of commitment from a number of organisations.
- *Level C exercise:* Either a *live or table-top* exercise set up at a local level to exercise a specific issue, possibly highlighted during a level A or B exercise. It may be designed to address the needs of a single agency but may require limited input from another agency or agencies. This level of exercise may also require a degree of inter-agency liaison.

It is important that all exercise participants undertake an internal organisational debrief, identifying and recording all areas of good practice and those areas that require improvement. In addition, leads from each participating agency need to undertake a multi-agency debrief and follow the same process. All lessons learned from these exercises should be fed back into plans and procedures, and retested in future exercises.

SUMMARY

- MIMMS principles underpin major incident education.
- MIMMS courses are available and are appropriate for staff in the health services.
- Continuing education beyond MIMMS is essential.
- Various levels of major incident exercise exist.
- Different types of exercise are appropriate for different educational needs.
- Lessons learnt from exercises should be incorporated into plans.



PART IV

Management

CHAPTER 10

Command and control

After reading this chapter you should be able to answer the following questions:

- How are command and control defined?
- Who has overall control at the incident?
- What is the purpose of the cordons at the incident?
- What are the tiers of command at the incident?

AIM

When faced with the chaotic scene of a major incident it is important that order is brought about rapidly. Order requires effective command and control.

DEFINITIONS

Command

Command is the vertical line of authority within each emergency and support service. *Each service has one individual who is in command.*

Control

Control is the horizontal line of authority across the emergency and support services. *The incident has one individual who is in overall control.*

Key point

Command and control are the cornerstones of effective major incident management.

INCIDENT COMMAND

Each service at the scene will have a commander and they will be identified by a distinctive major incident tabard.

The officer in charge of each emergency service on site is referred to as the 'Commander'. Each should wear a distinctive chequered tabard inscribed front and back with their appointment, for example 'Police Incident Commander' (Table 10.1).

The Health Service response is led by the Ambulance Commander and the Medical Commander. These two officers liaise closely with each other and with the commanders from the Fire and Police Services. The particular title of these commanders will vary from country to country.

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The Ambulance Commander and Medical Commander have distinct roles but must work as a command team. If they work together, efforts will not be duplicated, orders will not be contradictory, troublesome radio communications will be kept to a minimum, and difficult decisions will be shared. If conflict arises, this will be to the detriment of the casualties.

In the UK there has historically been a reluctance to state the relative positions of the Ambulance and Medical Commanders. However, as the Ambulance Service has statutory responsibility, the Ambulance Commander can be said to be *in control* of the health services response.

Table 10.1: Incident commander identifications

Appointment	Identifying tabard
Police Commander	Blue and white chequered
Fire Commander	Red and white chequered
Ambulance Commander	Green and white chequered
Medical Commander	Green and white chequered

Local highlights: Incident commander name and identification

Forward Commanders are responsible to the Incident Commander for the management of resources at a specific sector/operational area. The Forward Commander works in a forward operational area/sector and is the ‘eyes and ears’ of the Incident Commander. There is a Forward Commander for each designated sector/operational area.

The first vehicle for each service at the scene will initially act as its Incident Control Point. This vehicle should leave its blue lights flashing to identify its role. All other vehicles should extinguish their blue lights. Experience has shown that where this does not happen there can be confusion about where staff report to on arrival.

Each service will have provision for a dedicated incident command vehicle that will carry additional communications equipment and may have briefing facilities. This will take over from the first vehicle on the scene once it arrives.

INCIDENT CONTROL

One service at the scene will have overall responsibility for the effective coordination of the incident. This service should view itself as a facilitator of the other emergency services and ensure close communication and cooperation between them.

In the UK, the Police have this responsibility except where an incident occurs ‘offshore’, where the responsibility rests with the Maritime and Coastguard Agency. In some European countries, for example Sweden, the Fire Service has overall control. In most countries, in the presence of fire, chemicals or other hazards, the Fire Service will assume control of the imme-



diate area around the incident (the Bronze zone within the inner cordon), but the Police will still have overall control. Experience in Australia has led to the concept of overall authority resting with the most appropriate agency for the specific type of incident. The so-called 'combat agency' for a conventional man-made major incident would be the Police. In the case of a flood the State Emergency Service would assume control, whilst for an extensive bush fire the Fire Service would take the role.

CORDONS

The command and control of any major incident relies on a coordinated, integrated, multi-agency approach. The Police will normally provide coordination of this combined response. A key part of this coordination function is the support of the movement of emergency services to and from the incident. To facilitate this, cordons are put in place. Cordons also prevent anyone without an active role in the incident from gaining access to potentially hazardous areas.

Inner cordon

The *inner cordon* is not always clearly marked unless there is a specific hazard or a scene of crime, when it may be denoted by tape. Where a hazard does exist there may be strict access control across the cordon. In order to ensure complete evacuation if the hazard escalates, individuals may be tagged going in and going out. Control of movement through the inner cordon may rest with the Fire or Police Service depending on the nature of the hazard.

Outer cordon

The Police will determine the extent and location of the outer cordon with the aim of preventing unauthorised access to those areas being used by all services/agencies in relation to the incident.

The Police are also responsible for physically establishing the cordon using barrier tape, signs, and road blocks as necessary. Once it is established, only authorised personnel should be allowed through. All vehicles that cross the outer cordon should be clearly marked and all staff should carry personal identification. Medical personnel may attend in unmarked vehicles and may not be able to access the site without personal identification. The cordons are illustrated in Figure 10.1.

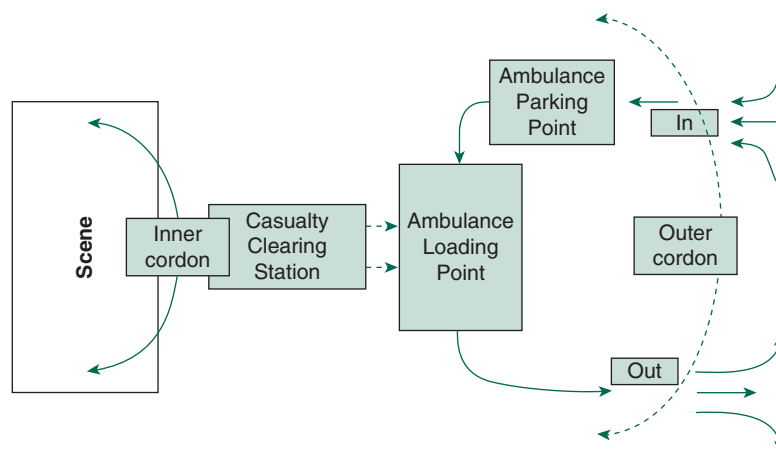


Figure 10.1: The cordons at a major incident

TIERS OF COMMAND

Various levels of command/management will need to be established to ensure effective control by each emergency service/agency. These levels are nationally agreed and are as follows.

Strategic/Gold Command

For a 'routine' major incident, there is only one Gold Command. However, in incidents that cross police force or county boundaries there is a probability that there will be a multi-agency Gold Command established in each domain. On these occasions it may be decided to establish regional or national coordination (sometimes termed Platinum).

A Strategic Commander's purpose is to establish a framework of policy within which a tactical command can work, thus providing support to the tactical command and determining plans for the return to a state of normality once the incident is brought under control. The Gold area is a theoretical boundary beyond the scene, representing a level of senior command that will decide on the resources to assist the scene.

Tactical/Silver Command

The outer cordon encloses the area of responsibility of the incident commanders. This is the Silver or tactical area. The commanders at an incident are in overall command of the scene, allocating resources to the Operational Commanders, planning and coordinating the overall response and obtaining additional resources as necessary.

The command vehicle for each emergency service will co-locate to form the *Joint Services Emergency Control (JSEC)*, or the Silver Command. For a conventional man-made incident (for example, train crash or terrorist bomb) there is only one Silver area. For widespread public disorder or a natural occurrence (for example, an earthquake with major structural collapse) there may be two or more discreet major incidents, each regarded as a Silver area.

Operational/Bronze Command

Bronze or operational areas are usually at the site of the incident. Within a Silver area, there can be any number of Bronze areas or *sectors*. Each sector will represent a focus of activity and may require its own Forward Commander. The tiers of command are illustrated in Figure 10.2.

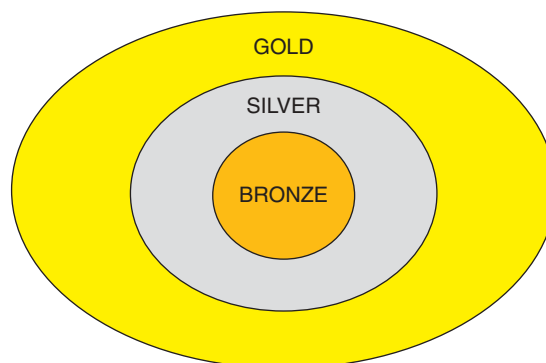


Figure 10.2: The tiers of command

THE CHAIN OF COMMAND

Each service has a vertical chain of command at the scene. It is not desirable for command to repeatedly change hands as more senior officers assist, as this will interrupt the continuity of management. Ideally, command should change hands once only from the acting commander (in the case of the Ambulance Service this would be the ambulance attendant on the first vehicle at the scene) to a commander of appropriate rank who has been despatched specifically to take the role. In protracted incidents, the welfare of incident commanders is as important as that of any other responder. Therefore, there may be the need to establish a Silver Commander rota. Where this occurs, care must be taken to ensure a complete handover is achieved and documented.

Incident, or Silver, Commanders should interact as shown in Figure 10.3. During major incidents and major incident exercises, it is often the case that communication between Silver Commanders is poor; the effective management of an incident demands good communication and these commanders *must* arrange to meet at regular intervals. In the early phases of the incident a brief discussion may be required every 20 or 30 minutes.

Key point

Good command and control requires good communication both vertically and horizontally.

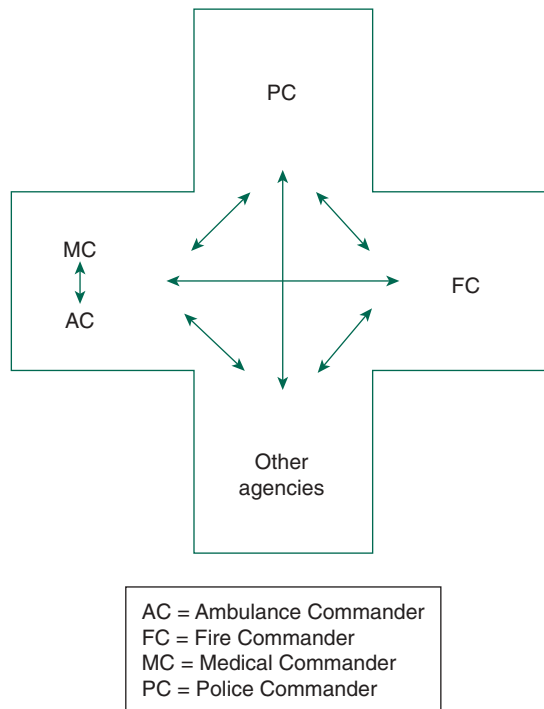


Figure 10.3: The cross of communication

The commanders of each scene may move around to maintain an overview of how the situation is developing, but will often concentrate their activity close to the command vehicles at Silver Control. Health Service commanders are managers and must not be involved directly in the rescue process or the treatment of the injured. Their role is to ensure that there are adequate resources at the scene, and that the resources are maintained through resupply of equipment, replacement of personnel and casualty distribution. The organisation of the Silver area of command is shown in Figure 10.4.

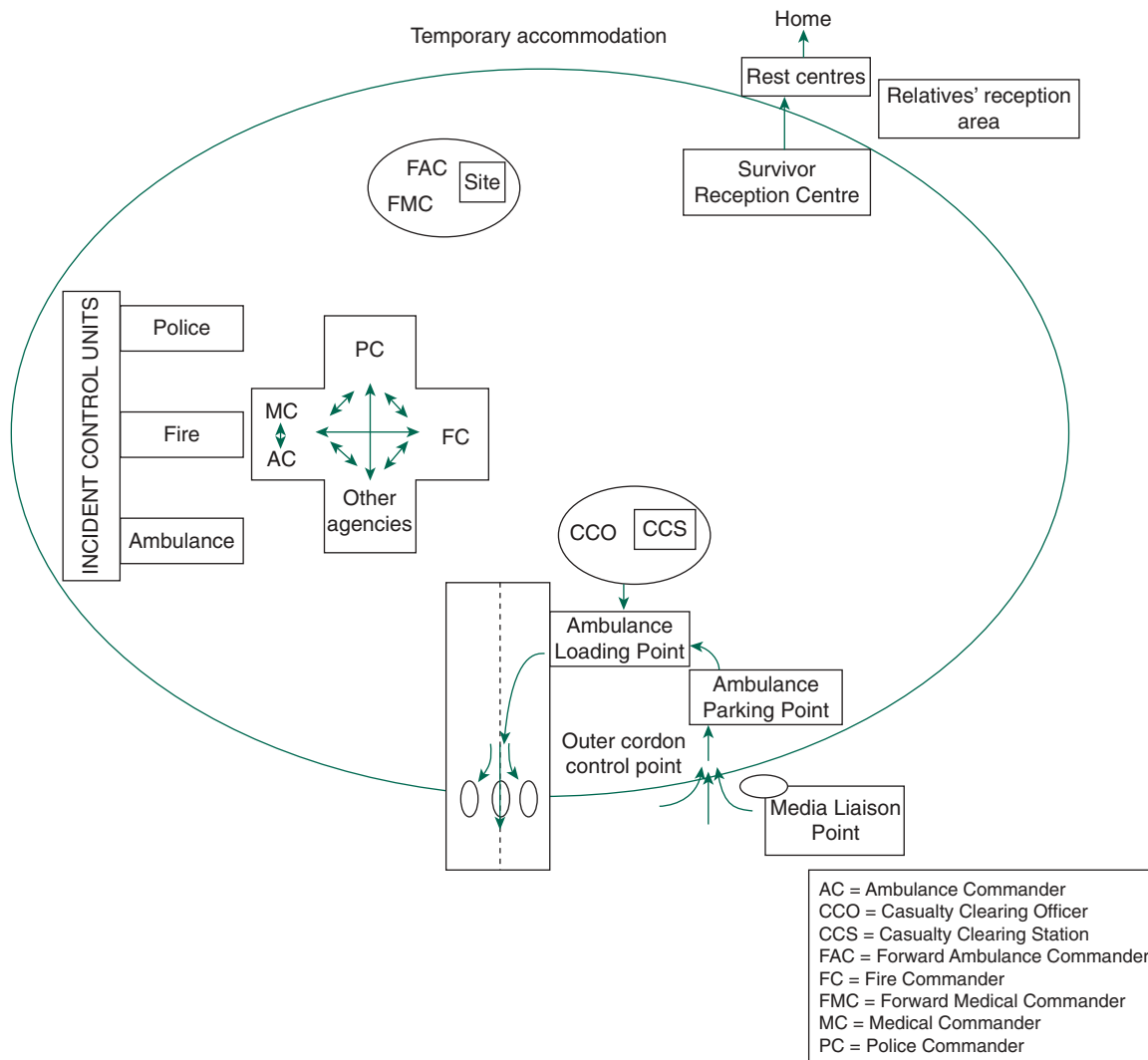


Figure 10.4: The Silver area

The organisation of the Bronze area of command is shown in Figure 10.5.

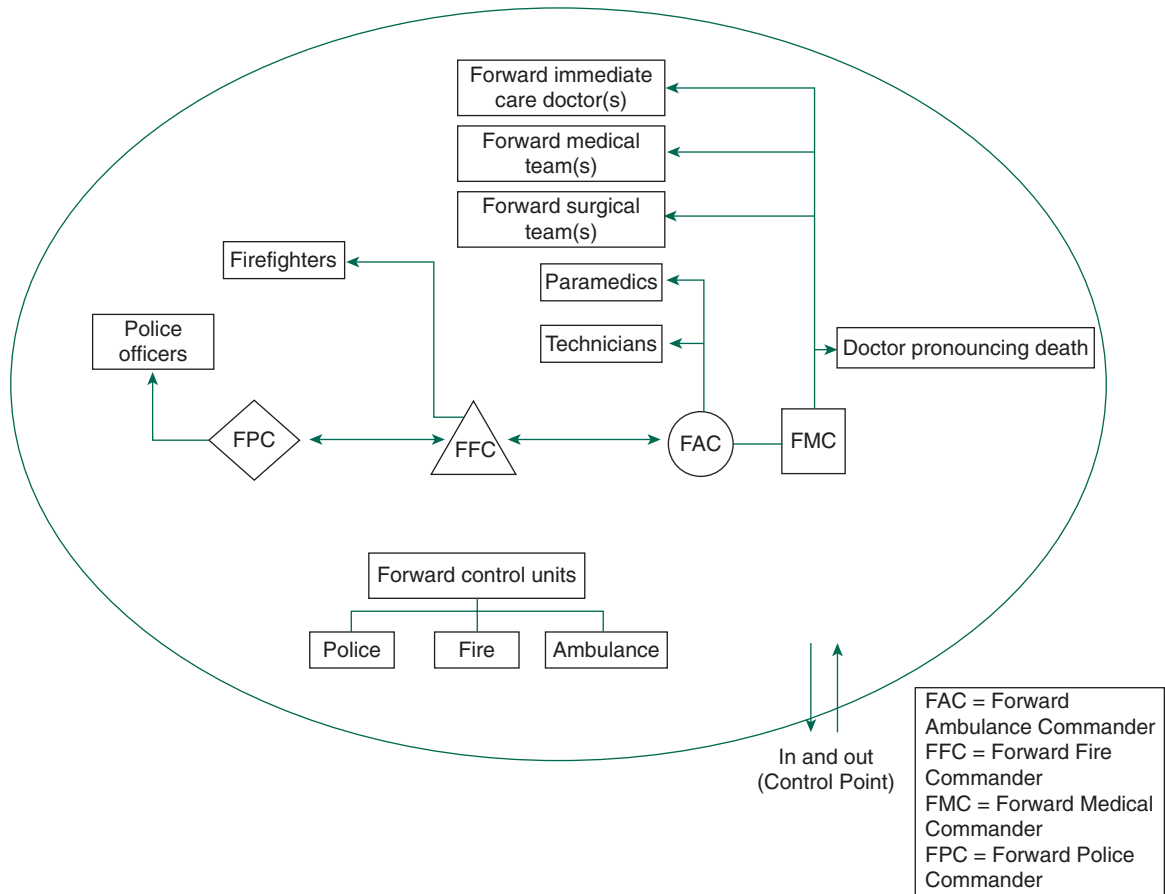


Figure 10.5: The Bronze area

Each emergency service has a clearly defined chain of command from the Incident Commander through the Forward Commander to individual personnel on the ground. A request for assistance must be passed through this chain to retain command. For example, if a fire fighter finds a trapped casualty, they should approach a member of the Ambulance Service (who will advise the Forward Commander) or the Forward Fire Commander and request support at that location. If requests are not sanctioned through the recognised chain of command, then command is effectively lost and appropriate actions may not occur or may be duplicated.

Key point

Requests for medical assistance at the site must be channelled through Commanders. Discipline is required if command is to be maintained.

SUMMARY

- Each emergency service at the scene has an incident commander.
- One service will take overall responsibility for the overall coordination of the management of the incident.
- Effective command and control requires good communication between and within services.
- There are three tiers of command in relation to a major incident: Bronze (operational), Silver (tactical), and Gold (strategic). There can be any number of Bronze areas within a single incident.
- Emergency service command vehicles will co-locate at the scene to form the Joint Services Emergency Control or Silver Control.
- Requests for assistance at the scene must pass through the correct chain of command.

CHAPTER 11

Health Service scene layout

After reading this chapter you should be able to answer the following questions:

- How is the Health Service response laid out at the scene?
- What criteria are used to select a site for the Casualty Clearing Station?
- How do the Ambulance Parking and Loading Points operate?

INTRODUCTION

In order to understand how the Health Service operates at the scene, it is essential to know the way in which it is laid out within the cordons.

KEY LOCATIONS

Whatever the nature of the incident, it is likely that the Health Service response will require certain key locations to be established. Figure 11.1 is a schematic representation of these key locations.

Of course, each incident is different and the exact locations and relationships will vary. It may be necessary to leave some functions out altogether or to duplicate others. For example, if access to particular parts of the scene is difficult then two Casualty Clearing Stations might be set up, each supported by an Ambulance Loading Point.

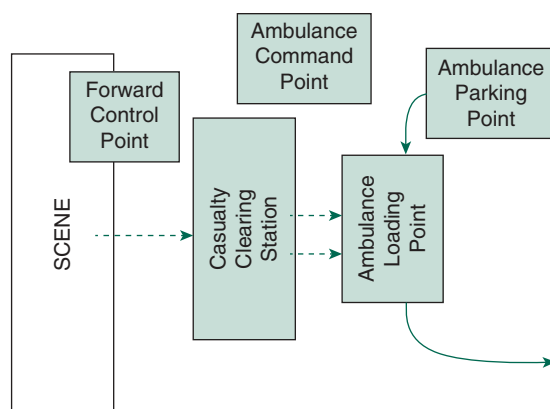


Figure 11.1: A schematic representation of the layout of the health services at a major incident

Ambulance Command Point

This is the ambulance command vehicle. It may be co-located with other command vehicles at the Joint Services Emergency Control (JSEC).

In the UK if the predesignated ambulance command vehicle has been deployed, it should be identified with a steady green light. In addition to the green light, standard flashing blue lights may also be used.

Local highlights: Identification of the Health Service Command Point

The Ambulance Command Point provides a focus for the management of the resources of all the health services, and an on-site communications facility.

Key point

All Health Service personnel attending an incident must report to the Ambulance Command Point.

Forward Control Point

This area is close to or within the immediate area of the incident and is selected so that the Forward Commander can direct operations using mobile communications. There may be a need to have more than one Forward Control Point and a number of Forward Commanders to direct different parts of a large scene.

Ambulance Parking Point

This is essentially a holding area where ambulances are kept until they are called forward to the Ambulance Loading Point. Ideally access, both from the arrival route and the scene, should be good. In prolonged incidents this area becomes a focus for staff briefing, resupply, and refreshment.

Casualty Clearing Station

This area is normally established by the Ambulance Service and supported by other clinicians. It serves as a focus for secondary triage and the treatment of casualties. The only absolute requirement is that this area should be safe. Access (both from the scene and to evacuation routes), shelter, light, and size also need to be considered. The Ambulance Loading Point (see below) is adjacent to it.

Key point

When the Casualty Clearing Station is established, factors such as safety, access, shelter and size should be considered.

When the Casualty Clearing Station is set up outside, the areas intended for casualties of different priorities should be clearly marked (Figure 11.2). This may be done with different colour (red/yellow/green) groundsheets, separate structures, inflatable tents or simply a stick in the ground with a triage label of the corresponding colour attached. When tents or other structures are used they should not be crammed with stretcher patients, this simply transfers patients from one entrapment situation (the incident) into another (the tent or structure). Close packing of stretchers not only limits access to the patients but also restricts the flow of casualties through the area. Patients should be placed in the tent with their heads towards the centre to allow access to their airway and to allow support of their breathing.

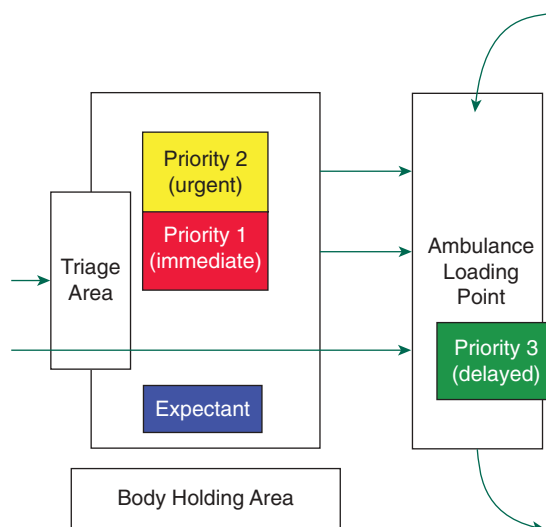


Figure 11.2: Schematic representation of a Casualty Clearing Station

Casualties can be moved between the treatment areas, depending upon whether they improve or deteriorate. A similar flow should be possible within the evacuation area. This system allows for those patients whose priority changes during treatment or while awaiting evacuation.

Ambulance Loading Point

This is the area where ambulances collect casualties from the Casualty Clearing Station for transportation to hospital or other health care facilities.

CONTROL OF KEY AREAS

One of the most important steps in converting the chaos of a major incident into organised treatment, is to establish control of the flow of patients. Equipment must be available to demarcate key areas and to signpost them. Plastic tape (green check to distinguish it from the blue and red tapes used by the Police and Fire Services, respectively) can be used to control entry and exit points. Collapsible signposts should be available to indicate the key clinical areas. The Ambulance Service commonly has tents (inflatable or other rapid deployment structures) that can provide a sheltered area for holding and treating casualties prior to transport.

Local highlights: Equipment for the control of key areas**SUMMARY**

- The site plan involves establishing an Ambulance Command Point (as part of the Joint Services Emergency Control), Forward Control Point(s), Casualty Clearing Station(s), and Ambulance Loading Point(s).
- In order to establish and maintain the flow of ambulances for evacuation of casualties, a circuit must be set up. An Ambulance Parking Point should be set up first.

CHAPTER 12

Safety at the scene

After reading this chapter, you should be able to answer the following questions:

- What are the safety priorities at the scene?
- How do I safely approach the scene?
- What is the role of the Ambulance Safety Officer?
- What are the basic principles of risk assessment at the scene?

INTRODUCTION

One of the first principles of pre-hospital emergency care is 'do not become a casualty yourself'. A responder to an incident is of little use to anyone if they become a casualty. Responder casualties may in fact make the situation significantly worse as they not only deplete the available pool of manpower but also add an additional burden to an already stretched health care system.

Every individual has a duty to take reasonable steps to ensure their own safety and to properly use the safety equipment provided. There is no way of guaranteeing absolute safety in an operational incident, but by following a few simple rules and being aware of the environment, the risks can be minimised.

HEALTH AND SAFETY LEGISLATION

Most countries have placed an obligation on employers to minimise the risk to their employees from work-related dangers. This legislation usually extends to all but the most severe incidents that emergency services respond to.

Local highlights: Relevant health and safety legislation

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THE 1-2-3 OF SAFETY

Responders should follow the 1-2-3 of safety. In order of priority:

1. Self safety.
2. Scene safety.
3. Survivor(s) safety.

Self safety

A responder's first priority must always be to ensure their personal safety. There may be situations where risk assessments have been carried out for a particular task or area of work. Responders should be familiar with these risk assessments and understand any steps they need to take to minimise risk. In addition, a dynamic risk assessment should be carried out throughout the incident as shown in Figure 12.1.

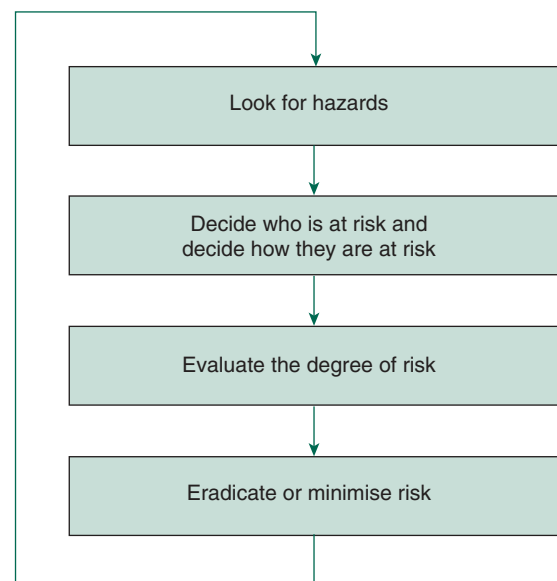


Figure 12.1: Dynamic risk assessment

It is always important to approach with caution – this allows time for risk assessment. Hazardous substances may be the cause of any incident, even if the nature of the call does not suggest it. Responders should maintain an index of suspicion throughout and should always follow the principles shown in Table 12.1.

Table 12.1: Safe approach

Action	Reason
Approach upwind and uphill of incident	Minimises exposure to contamination trail
Go to rendezvous point if identified	Ensures appropriate reporting and deployment
Stop at first fire appliance (unless closer than 100 metres)	May be standing off or have information
Stay a minimum of 100 metres from incident	Minimises risk from explosion
Retreat if continuous loud noise	May indicate leak under pressure
Wear maximum personal protective equipment available	Protects from contaminants
Obtain treatment if contaminated	Early treatment improves outcome

Once on the scene, suspicion should be maintained. If the cause of the incident is unknown, then STEP 1-2-3 (*safety triggers for emergency personnel*) has been developed to assist in identifying the possibility of hazardous materials incidents (Table 12.2).

Table 12.2: Safety triggers for emergency personnel (STEP 1-2-3)

Step 1	<i>One casualty</i>	Approach using normal procedures
Step 2	<i>Two casualties</i>	Approach with caution
Step 3	<i>Three or more casualties</i>	DO NOT APPROACH THE SCENE

There may also be other signs, which might be useful in confirming the release of a hazardous material and these are dealt with in more detail in Chapter 18.

Personal protective equipment

Personal protective equipment should be worn if indicated. This is described in detail in Chapter 7.

Scene safety

Ambulance Safety Officer

The Ambulance Safety Officer reports to the Ambulance Commander and is responsible for the overall safety of all health personnel at the site of a major incident. They will ensure that all ambulance and other health service staff wear the correct high visibility and protective clothing. Together with the other emergency services, specialist advisor(s), and decontamination officer(s) they will identify the risks and hazards present in the area of operation. Finally, they will monitor correct working practices at the scene. These tasks are shown in Box 12.1.

The Ambulance Safety Officer will be identified by a high visibility tabard inscribed 'Ambulance Safety Officer'.

Box 12.1: Ambulance Safety Officer tasks

- Liaise with any other specialist safety advisors present
- Identify any actual or potential hazards and ascertain the correct course of action/control measures required. Notify Ambulance Control and the Ambulance Commander of all hazards to ensure safety information is communicated to all staff
- Ensure that all Ambulance and Health Service personnel arriving and working at the site are correctly identified and wear the appropriate high visibility and protective clothing
- Ensure safe working practices are happening and act immediately to manage any risks to the health and safety of staff
- Conduct an analytical risk assessment at 30-minute intervals, recording the information as required
- Liaise with the Ambulance Parking Point Officer to ensure that all staff arriving at the scene are briefed about actual and potential hazards and are correctly attired prior to proceeding on the site
- Monitor the time responders spend on site and make provision for adequate rest and refreshment facilities at the scene
- Immediately advise staff in the inner/outer cordon areas and Ambulance Control/Ambulance Commander in the event that evacuation of the scene is required

Analytical risk assessment process

As well as initial dynamic risk assessments, a more detailed approach may be necessary. This is known as the analytical risk assessment. As things will continuously change during an incident, the Ambulance Safety Officer should constantly review and update the assessment of hazards. This should be done at 30-minute intervals or whenever the risk to Ambulance and Health Service personnel changes.

The analytical risk assessment includes the following elements:

- A formalised assessment of the hazards.
- An assessment of existing control measures with additional control measures introduced as appropriate.

Emergency evacuation signal

The emergency services should have an agreed method to warn responders within the inner cordon of a safety issue that requires immediate evacuation of the site. The signal is often three blasts on a whistle but could also be:

- The sounding of an air horn/car horn.
- Banging of metal objects together.
- A radio message transmitted to all call-signs.

Whichever method is used it must be agreed by the emergency services prior to the deployment of operational personnel. The emergency evacuation signal must be understood by everyone in attendance at the incident scene.

Survivor safety

Survivor safety is an important issue – there is little point in deploying health service staff to save life, only to see lives lost because of failure to identify and manage hazards.

Survivor safety may include:

- Removal to a place of safety away from the incident site, for example:
 - Use of safe buildings for shelter, e.g. a Survivor Reception Centre.
 - Use of Ambulance Service tented structures.
- In the case of a contaminated casualty:
 - The removal of contaminated clothing.
 - Assessment of the need for decontamination.
- Provision of warm blankets, clothing, etc.

AFTER THE INCIDENT IS OVER

During the closing stage of an incident, complacency can set in. The process of task and hazard identification, the assessment of risk, and the planning, organisation, control, monitoring, and review of the preventive and protective measures must continue until the last resource leaves the incident scene. The Ambulance Commander should have no hesitation in halting work in order to maintain safety.

It is important that systems are in place to monitor the health of staff following an incident. As a matter of course, Incident Commanders will take advice as to any immediate treatment and monitoring that staff should undergo if they have been exposed to any hazardous substance. Health and safety departments, occupational health services, employee counselling services, and peer support networks are valuable sources of advice and support. In addition to this, a written record of individual staff involvement/exposure at an incident should be retained.

SUMMARY

- Safety is extremely important at the scene of a major incident and may be governed by legislation.
- The 1-2-3 of safety should be followed.
- A risk assessment should be performed by the first crew arriving at the scene.
- The Ambulance Safety Officer should undertake analytical risk assessments regularly during the incident.
- Safety monitoring should carry on until the last resource has left the scene.
- After the incident is over the health of staff should be monitored as required.

CHAPTER 13

Communications

After reading this chapter you should be able to answer the following questions:

- Why are good communications important?
- What methods of communication can be used at a major incident?
- What is needed to establish a communications structure?

INTRODUCTION

Good communications are essential for an effective major incident response. Without good communications the emergency services cannot deliver a coordinated response. Poor communication is recurrently identified as a problem when major incident management is investigated.

'I was left with the clear impression that opportunities to pass vital information between the services were missed.'

Desmond Fennell OBE QC, investigation into the King's Cross Underground fire

'Emergency services shall carry out exercises simulating a major incident on a regular basis to test specifically their communication systems in the light of the shortcomings identified . . . '

Anthony Hidden QC, investigation into the Clapham Junction railway accident

'The key to an effective response to a major or catastrophic incident is communication. This includes communication within and between the emergency, health, transport and other services. It also includes effective communication with the individuals caught up in the incident, and the public at large.'

London Assembly Report of the 7 July Review Committee, 2006

Good communication is complete, accurate, and timely. It is designed to ensure that everyone who needs to know is informed as soon as possible. Systems should be in place to not only show that messages were passed, but also to record that they were received and acted on. To achieve this, good communication must be part of preparation – plans should include it, equipment must be in place, and staff who are expected to communicate must be trained to do so.

The consequences of bad communication can be severe. If, for example, a shortage of equipment at the Casualty Clearing Station is not communicated, there will be no resupply: this is a *lack of information*. If the sender of the message does not confirm with the receiver that the message is understood, the wrong action may be taken, e.g. a need for 'Entonox' may become

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a need for an 'empty box': this is *failure to confirm the information*. If messages are not logged with the Ambulance Service Control Vehicle at the scene, requests may not be actioned or may be carried out in duplicate: this is a *lack of coordination*.

Key point

Good communication is crucial to the effective management of a major incident.

COMMUNICATION METHODS

The following methods of communication will be discussed:

- Radios (airwave terminal or handset).
- Telephones (cellular, land line, internet, or satellite).
- Other methods including runners, pagers, loud-hailers, whistles, hand signals, public announcements, television and radio broadcasts, and multimedia communication devices.

Radios

Before using a radio it is important to know:

- Who can be contacted: radio net/talkgroups/channels.
- How the radio is operated: the working parts/battery, etc.
- The correct form of speech: radio voice procedure.

Traditional analogue radio net

On a traditional radio net, each person who uses the radio has an identifying name or number. This is known as a 'call-sign'. Everyone who uses a radio is on an allocated frequency and this is part of a 'radio net'. Each emergency service operates on a separate frequency and therefore has its own radio net. Messages are usually passed from an individual to a control room. An example of a radio net is shown in Figure 13.1. 'Control' can hear everyone and speak to everyone, but individuals may only be able to hear and speak to the control room, depending upon the operating system.

Single frequency simplex All users transmit and receive on the same frequency. All users can therefore be heard by, and can speak to, each other provided each set is powerful enough. This is also referred to as an 'open' channel and is desirable in a major incident so that all key officers can monitor the progress of the incident.

Duplex Users transmit and receive on separate frequencies. Each user can only talk directly to and can only hear Control (unless Control organises *talk-through*). Control can speak to and hear all stations. This is the usual Ambulance Service operational system for daily use.

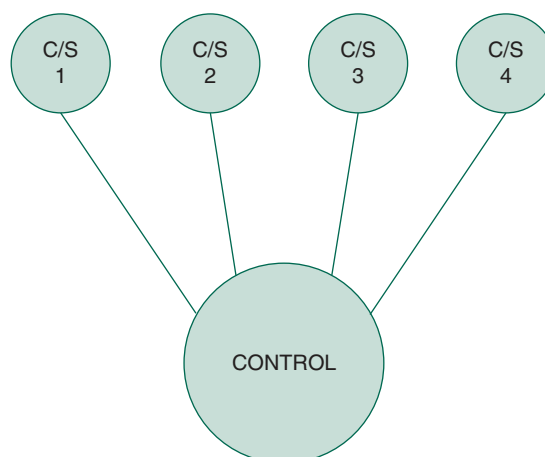


Figure 13.1: A radio net. C/S, call-sign

If a user has a hand-held radio as well as a radio in a vehicle, the same call-sign is usually retained (whichever radio set is being used at the time). In a major incident scenario, call-signs for hand-held radios will change, depending on the role of the individual.

Key point

Only one person can transmit on any radio net at any one time.

Radios can operate on HF (high frequency), VHF (very high frequency), or UHF (ultra high frequency). HF radios have the longest range and UHF the shortest. Traditional Ambulance Service radios have usually been VHF and allow communication with the Health Services Command Vehicle at the scene, with Ambulance Control, and directly with the hospital (if they have a receiver installed). UHF radios have often been distributed on the scene for use by key health personnel, but are unlikely to have a range that will allow communication much beyond the scene. HF radios may be utilised in remote areas or by military personnel.

TETRA (airwave) hand-held terminals

Throughout the United Kingdom, the emergency services are converting to a digital system of communication (airwave).

Since the late 1990s it has become apparent that the old analogue VHF/UHF frequencies that were being used to provide radio communication networks were no longer able to deliver the bandwidth necessary for development.

The new system is based on the TETRA (*terrestrial trunked radio*) standard as defined by the European Telecommunications Standardisation Institute (ETSI). It is designed to provide emergency services with a single, cohesive, two-way radio network that will support multiple teams.

Improvements over existing VHF radio service will include:

- Improved geographical coverage.
- Improved voice quality.
- Increased capacity.
- Reliability and functionality.
- Voice and data.
- Greater security of information with encryption built in.
- Emergency calls enabling an open microphone on the talkgroup.
- Multiple talkgroups.

The system will enable multiple modes of operation that will allow both secure voice calls and data packages to be sent and received using just the one terminal.

Modes of operation

1. *Point-to-point*: Individual private calls between two terminals using the network.
2. *Group calls*: Trunk mode operation between terminals on a set talkgroup.
3. *Direct mode*: Individual call between terminals without using the network.
4. *Multiple talk*: The ability to join a selection of pre-programmed talkgroups.
5. *Emergency calls*: A high priority call that enables an open microphone on the talkgroup.

The Ambulance Service has overall responsibility for planning, providing, and coordinating health service communications at the scene, and to and from the scene of a major incident.

The requirements for health service communications during a major incident are summarised in Box 13.1.

Box 13.1: Requirements for health service communications during a major incident

Onsite

Equipment to allow radio communication with and between:

- Key ambulance and medical personnel at the incident
- Ambulance vehicles at the scene
- Ambulance Control
- The incident and receiving hospitals
- The Police and Fire Services

Offsite

Radio communications with:

- The Ambulance Command Vehicle at the scene
- Ambulance vehicles travelling to the scene or to hospital
- The receiving hospitals
- Neighbouring Ambulance Services
- Hospital Liaison Officer(s)

Communication from the scene to the receiving hospitals may be direct, or indirect via Ambulance Control. The benefit of the indirect approach is that it allows the Health Service Commanders to concentrate on the scene management. Hospitals need to know specific information: how many patients, estimated time of arrival, and clinical severity (triage priorities). Clinical details of individual patients are not required for the hospital to activate their major incident plan and respond appropriately.

Radio working parts and radio voice procedure

To use a radio requires knowledge of the working parts: how to turn it on, select the channel, and change a battery. This is dealt with in Appendix E. Using a radio also requires knowledge of how to initiate a message and end a message, and the key words of 'radio shorthand'; this is referred to as radio voice procedure and is also explained in Appendix E with worked examples.

Telephones

Cellular telephones

The cellular telephone has some benefits as a communication tool in pre-hospital care:

- It allows unrestricted conversation and radio voice procedure is unnecessary.
- It allows communication with individuals outside the radio net.
- It allows direct communication with hospitals.
- It has national (and international) coverage.

There are, however, disadvantages to the use of cellular telephones at a major incident:

- There is no central coordination of messages.
- There is no centrally recordable audit of conversations.
- There are limited cells available and saturation of the system can rapidly occur.

The absence of central coordination of messages will mean that there is no log of important requests – thus requests will not be routinely followed up if they fail to be actioned. Failure of coordination may also lead to a duplication of effort, counter-orders, and a breakdown in the control of the health service response scene.

As cellular phones do not normally have a recording capability, there is the opportunity for key messages to be missed. Following any major incident, there will be a post incident inquiry

that will scrutinise communications between commanders. Failure to record or log these messages may result in criticism regarding areas of responsibility or miscommunication (see Appendix C).

As there are a limited number of cells they can rapidly become occupied by members of the media, public, and survivors. This can be overcome by having a reserved number of cells that can be activated in an emergency and accessed only by emergency service personnel who have modified phones. The modification of cellular phones for this purpose requires rigid control. Planning is required to ensure that an incident commander's telephone is protected in this way.

Key point

Messages should be passed through the Ambulance Control Vehicle to maintain control and recording of the health service's response.

Land lines

A field telephone system may be useful to connect fixed points around the incident, e.g. the Command Vehicle, Forward Control Point, and Casualty Clearing Station. Long messages or secure information can be sent over this network rather than the radio. Information cannot be recorded on this system.

In protracted incidents (days) it may be possible for a telecommunications provider to install new land lines.

Within a hospital, the telephone is the principle form of communication. Messages should be kept short and alternative methods of communication such as runners should be considered. Additional telephone points may be necessary within areas designated for major incident administration, with the telephones only used when the plan is activated. A fax machine is useful to receive information from the incident (where available) and to forward appropriate information to the Police.

A Police casualty documentation team will be sent to every receiving hospital to collect information on all patients treated. A central casualty bureau will collate the information from the hospitals together with information from the scene. The media, on instruction from the Police, will broadcast a public contact number for the casualty bureau.

A hospital switchboard may become rapidly saturated with calls in a major incident. These may come from staff answering the activation cascade, from the media, and from relatives or friends of the injured. It is the responsibility of the hospital's management team to provide a system that will cope with the increase in demand of calls and to regularly test this system.

Other methods

Runners

At the scene, the use of runners should always be considered. They are a reliable method to pass information and often faster than trying to make contact over a very busy radio net. It may be appropriate to send hand-written messages to avoid degradation of the content of the message. Runners must have the appropriate personal protective equipment.

Key point

Runners are reliable and may be faster than using the radio.

Hand signals

Hand signals can be adopted, and are useful for communicating in line of sight but where voice cannot be heard because of distance or background noise. They are used frequently by the military and Ambulance Service special operations teams.

Whistle

A whistle can be used to good effect to attract attention. However, repeated whistle blasts are often used to indicate imminent danger and the need to evacuate the site. This may preclude the use of a whistle for any other purpose at the scene.

Public announcements

Brief messages passed over a megaphone are an effective means of communication with a group of individuals. A public address system may be used to give information to a crowd when an incident occurs at an organised event. Similarly, the electronic information display boards at sports stadia can have public evacuation procedure notices pre-programmed (remember that spoken messages alone may not communicate with those with hearing impairment).

Television and radio broadcasts

Television increasingly broadcasts real time information from the incident site to the public. This can be useful to offsite commanders and receiving hospitals who gain a better understanding of the scene. In certain circumstances, broadcasters can be used to the advantage of the health and emergency services. An announcement on local radio can warn and inform the general public about the incident and may include information on public health messages and traffic management diversions. This information would be coordinated through the Police.

Video downlink

Police forces throughout the UK have helicopters that can video the scene and surrounding area and send real time images directly to command rooms. This provides vital scene information that would otherwise not be available.

Data transmission

The ability to transmit data messages can enhance communication during a major incident. Short message service (SMS) and multimedia messaging service (MMS) texts, email, and the use of the internet will allow Incident Commanders access to vital information when necessary. Data transmission also reduces the pressure on the traditional verbal communication infrastructure.

Telemedicine

Systems that allow real time remote support for the management of a major incident using an internet link from a remote computer with a modem and telephone have been developed. The use of a satellite telephone could allow remote support from anywhere in the world.

SUMMARY

- Good communications are crucial to the effective management of a major incident.
- Radios are in common use.
- Alternative methods of communication can be utilised as appropriate.
- The use of cellular telephones at the scene is convenient, but may contribute to a reduction in control and coordination.

CHAPTER 14

Assessment

After reading this chapter you should be able to answer the following questions:

- Why is scene assessment important?
- Who carries out the initial scene assessment?
- What should be included in the initial scene assessment?
- What constitutes subsequent scene assessment?

INTRODUCTION

The initial and ongoing assessments of the scene are fundamental to both single service and joint service scene management. The initial assessment needs to provide sufficient information not only to allow the assessor to declare a major incident, but also enough information to ensure that the response is to the right place with the right resources and with minimum risk to the rescuers. Subsequent, continuous scene assessments will inform the response as it evolves and will ensure that decisions are made with the best available facts.

INITIAL ASSESSMENT

As has been noted already, assessment is an integral part of the overall CSCA scene management approach. The initial scene assessment by the health services should be carried out by the attendant of the first ambulance resource on the scene – who will become the initial Ambulance Commander. This means that every attendant must be able to carry out an initial scene assessment.

The quality of the first information that is passed from the scene will be important in determining the speed and adequacy of the subsequent response. The acronym *METHANE* is recommended as a reminder of the key information to be passed.

M	Major incident declaration
E	Exact location
T	Type of incident
H	Hazards
A	Access/egress
N	Number of casualties
E	Emergency services and equipment required

Major incident declaration

The Ambulance Controller (AC) at the scene will quickly come to realise that the number of live casualties is greater than the resources available to treat them – and that a major incident (in health service terms) has occurred. When passing information back to Control, it is important that this fact is communicated clearly at the beginning of the conversation; this will allow the recipient of the information at Control to flag the importance of the message. An early clear declaration also ensures that there is no element of doubt about expected actions.

Exact location

It is essential that the exact location of the incident is sent immediately. This will help additional resources to arrive as quickly as possible. It can be difficult in some circumstances to be sure exactly where an incident has occurred – and a description of street names, junctions, landmarks, and even reference to the crew's vehicle (which should be locatable via the automatic vehicle location system) may help control pinpoint the location precisely.

Type of incident

A general description of the type of incident not only helps control and responders to envisage the scene, but also allows certain predetermined actions to occur. For example a gas explosion in a block of flats will trigger a different immediate response from the Fire Service than a multiple vehicle incident. Similarly the Health Service immediate response to an aircraft accident will be very different to that for a hazardous materials release.

Hazards

There are likely to be numerous hazards at any major incident scene and it is not reasonable to expect that the initial scene assessment will include a comprehensive hazard risk review. However a general description of hazard types – such as 'falling masonry' or 'fire' – can be helpful, and specific information about hazardous materials can reduce the risks to rescuers by allowing provision of appropriate personal protective equipment. It is very likely that the sophistication of the hazard report will increase as the incident progresses, so time should not be wasted initially in trying to cover everything.

Access

Again it is unlikely that there will be time to undertake a full review of routes in and out of a recently occurred major incident. Future responders will benefit from a general description of what can reasonably be found out immediately. For instance the fact that traffic on a motorway is stationary behind an incident may allow control to plan (with the Police) a different approach. Similarly, knowledge about flooded roads or broken bridges can save significant time for later responders.

Number of casualties

Everyone always wants to know the number of casualties involved; this is a key factor in planning the response by the Health Service. It can be one of the most difficult facts to establish early on in the incident as access to the casualties is usually poor, rumours (usually incorrect) are rife, and injuries are hidden. No more than a reasonable estimate is expected as part of an initial assessment – this is best obtained by a rapid, safe scene reconnaissance.

Emergency services and equipment required

Although it is likely that other emergency services will already be attending, it is important to reinforce the need for support from appropriate services via Health Service Control. At this stage any obvious equipment needs (beyond the usual major incident response) should also be highlighted so that early arrangements can be made.

CONTINUED ASSESSMENT

Once the initial assessment has been undertaken and has been communicated to Control (using the METHANE report), the AC should to continue to refine and update the assessment of the scene from a health service perspective. As further resources arrive and it becomes possible to establish a command and control structure, the AC needs to ensure that subordinate commanders are briefed to feed continual updates from their areas of control. In addition the AC should continually liaise with other service commanders to glean health-related information.

The continuous assessment process can be structured around the second part of the initial assessment, as shown below:

H	Hazards
A	Access
N	Number of casualties
E	Equipment and staff required

This can be used by commanders at all levels.

Hazards

Hazard information continues to be very important, both for decision making and also for planning. Subordinate commanders should ensure that the AC is kept up to date with developing hazards in their areas – often this information will be collated by the Ambulance Safety Officer who will also liaise with other emergency service safety officers and will brief the AC accordingly.

Access

The routes into and out of the scene will usually be under the control of the Police. However, the location of any Ambulance and Health Service rendezvous points and the exact circuit to be used by ambulances within the outer cordon are within the control of the Ambulance Parking Point Officer. Changes in arrangements (perhaps dictated by evolving hazards) form part of continuous scene assessment. Forward Commanders may also report special access routes within the incident site.

Number of casualties

While clarity about the number of casualties involved in the incident does develop with time, collating the information can become increasingly difficult as the scene becomes dynamic. It is essential, therefore, that this aspect of scene assessment is actively managed. Regular reports on the number and nature of casualties (usually expressed in terms of their triage priorities) should be sought from all parts of the scene. Forward Commanders and the Casualty Clearing Officer will be expected to maintain a good understanding of the casualty states in their areas and must feed this information regularly to the AC. This will either be on an ad hoc basis as the AC moves around the scene or using a more formal (usually timed) reporting format. Knowing the total number and the remaining number of casualties at a scene is a basic requirement for appropriate scene management, and is also very important in planning the need for hospital resources.

Equipment and staff required

The equipment in an established scene will ideally be managed though an Equipment Officer who will be responsible both for resupply and for identification of extraordinary equipment requirements. Subordinate commanders will need to ensure that their scene assessments

include equipment requirements so that the Equipment Officer can arrange for appropriate provision.

Staff requirements will reflect the number and nature of the casualties at the scene. In some circumstances specialist medical teams will be needed for particular patients, whilst in prolonged incidents the need is not for specialists but rather for enough staff to ensure proper rest and recuperation. The AC will rely on subordinate commanders to pass this information up in their regular scene assessment reports.

RESPONSIBILITY

Scene assessment is the responsibility of all Health Service Commanders – each should continuously assess their area of responsibility using the HANE format. The information gained should be used both to manage the immediate area and also should be passed up the chain of command to better inform the overall picture.

SUMMARY

- Scene assessment is essential for both the initiation and evolution of the response to the incident.
- The METHANE message gives a structure for initial scene assessment.
- Subsequent assessment can be structured as HANE.
- This assessment can and should be used continuously by commanders at all levels.



PART V

Medical support

CHAPTER 15

Triage

After reading this chapter you should be able to answer the following questions:

- What is triage?
- When is triage carried out?
- Where is triage carried out?
- What priorities should be used?
- How are priorities assigned?
- What casualty labels should be applied?

HISTORY

Triage, meaning to sieve or to sort, is the first step in providing medical support at major incidents (Box 11.1).

Box 11.1: The hierarchy of medical support

- Triage
- Treatment
- Transport

Triage was first described in modern times by Baron Dominique Jean Larrey who was Napoleon's Surgeon Marshal. He introduced a system of sorting the casualties that presented to field dressing stations. His aims were military rather than medical and the highest priority was given to soldiers who had minor wounds and who could therefore be returned quickly to the battle with minimum treatment. There is no English language record of the use of triage until the First World War. The official history of the United States Army in this conflict uses the word 'triage' when describing the physical area where sorting was done, rather than a description of the sorting itself. Triage has developed since then to be the cornerstone of military medicine. In more recent times, it has become a daily management tool within civilian emergency departments.

AIMS

The aim of triage, wherever it is done, is not only to deliver the right patient to the right place at the right time but also to 'do the most for the most'. It can be deduced from this that triage

principles should be applied whenever the needs of the casualties exceeds the capacity of the skilled help immediately available.

Key point

Triage principles should be used whenever the needs of the casualties exceed the capacity of the skilled rescuers available.

Thus triage should take place during the management of emergencies ranging from road traffic accidents (where there might be four or five casualties and only one or two paramedics in attendance) to major incidents where, despite large numbers of medical, nursing and paramedical staff, the number of casualties is so large that decisions about the order of their care need to be taken to ensure the best overall outcome.

TIMING

Triage is a dynamic rather than a static process. The state of the patient may change for the better or worse either because of a progression of the injuries or due to interventions that are made.

Key point

Triage is a dynamic (continuous) process.

Triage must therefore be repeated many times during the care of a casualty. For example, a typical casualty might be triaged when first seen, prior to movement from the immediate scene; in the Casualty Clearing Station, prior to evacuation; on reception in hospital; during resuscitation and treatment; and prior to surgery. In addition to these occasions (that correspond to events external to the patient), a reassessment of priority will be necessary whenever the patient's condition is noted to have changed.

SITE

The first triage decision (*primary triage*) is likely to be made at the place where the casualty is found. Subsequent decisions at the scene (*secondary triage*) are taken at the Casualty Clearing Station. A schematic triage and evacuation map is shown in Figure 15.1. In this scheme it is envisaged that triage at the site will be carried out predominantly by ambulance personnel, while triage in the Casualty Clearing Station will be carried out by any trained medical personnel available. Some patients, particularly the minor injured, may be taken in the short term to a 'place of safety' where they should be assessed to confirm that they do not need further health service input. When appropriate transport is available, they may be taken to a Survivor Reception Centre (if uninjured) or to a hospital P3 area for treatment.

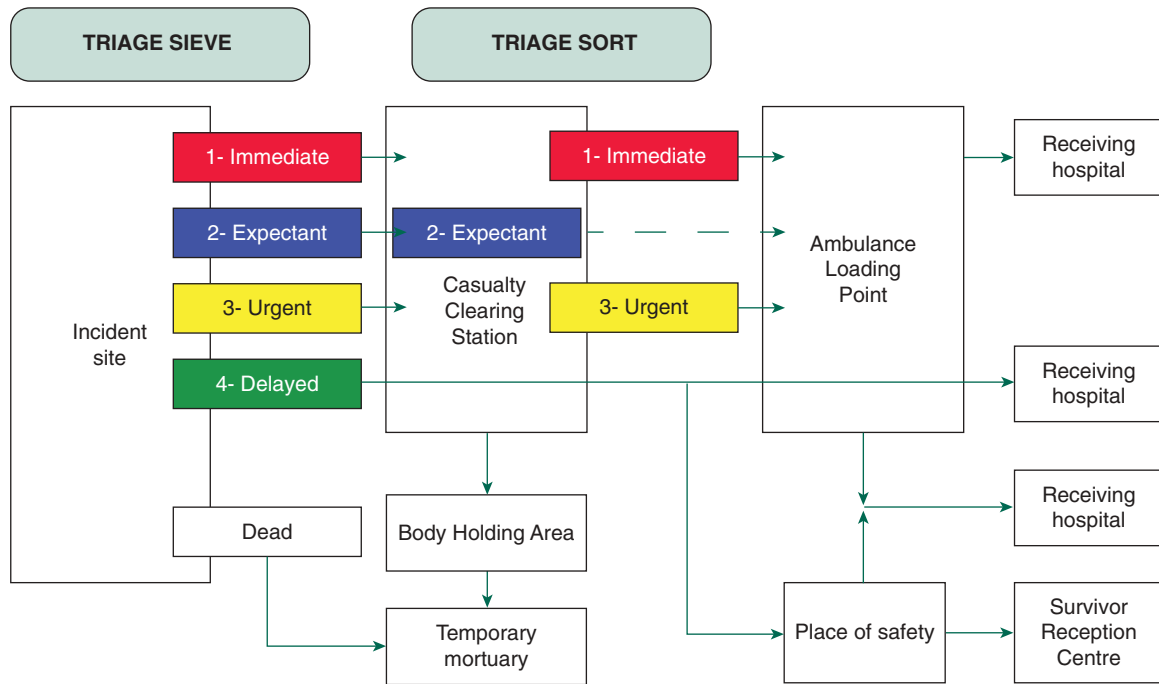


Figure 15.1: Triage and evacuation map

PRIORITIES

There are four priority systems that are widely used. Two of these are derived from the military, although they are also incorporated into civilian triage labels: they are the ‘P’ (priority) and the ‘T’ (treatment) system. Civilian systems are descriptive and colour coded. All these are summarised in Table 15.1.

Table 15.1: Triage priorities

P	T	Description	Colour
1	1	Immediate	Red
2	2	Urgent	Yellow
3	3	Delayed	Green
1 Hold	4	Expectant	Blue (not standard)
Dead	Dead	Dead	White or black

For the purposes of this text the T system will be used. The four priority groups are defined as shown below.

Local highlights: Triage priority

- *T1, immediate priority*: casualties who require immediate life-saving procedures.
- *T2, urgent priority*: casualties who require surgical or medical intervention within 2–4 hours.
- *T3, delayed priority*: less serious cases whose treatment can safely be delayed beyond 4 hours.
- *T4, expectant priority*: casualties whose condition is so severe that they cannot survive despite the best available care and whose treatment would divert medical resources from salvageable patients who may then be compromised.

In a civilian setting the expectant priority will very rarely be activated and only if the incident is ‘uncompensated’ at some point. This is more likely in a natural incident rather than a man-made incident. However, in a military operational setting it is easier to envisage where the tactical situation prevents adequate medical resources being deployed to the scene. The decision to invoke the expectant category will rest jointly with the Health Service Commanders at the scene and may be revoked if adequate resources become available. At this time, any surviving ‘expectant’ patients will become ‘T1, immediate’. The avoidance of the use of this category is probably a mistake, since failure to use it correctly will on balance cost lives rather than save them.

Key point

Avoiding the use of the expectant category may cost lives.

Local highlights: Rules for invoking the expectant category

It is essential that all the health care providers attending a major incident use the same priority system and the same method for categorising patients into these groups. Historically, different organisations have used different priority systems and methods. The confusion that this has caused at the scene and the receiving hospitals is avoidable.

It is recognised that some of the available triage labels do not include an independent expectant category. In these circumstances the delayed category can be used, endorsed with ‘expectant’. Clearly these patients must be separated from those with genuine minor injuries.

TRIAGE METHODS

Having established the triage categories, it is necessary to provide a reliable method of triage so that all users will come to the same triage decision. There may be considerable numbers of casualties and a corresponding number of critical decisions have to be made very quickly. The ‘first look’ or primary triage (that carried out by the first rescuers on the scene as a quick assessment of the casualties) therefore needs to be rapid, simple, safe, and reproducible.

Key point

Initial triage decisions need to be made quickly, safely, and reproducibly.

Once primary triage has been carried out, more time and resources may be available at the Casualty Clearing Station for a more detailed 'secondary triage' assessment.

The simple methods to support these two levels of triage will be referred to as the '*triage sieve*' and the '*triage sort*', respectively. However, in a situation where there are overwhelming numbers of casualties there may never be enough resources for the detailed assessment to take place: in this case the triage sieve will be used for repeated assessments.

Physiological versus anatomical methods

Traditional triage involved 'eye balling' the patient and making a decision based on what injuries could be seen coupled with gut instinct. Such anatomical triage has considerable limitations (Box 15.2). Physiological triage relies on detecting changes in vital signs as a result of injury or illness: these systems are more objective, can be performed rapidly without the need to widely expose the patient, and require very little training or clinical experience. Both the triage sieve and the triage sort are physiological methods and can be applied safely in a major incident without modification. Where there is an experienced operator, knowledge of the clinical condition (that is based on any obvious anatomical injury) may be used to upgrade a triage category.

Box 15.2: Limitations of anatomical triage

- Patients have to be undressed to see injuries: this is time consuming and impractical
- Decisions are not reproducible between observers with different experience
- Life-threatening injuries may not be detected by examination alone (for example, less than 50% of cases of acute haemoperitoneum are detected by abdominal physical examination alone)

Triage sieve

This first look triage quickly sorts the casualties into priorities. As it is quick it is not perfect, but any misclassification made at this stage can be corrected later on.

Mobility

Casualties that can still walk are categorised *T3, delayed*. This is the mobility sieve.

Key point

Walking patients are initially categorised as *T3, delayed* priority.

It is true that it is possible to walk with a knife sticking out of your back or with 50% burns. Eventually, however, such patients will collapse and because triage is dynamic they will be reassessed and their priority will be changed. Remember, the triage sieve is only a snapshot of the patient's condition and not a predictor of what might develop later. Where triage categories are upgraded because of a concern about potential deterioration there will be a disproportionate number of T1 and T2 patients to manage and this can overwhelm limited health care resources. This is why triage must be dynamic.

ABC

Those patients who are not walking are assessed according to airway, breathing, and circulatory (ABC) parameters. A 'quick look' will assess if a patient is not breathing. If this is the case the airway is opened with a simple manual manoeuvre (head tilt and chin lift or jaw thrust if cervical trauma is suspected) and the patient reassessed to see if breathing has started. Patients who do not breathe despite airway opening are dead.

Key point

Patients who cannot breathe despite simple airway manoeuvres are dead.

If breathing starts when the airway is opened there is an airway problem: the airway is important and these patients are *T1, immediate*. It is clear that an intervention is needed in these patients as they may stop breathing when the airway manoeuvre is released. A bystander can be used to maintain the airway position, a simple airway adjunct can be inserted, or the patient quickly turned into the recovery position. It is appropriate for anyone undertaking primary triage to carry both simple airway adjuncts and dressings for patients who are bleeding. Unfortunately, in a major incident situation, if simple manoeuvres do not work, the primary triage process takes precedence over the treatment of a single casualty.

For those patients who are breathing, respiratory rate is used as an objective assessment of adequacy. If the rate is unusually low (less than or equal to 9 breaths/minute) or unusually high (greater than or equal to 30) then there is a breathing problem: breathing is important and these patients are *T1, immediate*.

Key point

Casualties with respiratory rates of 30 or above, or 9 or below, breaths per minute are *T1, immediate* priority.

If the rate is normal (between 10 and 29 breaths/minute) an assessment of the 'circulation' is made, although this can be difficult in the pre-hospital environment. The pulse rate is checked and those patients with a rate of 120 or more per minute will be *T1, immediate*.

Key point

Casualties with a pulse rate of 120 or more beats per minute are *T1, immediate* priority.

There are occasions when the taking of a pulse rate can be difficult due to it being particularly weak and difficult to palpate. If this is the case then a capillary refill time is assessed in the nail bed. If it is over 2 seconds the patient has a circulation problem: circulation is important and the patient is *T1, immediate*. Again, practicality dictates that external exsanguinating haemorrhage should be stopped at this stage: a patient may be able to press on his own wound, or a bystander can be directed to assist.

If the pulse is 119 or less or (if used) capillary refill is 2 seconds or less then the patient is assigned to the *T2, urgent* priority.

Key point

Casualties with a capillary refill time of more than 2 seconds are *T1, immediate* priority.

While capillary refill time can be used for the circulatory assessment, it is affected by ambient temperature and will be significantly reduced in normal subjects in cold conditions. It is reasonable to assume that the normal capillary refill time for a casualty is the same as that for a rescuer when in the same conditions. The triage sieve is illustrated in Figure 15.2.

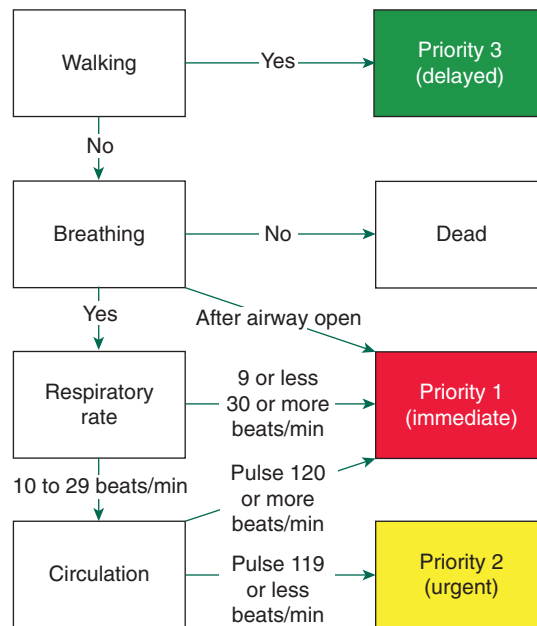


Figure 15.2: The triage sieve

The physiological parameters for the triage sieve are based on adult ranges. Should these be applied to small children there will be an artificially high triage priority assigned. Some think this is desirable as children should be removed from the incident site as quickly as possible. However, paediatric assessment and treatment resources are generally limited and if these are overstretched further at the hospital level because of over-triage there may be insufficient capacity to deal with the genuine high priority cases. For this reason a special method of triaging children might be beneficial.

The paediatric triage tape uses the concept that between the ages of 1 and 10 years length is directly proportional to age, weight, and vital signs: from this, a series of modified triage sieve algorithms have been produced using the best available guidelines for normal ranges of vital signs. These algorithms are arranged in boxes on a linear waterproof tape that is laid next to the child. The appropriate algorithm is the one next to the child's heel, as illustrated in Figure 15.3. The adult triage sieve is changed in a number of ways. First, very small children cannot walk and the mobility sieve is altered accordingly. Second, the value of capillary refill is also questionable and it is only used to screen out abnormalities: in other words, if it is normal the child is *T2, urgent* but an abnormal value still requires a pulse to be taken. Finally, the importance of bradycardia in critical hypovolaemia is recognised and lower limits of pulse rate are given. If the child is trapped a *T1, immediate* priority is assigned until the child is released when objective re-triage can be performed. The triage sieve does not support the allocation of *T4* (expectant) in either adults or children as it is too quick an assessment to do this accurately.

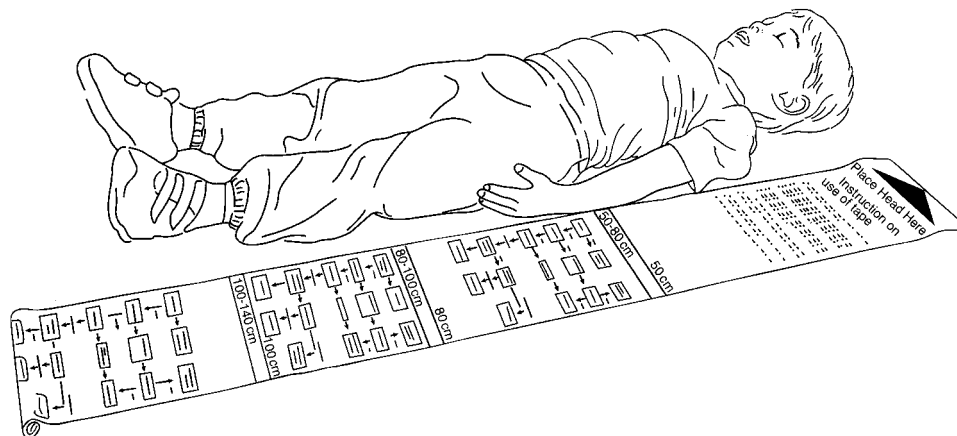


Figure 15.3: Paediatric triage tape

Triage sort

Once patients arrive in the Casualty Clearing Station they can be re-triaged in a more controlled manner, providing that there are resources available to allow this. This process is termed the triage sort.

Many physiological scoring systems have been described and the best known of these is the trauma score. This is a physiological measure of the severity of injury based on five simple parameters: respiratory rate, respiratory effort, systolic blood pressure, capillary refill, and Glasgow Coma Scale.

In the pre-hospital setting the Triage Revised Trauma Score (TRTS) has been advocated as the best system currently available. This is based on just three parameters: respiratory rate, systolic blood pressure, and Glasgow Coma Scale. These parameters are coded as shown in Table 15.2 to give a score from 0 to 12.

Table 15.2: Triage Revised Trauma Score system

Physiological variable	Measured value	Score
Respiratory rate (breaths/min)	10–29	4
	>29	3
	6–9	2
	1–5	1
Systolic blood pressure (mmHg)	0	0
	≥90	4
	76–89	3
	50–75	2
Glasgow Coma Scale	1–49	1
	0	0
	13–15	4
	9–12	3
	6–8	2
	4–5	1
	3	0

The TRTS can be used to assign triage priorities as shown in Table 15.3.

Table 15.3: Triage Revised Trauma Score and priority

Priority	TRTS score
T1	1–10
T2	11
T3	12
Dead	0

If the fourth (expectant) category is in use then a TRTS of 1–3 can be used to define it.

Work carried out for the US Navy has shown that non-expert staff can reliably trauma score casualties after a very short period of training. The use of such a system is therefore feasible. Furthermore, many modern casualty labels (see below) incorporate trauma scoring as part of the patient report.

The advantages of the physiological methods are that they are quick and reproducible. However, they do not take into account the nature of the injury at all and therefore cannot be used to decide whether a patient should be dispatched to a specialist or a general facility.

By mixing together the best parts of the anatomical and physiological methods discussed above, something close to the ideal can be achieved. The rapidity and simplicity of a physiological method such as the TRTS are used to define the initial priority. This is supplemented by as much relevant anatomical information as can be obtained in the time and conditions. Thus patients with head injury can be selected for neurosurgical centres and patients with burn injury can be sent to regional burns centres. If evacuation is delayed, the anatomical information can be expanded up to the level of a full secondary survey as time allows.

The recommended method of assigning priorities is that the first look triage assessment is carried out at the site of injury using the triage sieve. This is followed (usually in the Casualty Clearing Station) by a mixed approach to triage sorting consisting of a physiological score (such as the TRTS) to assign priority supplemented by relevant anatomical information to determine destination.

Key point

Physiological methods of triage should be used first. These can be supplemented by as much anatomical information as time and conditions allow.

TRIAGE LABELLING

There is little point in triaging casualties into priorities if other rescuers are not made aware of the results of the assessment. Some form of labelling is necessary.

To be maximally effective a triage label should be highly visible, should use the standard categories (numbers, words, and colours) discussed above, and should be easily and firmly secured to the patient. The label must also allow the patient's priority to be altered as their condition changes.

Key point

Triage labels must be highly visible, easily and securely attached, and allow for priorities to be changed.

It is helpful if triage labels themselves can be used for making other clinical notes in the field. In general, the primary colours are preferred since these show up better under difficult ambient lighting conditions. The labelling of the dead is important; the dead label can either be part of the standard triage label or may be a special card designed for this purpose (Appendix D).

Types of label

In broad terms, two types of triage label exist: single and folding.

Single card

When using single cards, a label marked with the appropriate priority is attached to the patient; labels generally consist of a piece of coloured card with printed headings and space for patient information. The single label system is illustrated in Figure 15.4. Since a single coloured card is attached to the patient, changing between categories is relatively difficult as the first card must be removed prior to the new card being attached. This is doubly disadvantageous if notes about the patient have been made on the first card since either this card must be left in place or the notes that have been made on it must be transferred to the new card. If the first card is left then confusion can arise about the current category of the patient.

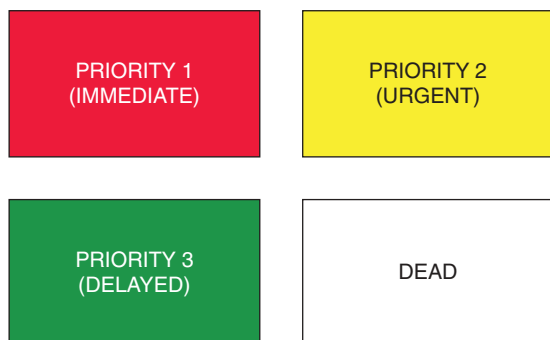


Figure 15.4: Single label system

In general, single label cards are a poor tool if dynamic triage is to be carried out.

Key point

Single card triage labelling systems are not ideal for dynamic triage.

A variation on the single label card is the *Mettag* label. This consists of a label that has a number of colour-coded perforated strips on its bottom edge; each strip accords to a different triage category. The strips that do not apply to the patient are removed by the rescuer performing triage and the lowest strip remaining therefore corresponds to the patient's priority. This card has two disadvantages. First, if the patient gets better then it is necessary either to replace the card or to stick the strips that have been torn off back on (i.e. the patient can only deteriorate dynamically). Second, the strip on the card designating the priority is not large and is therefore not visible from a distance. This makes it difficult for a triage officer or another rescuer to look around and assess the number of patients in a particular category in a particular area.

Folding card

The second general approach is the use of a folding card. One of these, the cruciform card, is shaped like a cross. When all the corners of the cross are folded into the middle, the card becomes rectangular. This is illustrated in Figure 15.5.

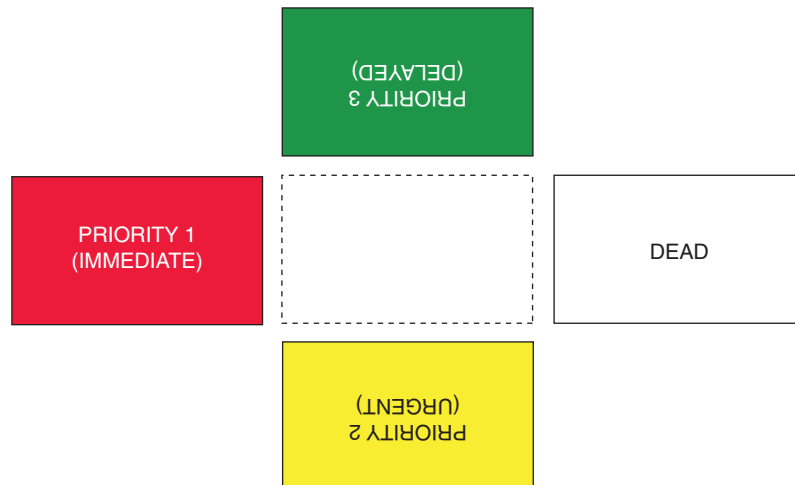


Figure 15.5: Cruciform label system

The cards are folded in such a way that only the desired one of the four priorities is left on the outside; if the priority is changed then it is a simple matter to refold the card and show the new priority on the outside. This system overcomes the problem of additional data since the same card can be used however many times the priority is changed.

Other potential dynamic solutions include card sets and laminated folding card strips.

Key point

Folding triage labels can be used from the time of first triage on the scene to final triage in the receiving hospital.

These cards are extremely useful for dynamic triage but, of course, can be abused by the casualties themselves who may refold them to give themselves a higher priority.

Although triage labelling is essential, it is not always necessary to use the complex triage cards discussed above. Coloured pegs corresponding to the triage category are quite adequate during the first look triage (triage sieve) and are easily carried on the belt of a rescuer's clothing. The 'slap on wristband', colour coded in the same way, allows the person triaging to quickly identify each category by attaching an appropriate coloured band to a wrist rather than having to fold a label to the correct status.

Key point

Simple alternatives such as the use of coloured pegs or wristbands are acceptable during the triage sieve.

Local highlights: Triage labels in use

PERSONNEL

Triage is an essential but difficult task. It should always be carried out by trained staff. Over the course of an incident, the person triaging may change from an ambulance paramedic to a senior clinician. Whoever does it, the principles are the same.

SUMMARY

- Triage is the first step in the hierarchy of medical support at a major incident.
- It is a dynamic process, starting with a triage sieve at the site where casualties are found, moving via a physiological and anatomical triage sorting process in the Casualty Clearing Station (triage sort) and continuing on arrival at the receiving hospital through to the point of definitive care.
- Folding labels are the best labels available for dynamic triage.

CHAPTER 16

Treatment

After reading this chapter you should be able to answer the following questions:

- Who should carry out treatment at the scene?
- Where is treatment carried out at the scene?
- What treatments are carried out at the scene?
- How much treatment is carried out at the scene?

INTRODUCTION

The treatment phase is the second step in medical support at the scene. During a major incident, a large number of people will become involved in the treatment of the injured and ill. Their experience will range from the concerned bystander to specialist clinicians. Treatment at the scene is mainly concerned with the stabilisation of casualties to enable them to get to hospital to have definitive treatment. Triage of the patients prior to treatment enables identification of those patients who need immediate interventions. This highly structured approach by the Health Service team ensures 'doing the most for the most'.

WHO CARRIES OUT TREATMENT AT THE SCENE?

Civilians/bystanders

Very basic forms of treatment may be started in the initial stages of the incident by survivors involved in the incident (who may be injured themselves) and by bystanders who were close to the incident when it occurred. Some of those providing this immediate treatment may be trained in basic first aid. This first aid may be life saving but is unlikely to be able to deal with large numbers of casualties.

Key point

Initial first aid may be provided by other survivors and bystanders.

First aiders

It is only when the emergency services begin to arrive that large numbers of people trained in first aid are likely to be found at the scene. All Police and Fire Service personnel receive instruction in life-saving first aid; furthermore, some emergency services carry advanced life support equipment (a variable amount) and have personnel trained to use it. Once their initial responsibilities have been discharged, all emergency services may become involved in early treatment. Aid volunteers may also attend and can be used to provide first aid.

Key point

Once their initial tasks have been accomplished other emergency services can assist in basic first aid.

Ambulance Service

The Ambulance Service has overall responsibility for providing treatment at all incidents outside the hospital. The skills within this service range from life-saving first aid to advanced life support. Allocation of tasks should reflect skill level.

Medical staff

Medical staff at the scene will come from different backgrounds. Their primary role is to complement the Ambulance Service and provide more advanced treatments. Some medical staff will be adept at working in the pre-hospital environment, while others will have little practical experience. Occasionally, mobile surgical teams will need to come onto the scene of the incident, although their presence should be for specific treatments on specific patients. Nursing staff may also be present and can be utilised for triage, first aid, and as part of the resuscitation teams within the Casualty Clearing Station.

HIERARCHY OF MEDICAL SUPPORT

It is absolutely essential that those managing the Health Service response remember the hierarchy of medical support (Box 16.1). In order to achieve the best overall outcome for the casualties, triage must precede both treatment and transport. Once triage has been carried out, then the limited advanced treatment capability can be directed to those casualties who have the greatest need. Rescuers with a lower skill level can be used to look after casualties with less immediate problems.

Box 16.1 Hierarchy of medical support

- Triage
- Treatment
- Transport

TREATMENT**Where is treatment carried out?**

In the initial stages, before the medical response becomes structured, the vast majority of first aid measures will be provided at the site of the incident by bystanders. These first aid measures will be carried out within the first few minutes after the incident has occurred.

Once the emergency services arrive, a command and control structure will be put in place and the focus will be on treatment in a Casualty Clearing Station (Figure 16.1). This is a more suitable environment for advanced procedures to take place. Casualties presenting with minor injuries will often not be taken to the Casualty Clearing Station, but will be moved to a 'place of safety' in the first instance. Here they will receive any necessary first aid and will undergo secondary triage to ensure appropriate casualties are taken to a Survivor Reception Centre, while those with any further needs are taken to hospital.

In certain circumstances, treatment will take place at the site. Casualties who are entrapped may need advanced measures and these will need to be provided *in situ*.

How much treatment is carried out?

The aim of treatment at the scene of an incident is to ensure that casualties are well enough to undertake the journey to a facility where they can be fully assessed and treated.

The amount of treatment needed before transport often reflects the triage category. Thus a walking patient who has been categorised *T3, delayed* will be moved to a hospital without receiving any significant treatment at all. On the other hand, a casualty with a compromised airway who has been categorised *T1, immediate* may require considerable input at the scene in order to make transportation as safe as possible.

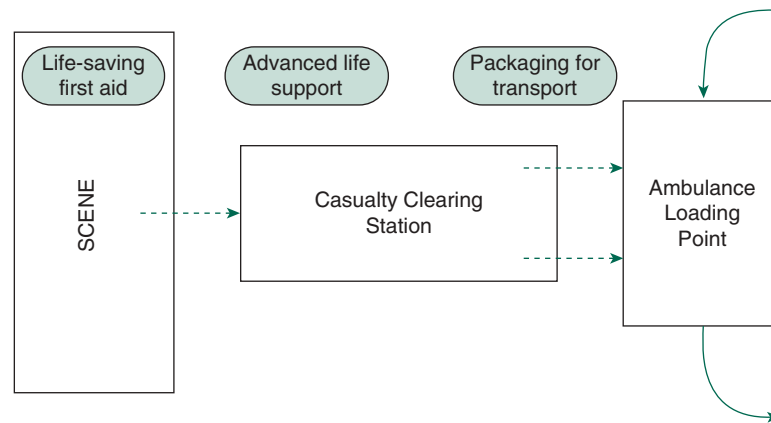


Figure 16.1: Treatment at the scene

What treatment is carried out?

Virtually any treatment can be provided in the pre-hospital setting. This, however, does not mean that all treatments should be provided at the scene. The aim of treatment remains the safe transportation of the casualty to hospital; thus the amount of treatment should be limited to that which ensures that this is possible.

Key point

The aim of treatment at the scene is to allow the casualty to reach hospital safely.

Overall, medical management will be optimal if treatment is kept at this level. If too little is done, patients will die unnecessarily on the way to hospital. If too much is done, then time that could have been spent with other patients will have been wasted. Treatments at the scene are therefore likely to be limited to those concerned with problems of the airway, breathing, and circulation. Other treatment measures may be necessary (up to and including amputation for extrication), although this will be very rare.

An important component in treatment is the packaging of the patient for safe transport to hospital. Measures to prevent exacerbation of spinal injuries are an integral part of packaging for transport. For this reason, the loading point is situated directly outside, or as near as possible to, the Casualty Clearing Station.

Key point

Most treatment at a major incident will be directed towards airway, breathing, and circulation.

The treatment that health service staff provide should remain within the limits of their competence. Health personnel will work much better doing a job similar to their day-to-day practice. Competence should be considered on an individual basis where possible.

Key point

Health service personnel at the scene should not operate outside their skill level.

An overview of basic and advanced treatments likely to be used at the scene is given in Table 16.1.

Table 16.1: Basic and advanced treatments at the scene

	Basic treatments	Advanced treatments
Airway	Airway opening: chin lift jaw thrust	Oropharyngeal airway Nasopharyngeal airway Oral tracheal intubation Surgical airway: needle cricothyroidotomy surgical cricothyroidotomy
Spinal control	Manual cervical stabilisation	Logrolling Cervical collar application Spinal board application Rapid extrication
Breathing	Mouth-to-mouth ventilation Mouth-to-nose ventilation	Mouth-to-mask ventilation Bag–valve–mask ventilation Needle thoracocentesis Chest drain placement
Circulation	Control of external haemorrhage	Infusion set up Peripheral venous access: extremity veins external jugular veins venous cutdown Central venous access: femoral vein internal jugular vein Intraosseous access Defibrillation

It is essential that the ambulance, paramedical, nursing, and medical personnel who are sent to the scene of a major incident are appropriately competent. It is totally unacceptable for health staff attending a major incident response to be either untrained or poorly skilled. Table 16.2 summarises the areas in which responding staff should have competence.

Table 16.2: Areas of essential competence for responders

Responder	Competence required
Ambulance officer	Incident management
Ambulance paramedic	Primary triage, trauma care, life support
Doctor	Secondary triage, advanced trauma care, advanced life support, minor injury assessment
Nurse	Primary triage, advanced trauma nursing care, life support, minor injury assessment

Local highlights: Expected qualifications of responders

CLINICAL RESPONSIBILITY

The issue of where clinical responsibility rests is difficult to resolve. It is clearly the responsibility of the Ambulance Commander to ensure that there are enough ambulance personnel at the scene supported by enough equipment to perform their role to best practice standards. Equally the Medical Commander has a responsibility to identify the right number and skill mix of clinical personnel needed to support the Ambulance Service. If this has been achieved, then individual clinicians must take responsibility for their own actions.

SUMMARY

- The first treatment delivered is likely to be basic first aid from unskilled people.
- Emergency service personnel are all trained in life-saving first aid.
- The Ambulance Service has responsibility for treatment at the scene.
- Attention to airway, breathing, and circulation is most often all that is required at the scene.
- All health staff attending major incidents should have current competency at the appropriate skill level.

CHAPTER 17

Transport

After reading this chapter you should be able to answer the following questions:

- How are the Casualty Clearing Station and other areas set up to facilitate evacuation and transportation?
- What decisions about transportation need to be made?
- What methods of transportation are available?

INTRODUCTION

Transportation is the third step in medical support at a major incident (Box 17.1). Both triage and treatment decisions will have an effect on transportation. To a large degree, the order of evacuation, the destination, and the mode of transportation will be dictated by early command decisions made jointly between the Ambulance and Medical Commanders. The senior clinician of the treating team and the Casualty Clearing Station Officer will also be involved in the decision-making process.

Box 17.1: The hierarchy of medical support

- Triage
- Treatment
- Transport

As discussed in Chapter 2, one of the primary tasks of the Health Service command and control structure is to ensure that the movement of patients is as efficient as possible. To achieve this, close attention needs to be paid to the organisation of transportation both at the scene and beyond. The structure of the treatment and evacuation areas is crucial, as are decisions regarding evacuation methods. Furthermore, the officers responsible for transportation need to have the ability to be flexible about methods of transport and the order of evacuation, if the best use is to be made of resources available.

ORGANISATION

Casualties requiring evacuation from the scene will not necessarily arrive at the Casualty Clearing Station in priority order. This may change the form of transport required at various times throughout the incident.

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Chain of transport

Once a major incident has been declared, ambulance resources will be deployed to the scene from a variety of locations. It is imperative that a preferred access route is established early, which is both safe and also delivers resources to a single point. This will expedite the arrival of resources for the initial Ambulance Commander. Once emergency service commanders are on-scene and the Joint Services Emergency Control is established, access and egress routes through the outer cordon will be agreed. The 'ambulance circuit' will then be used by all ambulance resources as they arrive at the agreed parking point and leave the loading point en route to receiving hospitals.

Once in position, the Ambulance Parking Point Officer will hold vehicles at the parking point and will dispatch them as required. A range of vehicles may be available and they will be matched to patient needs.

Once called forward, vehicles will proceed to the Ambulance Loading Point (which should be as close to the Casualty Clearing Station as possible) and will load their assigned casualties. The Ambulance Loading Point Officer will inform the crew of the patient's condition, ongoing treatment requirements en route, and destination. Once released from the loading point, ambulances will proceed around the circuit to an exit point at the outer cordon, then to their destination. This system ensures that both the number and nature of vehicles at the loading point is optimised.

A schematic representation of the ambulance circuit is shown in Figure 17.1.

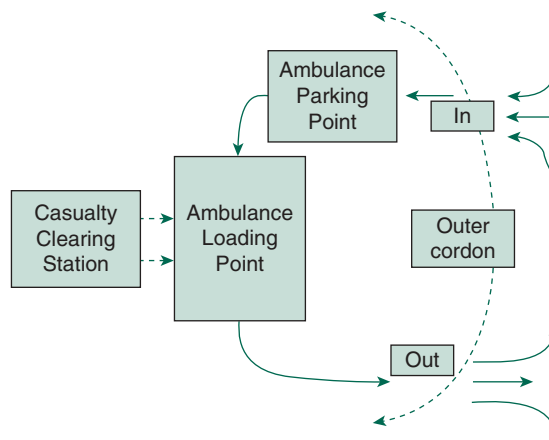


Figure 17.1: Ambulance circuit

Casualty flow

Priority 3 casualties have initially been triaged as such because they are walking. This group of casualties do not as a matter of course go to the Casualty Clearing Station but are directed in the short term to a place of safety prior to the establishment of a Survivor Reception Centre. The Ambulance Commander must, however, ensure that an appropriate medical resource is assigned to this location to carry out secondary triage (triage sort). This is to reassess the patients and to ensure that there is an available clinical resource if any priority 3 patient's condition deteriorates. The schemes detailed below show possible casualty flows from incident site through to receiving hospital (Figures 17.2 and 17.3).

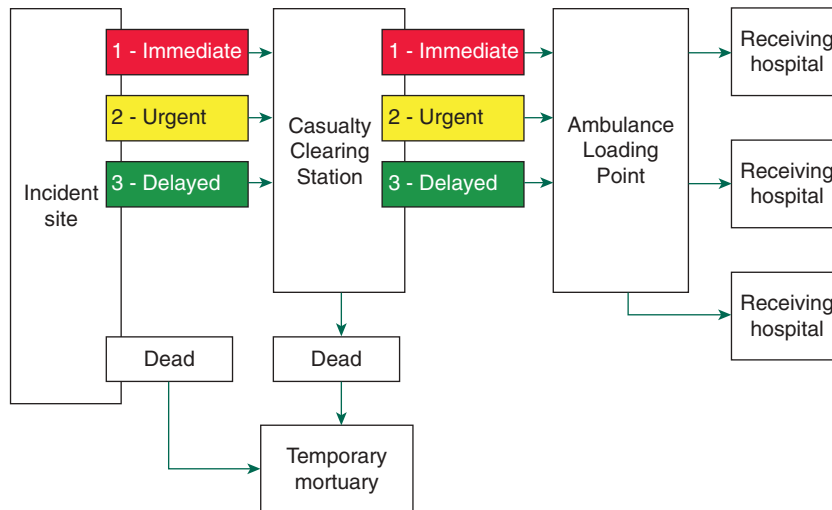


Figure 17.2: Evacuation scheme 1

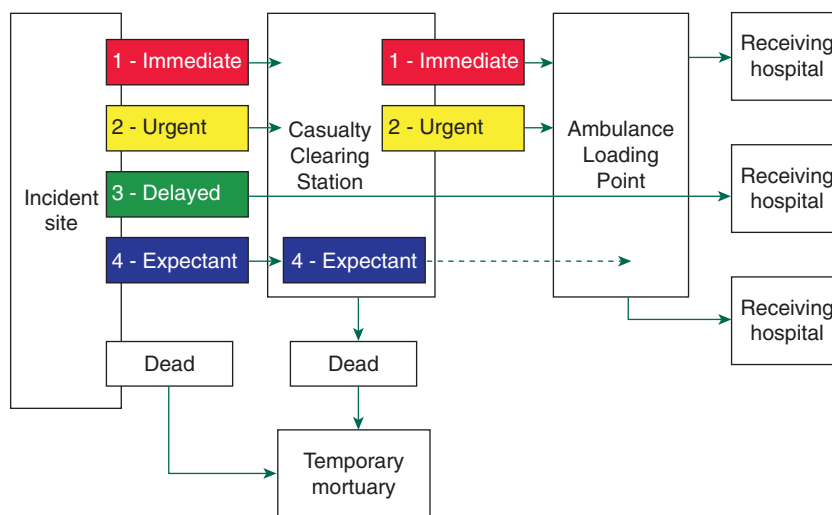


Figure 17.3: Evacuation scheme 2

In the first scheme (Figure 17.2), patients who are priority 1 (immediate) and priority 2 (urgent) are moved to the Casualty Clearing Station and from there to the loading point.

If the expectant category is in use then regular re-triage must take place to confirm their priority status. Priority 4 patients should be evacuated after all priority 1 patients have been dealt with (Figure 17.3). The level of care required for this group may be beyond that available at certain points in the incident.

EVACUATION DECISIONS

There are three key decisions to be made before a particular patient is moved from the scene. The first concerns priority for evacuation, the second treatment and packaging for evacuation, and the third is destination.

Priority for evacuation

Generally, the priority for evacuation will be exactly the same as priority after treatment. The triage sieve and triage sort techniques described in Chapter 15 can be used to determine priorities in the Casualty Clearing Station. Casualty Clearing Officers may have to use additional

criteria such as the availability of suitable transport and the capacity of vehicles leaving for particular destinations to decide the order of evacuation.

Key point

Although triage category in the evacuation area is reached using standard triage principles, other criteria will have to be taken into account when deciding the exact order that patients leave the scene.

Treatment and packaging

The correct amount of treatment is that necessary to ensure safe transportation of a casualty to hospital, or, if stabilisation is not possible, the amount which will give the casualty the best chance of surviving to reach hospital.

Key point

Treatment and packaging should be limited to that necessary to allow safe transport.

Destination

It is the responsibility of the Health Service Commanders to decide which hospitals are to be used as receiving hospitals. The Medical Commander must establish how many patients of each triage category can be accepted by each hospital. This should be reviewed on a regular basis as the incident continues.

In larger urban areas, where there is a choice of destinations, it is better to select patients for direct transfer to specialist facilities at the scene of the incident. The Medical Commander may contribute to decisions about which patients are suitable for direct transfer to specialist units, e.g. a patient who has a significant head injury can be directed to a neurosurgical centre, and patients with severe burns may be sent to regional burns units.

Key point

Casualties requiring specialist centres should be transported to them directly from the scene: RIGHT PATIENT, RIGHT PLACE, RIGHT TIME – FIRST TIME.

METHODS OF TRANSPORTATION

Emergency ambulances

The usual method of transportation in everyday practice is an emergency ambulance. Such vehicles are specifically designed to enable safe transport of the seriously ill and injured, and have many facilities for the provision of advanced life support en route. In a major incident, when normal health service responses are overwhelmed, there may not be enough of these vehicles, and other methods of transportation need to be considered.

Other land vehicles

Three key elements must be considered by the Ambulance Commander when transportation needs and possibilities are being assessed (Box 17.2). First, what capacity is needed, and what capacity does each potential vehicle have? Second, what is the availability of each of the potential vehicles? Finally, how suitable are the various potential vehicles for the task in hand? This latter decision needs to be based on an assessment of the speed, safety, reliability, and levels of equipment. A standard emergency ambulance, for example, will be unsuitable for rough terrain

when access roads are limited (unless it is four-wheel drive), and specialist vehicles may have to be used, or a helicopter considered. It is likely that a number of vehicles such as police personnel carriers will be available for the transport of priority 3 patients. More seriously ill or injured patients who need to be transported on stretchers are more difficult to transport in non-specialist vehicles. Patient transport ambulances fitted for stretchers may be suitable for priority 2 (urgent) patients.

Box 17.2: Criteria for selecting transportation for patients

- Capacity
- Availability
- Suitability

Helicopters

Helicopters are often available, but the number that are specifically designed for patient transport is limited. Other aircraft, such as those that can be provided by the Armed Forces, are rarely routinely fitted for stretcher carrying, and vary in both capacity and suitability. Helicopters are most suitable when rapid transfer to a specialist centre is required, the road infrastructure is disrupted, or the terrain is unsuitable for ambulances.

In other circumstances the disadvantages may outweigh the advantages. In particular, the lack of a primary helicopter landing site at the hospital may mean that a secondary ambulance transfer from a distant landing site (such as a school playing field) will be necessary.

Key point

Helicopters are most suitable when rapid transfer over a distance to a specialist centre is required.

Other possibilities

In particular circumstances the use of other types of transport, such as boat or train, may be considered. For instance, many major airports are extremely well connected to the rail network. If the area is isolated from the main receiving hospitals or if local hospitals are likely to be unable to cope with the numbers of casualties, then it may be advantageous to move some casualties en masse by rail and re-triage them on arrival at a station close to other hospitals.

SUMMARY

- Transportation is the third step in medical support at major incidents.
- Effective organisation of both the ambulance circuit and the flow of patients is vital if evacuation is to proceed smoothly.
- The order of patient evacuation depends on both triage category and other factors.
- Emergency ambulances form the mainstay of transport capacity.
- Other vehicles may need to be used when the circumstances are appropriate.
- Helicopters may play a part and can be invaluable in particular circumstances.



PART VI

Special incidents

CHAPTER 18

Hazardous materials and CBRN incidents

After reading this chapter you should be able to answer the following questions:

- What actions are required at hazardous materials incidents by responding agencies?
- What is the command structure at an incident involving hazardous materials?
- What are the zones and cordons at hazardous material incidents?

INTRODUCTION

Plans that deal with the consequences of incidents involving hazardous materials (HazMat) and chemical, biological, radiological, and nuclear (CBRN) materials have been developed using knowledge gained from live incidents and multi-agency exercises. In general, plans are suitable for both HazMat and CBRN events.

1. *HazMat incident*: An accidental release of a substance, agent, or material that results in illness or injury, the denial of access to an area, or the interruption of the food chain.
2. *CBRN incidents*: These are usually deliberate. The term covers a distinct range of hazards:
 - *Chemical*: Poisoning or injury caused by chemical substances, including chemical warfare agents, or misuse of legitimate but harmful household or industrial chemicals.
 - *Biological*: Illnesses caused by the deliberate release of dangerous bacteria, viruses, fungi, or toxins (e.g. the plant toxin, ricin).
 - *Radiological*: Illnesses caused by exposure to harmful radioactive materials, possibly inhaled or ingested in food or drink.
 - *Nuclear*: The explosion of a nuclear device causes widespread effects due to blast, heat, and large amounts of harmful radiation.

Irrespective of the particular responsibilities of organisations and agencies responding to the incident, coordinated effective multi-agency activity is necessary to achieve the following:

- To preserve and protect lives
- To mitigate and minimise the impact of an incident
- To inform the public and maintain public confidence
- To prevent, deter, and detect crime
- To assist an early return to normality

Other important common objectives involve managing the health and safety of all those responding to the incident, safeguarding the environment, facilitating judicial, public, technical, or other inquiries, and, finally, evaluating the response and identifying lessons to be learned.

ROLES AND RESPONSIBILITIES OF RESPONDING AGENCIES

Ambulance Service

The Ambulance Service has the principal responsibility for triage and decontamination of contaminated casualties at the scene of an incident. However, all responding agencies will collaborate to ensure that the risk to casualties from continuing exposure to the hazard is properly controlled.

Fire and Rescue Service

The core functions of the Fire and Rescue Service (FRS) are saving life, protecting property and the environment from fire and other emergencies, and providing humanitarian services. The management of operations within the inner cordon is normally delegated to the FRS, including the safety of all personnel working within it. Recovery or rescue from within the inner cordon will, in all but exceptional circumstances, be the responsibility of the FRS.

If circumstances require the implementation of mass decontamination or other form of decontamination, then the Ambulance Service may request that the FRS assist in the implementation of these procedures.

Police Service

The Police Service undertake the overall coordination of activity at the scene of a major incident, which will include all incidents that require the decontamination of people exposed to CBRN material. The police often have specialist officers trained in CBRN personal protective equipment (PPE). These officers will deploy where required within the contaminated area if operationally viable and safe to do so.

Their key responsibilities are:

- To provide sufficient Police resources to implement a secure inner cordon.
- To coordinate activity and cooperate fully with, facilitate and support the Ambulance and Fire Services leading to effective, early decontamination being undertaken.
- To search the selected decontamination area(s) for secondary devices.
- To maintain good order and provide protection to multi-agency partners (Ambulance and Fire Services and any other agency involved in the process) to ensure that they can operate fully in a safe environment.
- To ensure the integrity and maintenance of the investigative process throughout decontamination, as far as possible, although priority must be given to saving life. This includes the security and management of suspects and witnesses throughout the decontamination process.

CORDONS AND ZONES

Initial cordon

The initial cordon is temporarily established by the first wave of unprotected emergency responders – before any detailed scene assessment or any other scientific analysis has been conducted. It provides an initial means of containing the problem and adds an element of control to the incident.

Inner cordon

The inner cordon encompasses both the hot and warm zones. It must provide a secure environment for the emergency services and other agencies to work within.

Outer cordon

The outer cordon designates the controlled area into which unauthorised access is not permitted. It encompasses the hot, warm, and cold zones (Figure 18.1).

Cold zone

This is the uncontaminated area between the inner cordon and the outer cordon.

Warm zone

This is the area uncontaminated by the initial release of a substance, which becomes contaminated by the movement of people or vehicles.

Hot zone

This is the contaminated area (or areas) where the initial release occurred or disperses to. It will be the area likely to pose an immediate threat to the health and safety of all those located within it, and is the area of greatest risk.

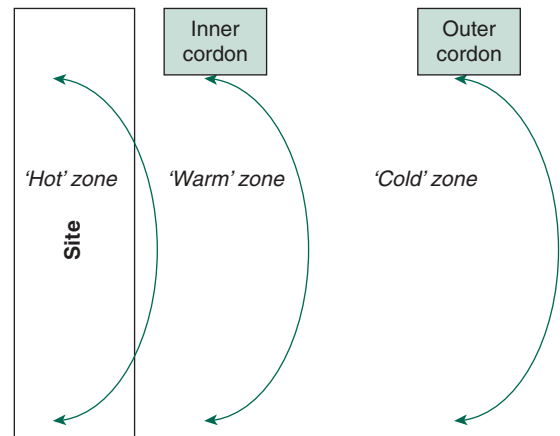


Figure 18.1: Contamination zones

SAFETY

Recognition of potential safety issues is important and a high index of suspicion should be maintained. The STEP 1-2-3 tool shown in Box 18.1 is designed to facilitate early recognition and therefore to maximise safety.

Box 18.1: STEP 1-2-3

Step 1	<i>One casualty</i>	<ul style="list-style-type: none"> • Nothing unusual – approach using normal procedure
Step 2	<i>Two casualties</i>	<ul style="list-style-type: none"> • Approach with caution • Consider all options
STEP 3	<i>Three or more casualties</i>	<ul style="list-style-type: none"> • Report on arrival and update Control • DO NOT APPROACH THE SCENE • Withdraw • Contain • Situation report • Isolate yourself • SEND FOR SPECIALIST HELP

There may also be other signs, which might be useful in confirming a release and going some way to identifying the substance involved. If a problem has already been identified using STEP 1-2-3 then no additional signs should be sought. Equally, if other signs are noted before STEP 1-2-3, withdrawal should be immediate and control must be informed.

Other signs are:

- Dead animals/birds/fish in large numbers.
- Lack of insect life: dead insects in surrounding area.
- Physical symptoms: numerous individuals experiencing water-like blisters, pinpoint pupils, choking, respiratory distress, or rashes.
- Mass casualties: numerous individuals presenting with health problems ranging from nausea and disorientation to respiratory distress, usually with sudden onset.
- Unusual liquid droplets: surfaces may have oily droplets, water surfaces may have an oily film.
- Unusual appearance: trees, lawns, shrubs, and bushes may be discoloured, withered, or dead.
- Unexplained odours: ranging from fruity or flowery to sharp/pungent to garlic/horseradish to new-mown hay. It is important that the odour is out of character with the surroundings.
- Low-lying clouds or fog like conditions that are not explained by prevailing weather conditions.

As well as injury and illnesses in people, all of the above features pose the threat of environmental contamination.

TREATMENT

When people are exposed to hazardous substances, these can become lodged on their clothing, skin, and hair and present a continuing health risk for themselves and their immediate contacts. It is important, therefore, that safe and effective early decontamination (removal of the contaminant to prevent further exposure of the contaminated individual and to minimize the spread of the contaminant) be undertaken. However, decontamination is not an inevitable response to HazMat or CBRN events. Whether or not to initiate decontamination procedures will depend on the initial assessment of the nature of the event by first responders and subsequently by trained Ambulance Service specialists.

Decisions on whether to decontaminate and which decontamination option(s) to pursue will depend greatly on the circumstances of the incident and on the findings of the operational hazard and risk assessments carried out by the emergency services at the scene. Responsibility for these decisions will rest with the Ambulance Commander in consultation with the Fire Service and Police Commander. This includes consideration of the different needs and options for decontamination of casualties, who are either injured or uninjured, and for those who exhibit or develop signs and symptoms of exposure or contamination, as opposed to those who do not.

Decontamination procedures (for people, equipment, property, or the environment) are not new and are routinely carried out by emergency service responders dealing with incidents involving hazardous substances. In most instances, this involves the responders themselves having their protective clothing decontaminated using cold or warm water applied manually or through simple showering devices.

For many incidents, the earliest contacts with contaminated casualties will be emergency services personnel involved in their rescue, triage, and treatment. In addition to direct physical contact with the contaminant, these responders might also risk exposure to airborne substances that are re-aerosolised or vaporised (commonly referred to as 'off-gassing') from the contaminated person.

Decontamination of casualties should be managed as part of a multi-agency response. This applies to all situations, minor or major, where the contamination poses a threat to the health of contaminated casualties or their contacts. Further action might be required by other responding organisations for the decontamination of exposed facilities and environments and of any surfaces with which a contaminated casualty has come into contact.

Hierarchy of categories

Decontamination can take several forms ranging from improvised decontamination by people responding to an immediate and necessary need, through to full and comprehensive decontamination.

Clinical decontamination

The process where contaminated casualties are treated individually by trained health care professionals using purpose-designed decontamination equipment to deliver the 'rinse, wipe, rinse' method of decontamination.

Interim decontamination

The use of standard equipment to provide a planned and structured decontamination process prior to the availability of purpose-designed decontamination equipment.

Improvised decontamination

The use of an immediately available method of decontamination prior to the use of specialist resources.

Mass decontamination

A planned and structured procedure using purpose-designed decontamination equipment, where there are large numbers of casualties.

Command and control of the decontamination process

A decontamination incident warrants the inclusion of additional roles (Figure 18.2).

A Bronze Commander (Decontamination Officer), fully trained in decontamination procedures should be appointed, whose sole responsibility is to oversee the decontamination process and ensure that correct procedures are adopted throughout. The prime responsibility of the Decontamination Officer is the safety of decontamination staff.

The Decontamination Officer should be located in the cold zone and will be supported by an Entry Control Operative who will manage the Entry Control Board, detailing individuals' names, roles, and time of entry into the contaminated area.

Primary triage should be carried out by responders wearing chemical protective equipment. This role should be supported by a primary treatment team who can administer life-saving care, including antidotes, as required.

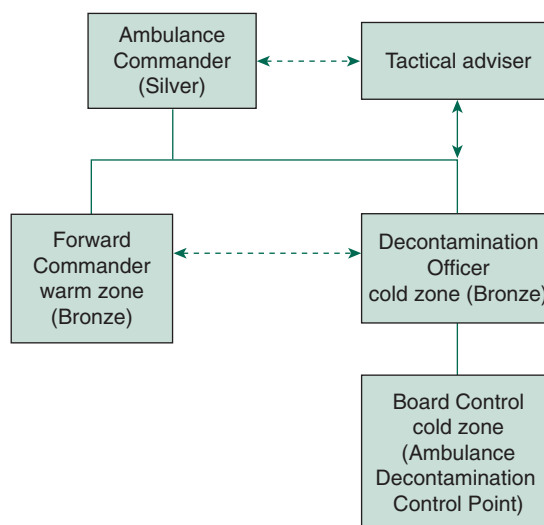


Figure 18.2: The decontamination command structure

SUMMARY

- The Ambulance Service has the lead responsibility for triage, decontamination and treatment of contaminated casualties.
- The Fire Service usually manages the area within the inner cordon while the Police are responsible for overall coordination of the response.
- The inner cordon encompasses the hot and warm zones.
- The hot zone includes the area directly contaminated by the release.
- The warm zone is the area contaminated by the movement of vehicles and people.

CHAPTER 19

Incidents involving large numbers of children

After reading this chapter you should be able to answer the following questions:

- How is preparation for an incident involving large numbers of children different?
- How are children triaged at a major incident?
- What challenges are there in the treatment of children at major incidents?

INTRODUCTION

For many individuals in the Health Service, the prospect of dealing with a major incident resulting in large numbers of injured children is daunting. For this reason these incidents are special. Such incidents do occur both in the UK and abroad (Table 19.1). Major incidents can arise from a variety of causes and children are not excluded from any particular type of incident.

Table 19.1: Major incidents known to have involved significant numbers of children

Major incident	Year	Total number of casualties	Number of paediatric casualties
Martinez coach crash (USA)	1975	51	50
Mass lightning strike (USA)	1977	47	47
Bologna bombing (Italy)	1980	291	27
M5 coach crash (UK)	1983	31	27
Chemical gas leak, Arizona (USA)	1987	>67	67
Enniskillin bombing (NI)	1987	65	6
Three Rivers regatta accident (USA)	1990	24	16
Dimmocks Cote train crash (UK)	1992	45	12
Avianca plane disaster (USA)	1993	92	22
York coach crash (UK)	1994	41	40
Abbeyhill junction train crash (UK)	1994	47	10
Oklahoma bombing (USA)	1995	759	61
Manchester bombing (UK)	1996	217	30
Dunblane mass shooting (UK)	1996	30	28
Beslan siege (Russia)	2004	>700	>335
Utoeya Island shooting (Norway)	2011	69	30

Major Incident Medical Management and Support: The Practical Approach at the Scene, Third Edition. Edited by Kevin Mackway-Jones.

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Difficulties in the management of children during a major incident have been documented at all stages of the incident response. In the pre-hospital phase, problems have been identified in determining triage and transport priorities and in obtaining adequate amounts of paediatric equipment. Few hospitals are staffed or equipped to deal with any more than a few seriously ill or injured children, with well-documented shortages of paediatric surgical and intensive care unit beds. Specialist services for children are geographically scattered and confined to specialist hospitals which are not always co-located with emergency departments. This distribution of specialist services may make it difficult to get children to specialist centres during a major incident.

Local highlights: National guidelines for the needs of children in major incidents

PREPARATION

Planning

An incident involving a large number of children may require a regional or multi-regional response. Health authorities and the Ambulance Service should ensure that they have adequate plans for the management of children in major incidents. Mechanisms for alerting and supporting specialist centres must be in place. Close liaison between pre-hospital, receiving hospital, and specialist children's services must take place.

Equipment

As mentioned above, children are involved in many major incidents and equipment is widely available, therefore the Ambulance Service should ensure that they have adequate supplies of paediatric equipment on their major incident support vehicles. Specific arrangements may be required to ensure the supplementation of hospital supplies from specialist children's hospitals.

In the UK there is a national reserve stock of equipment held by the Ambulance Service; 20% of the equipment is for children. This can be used locally, regionally and nationally as required.

Training

It is important that children take part in all major incident practices where they might in reality be present and that the age of the children matches that which might be present in a real incident. Children can provide very useful feedback about matters not immediately obvious to adults.

MEDICAL SUPPORT

Triage

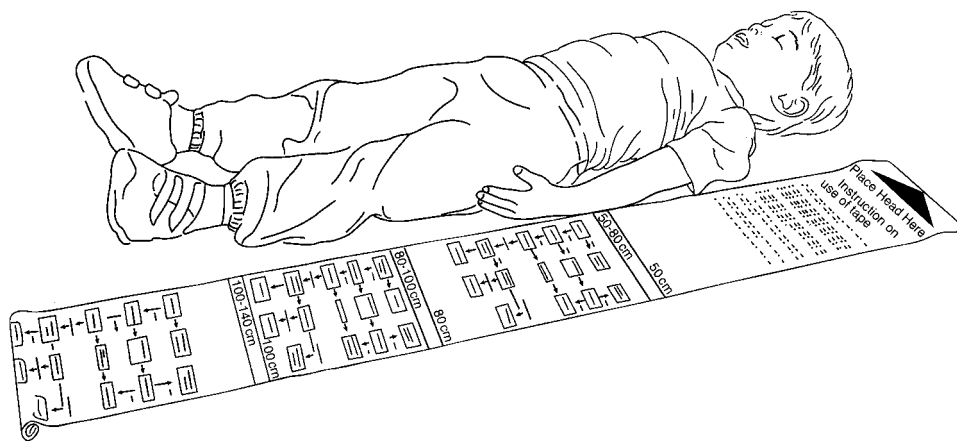
The standard triage sieve and triage sort are based on adult physiological values. As children have higher pulse rates, higher respiratory rates, and lower blood pressures (Table 19.2) they will usually be over-triaged if these are used. The sieve, as discussed in Chapter 15, has been modified to accommodate this.

Table 19.2: Normal physiological values for children

Age (years)	Respiratory rate (breaths/minute)	Pulse rate (beats/minute)
<1	30–40	110–160
1–2	25–35	100–150
2–5	25–30	95–140
5–12	20–25	80–120
>12	15–20	60–100

In incidents involving small numbers of children, this is unlikely to be a significant problem as there may be practical and humanitarian reasons to remove children from the scene at an early stage. However, in incidents involving large numbers of children, systematic over-triage may adversely affect the overall response as no effective prioritisation will occur. To compensate for this, a paediatric triage tape has been developed that modifies the triage sieve according to children's normal physiological variables (Figure 19.1).

The paediatric triage tape is based on the approximate length to weight correlation for children aged 1–10 years. A series of modified triage sieve algorithms have been produced using the normal ranges of vital signs. These algorithms are arranged in boxes on a linear waterproof tape that is laid next to the child. Where the child's heel touches the tape indicates the algorithm to be used for that length of child.

**Figure 19.1:** Paediatric triage tape

This system means that triage officers can more accurately assess the physiological derangement in children, and in addition there is no need to remember all the variables as they are written on the tape. On occasion, the position of the child may make it impossible to use the tape but the algorithms can still be used based on age (Figures 19.2–19.4).

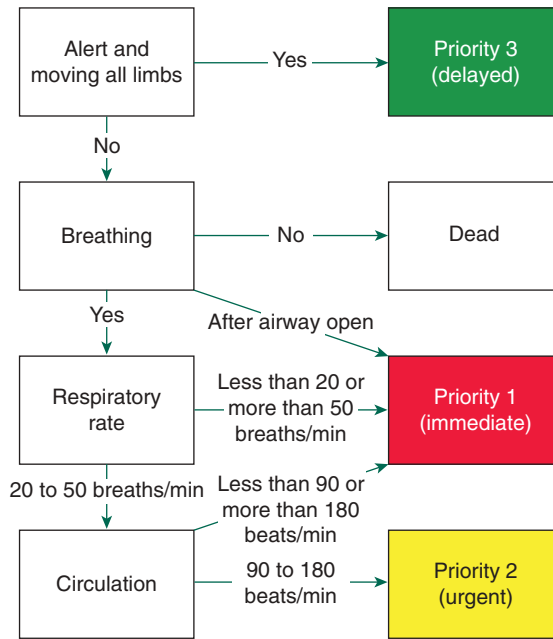


Figure 19.2: Paediatric sieve, 50–80cm or 3–10 kg

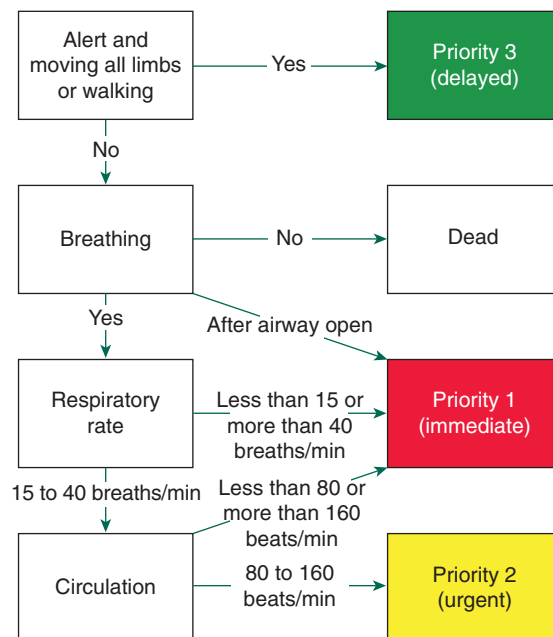


Figure 19.3: Paediatric sieve, 80–100cm or 11–18 kg

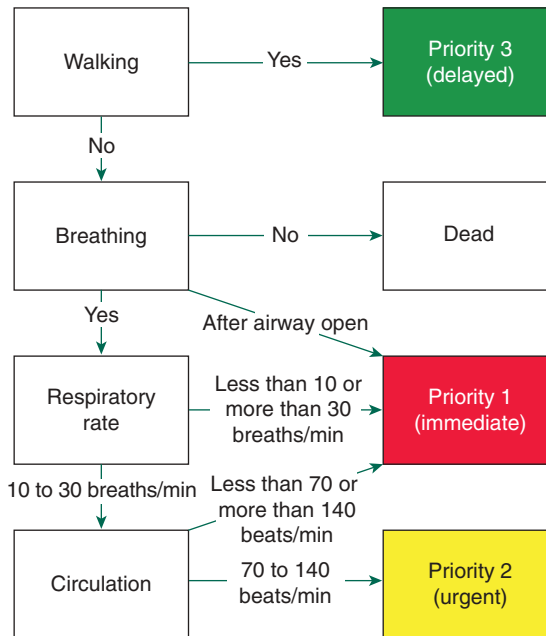


Figure 19.4: Paediatric sieve, 100–140 cm or 19–32 kg

Treatment

Pre-hospital responders may find dealing with children difficult. In particular, they may be unfamiliar with the normal physiological and psychological responses of children to illness or injury.

A number of other issues may complicate the response:

- *Scene safety*: Rescuers are willing to take greater risks when a child is involved. Emotions cloud judgement – so every precaution should be taken to prevent unnecessary risk taking.
- *Families*: Major incidents may involve more than one family member. Ideally members of the same family should be kept together, but this may not always be possible if a patient's injuries require specialist care.
- *Media*: There will be a high level of media interest at an incident involving children.

Definitive care

It is highly likely that in an incident involving large numbers of children, emergency services may require additional help from regional services such as paediatric intensive care units and paediatric surgical units. Planners must liaise with these groups to agree a method for support during an incident.

Recovery phase

Incidents involving children are more likely to result in psychological morbidity for the rescuers. All people involved in the response must be alert to such problems in themselves and their colleagues.

SUMMARY

- Children are often involved in major incidents.
- Planning, equipment provision, and training should reflect this.
- The triage sieve can be modified to better reflect the physiology of younger children.

CHAPTER 20

Incidents involving casualties with multiple burns

After reading this chapter you should be able to answer the following questions:

- What factors influence the management of burns injuries in a major incident?
- What is the role of the burns assessment team?
- What is the role of the National Burns Bed Bureau?

INTRODUCTION

The initial resuscitation of a casualty involved in a major incident and sustaining a burn injury should follow the standard ABC approach. Whilst the burns are often very evident, the potential for other injuries should not be overlooked.

Initially, casualties with burns may appear to be less physiologically injured than they actually are. The potential for gradual loss of the airway is well recognised, but the delay in assessment or failure to correctly assess the burn surface area (leading to delayed and inadequate fluid resuscitation) can also significantly impair the quality of care.

Once the acute phase of care is complete and resuscitation well underway, burn-injured patients have a very prolonged post-acute period of care that can run to weeks or even months. The multi-disciplinary nature of this, involving specialist nursing, physiotherapy, psychology and even social care, is very time and resource intensive.

CAPACITY

The total number of burns units and dedicated burns beds is always very limited. In most domains, it would not require a particularly large number of cases to overwhelm a single unit's capacity.

In response, National Burns Bed Bureaux (NBBBs) have been established in many countries to maintain a regularly updated log of burns bed availability. The intention is that patients with significant burns injuries can be transferred across the country to a dedicated bed as quickly as possible, potentially direct from the scene of an incident.

In the UK, the National Burns Major Incident plan gives the nearest burns unit and its Hospital Control Team responsibility for managing the distribution of patients. While the scale of the incident is being established, no patients will be moved. Once the scale is known a distribution plan for the casualties requiring specialist care will be made.

BURNS ASSESSMENT TEAM

The need for an expert clinical review of burns patients (to assess the severity and extent of the injury and oversee the initial resuscitation until arrival in a dedicated unit) is well recognised.

A burns assessment team (BAT), consisting of an experienced burns surgery resident or consultant and a senior burns nurse, should be deployed to each emergency department that has received burned casualties from the scene. There they should assess the injuries to provide objective information to the coordinating receiving burns unit.

It may be possible for the coordinating unit to deploy more than one team but adjacent burns units may need to make one or more BATs available to assist the primary unit.

Once a fully informed burns casualty profile has been determined, a distribution plan can be created. The BATs may then be able to act as retrieval teams to bring the patients back to their units.

PATIENT DISPERSAL

Emergency departments typically care for minor burns injuries as a routine. Those patients, who have injuries that do not pass the threshold requiring fluid resuscitation or not involving danger areas such as hands, feet, or perineum, can be managed at the local hospital.

At the other end of the spectrum, there are patients who are so severely burned that palliative care is the only reasonable option in a major burns incident. The 'burn index' (the sum of the patient's age and their percentage burn) can be used to identify patients who are likely to have a poor outcome and meet this decision threshold. Those with an index >100 might be managed expectantly and transfer to a burns unit might not be appropriate. A poor pre-morbid state and involvement of the airway in the burn are also markers of poor progress but are difficult to quantify.

Patients with significant burns should be managed in a unit with the specialist skills to care for them. This may require long-distance transfers. It is possible that transfer to burns units across international borders may be needed.

SUMMARY

- Burns-injured casualties need specialist assessment and management.
- The capacity of a burns unit is very limited and patient dispersal is likely to be very wide.
- Burns assessment teams should attend the receiving emergency departments, as determined by the local coordinating burns unit, to assist with assessment and management of burns-injured patients, providing an expert assessment to inform the coordinating unit.
- Minor burns patients are likely to be managed locally. Severely burned patients who are unlikely to survive may be managed palliatively at the original receiving facility.

CHAPTER 21

Mass gatherings

After reading this chapter you should be able to answer the following questions:

- What is a mass gathering?
- How does pre-planning of mass gatherings contribute to the major incident response?

INTRODUCTION

Mass gatherings present their own unique set of problems – fortunately, with adequate planning, most can be anticipated. The planned response should follow a generic approach; in addition, specific risks should be identified and planned for. The major difference if an incident occurs at a mass gathering is that the basic major incident management structure is often in place prior to the incident. Consequently, senior decision makers are present at the very early stages of the incident to coordinate the response.

Key point

A mass gathering incident can be regarded as a planned major incident.

WHAT IS A MASS GATHERING?

Mass gatherings are defined differently around the world. In the UK and the United States, a crowd of more than one thousand people is regarded as a mass gathering. The vast majority of events involving this number of people are anticipated and organised in advance and a number of important decisions can be made in advance (Figure 21.1). A small number of gatherings of this size may occur without pre-planning as the warning time is too short. The response to these should follow generic principles.

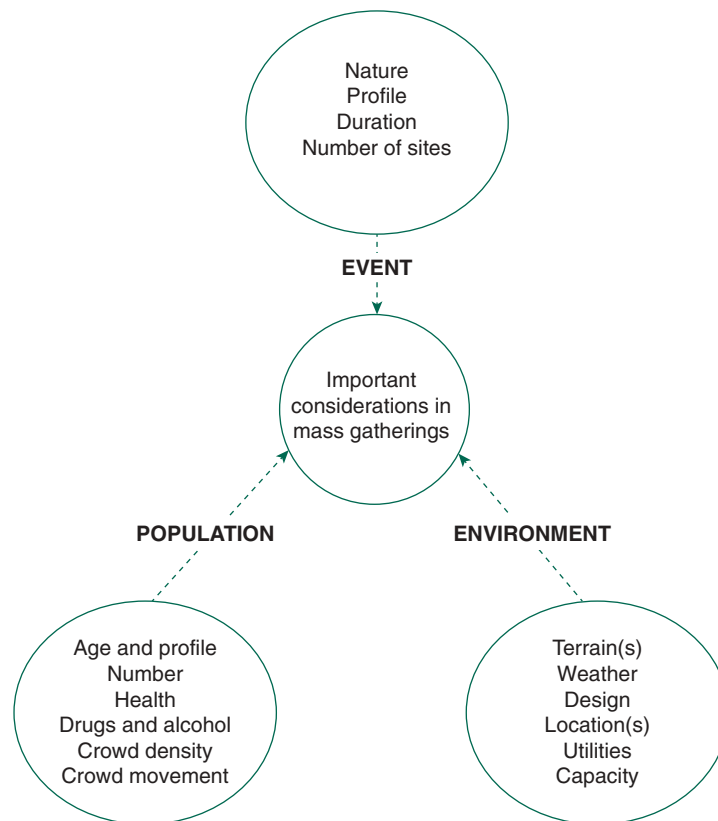


Figure 21.1. Risk factors to be considered when planning mass gathering events

The event

Stadium-based sporting events can attract large numbers of people to relatively small areas, while in other sporting events the spectators can be dispersed more widely. Religious events can attract huge numbers to a site, for example the Hajj attracts 2 million pilgrims to Mecca on an annual basis. Political demonstrations are not uncommon and frequently occur in large cities and involve large numbers of people.

Many mass gathering events only last for hours while others (e.g. music festivals, sporting competitions) take place over a much longer period.

With increasing security at obvious terrorist targets, attacks on softer targets have become more likely.

The environment

Outdoor events are influenced by the weather, which will vary considerably by season and from one region of the world to another.

The movement of people at a mass gathering event increases the chance of injuries occurring. The high-risk times are at the start, the interval, and the end when large numbers of people move simultaneously. Events where people are seated are easier to plan and control as the number of seats dictates the crowd capacity. The design of modern stadia is such that the size of groups is controlled. Venue design can give rise to difficulties of access for emergency services.

The population

An important factor in determining the predicted medical need is the nature of the population attending the event. Events attract different populations, e.g. young adults at music festivals (and alcohol consumption may be high) or a large number of children at some football matches.

PREPARATION AND PLANNING

Any organising body of a mass gathering needs to ensure that local and national guidelines are consulted and followed. In the UK, the 'Green Guide' provides guidance on the accommodation and management of crowds within sports grounds. The 'Purple Guide' provides tools and guidance for the management of outdoor events such as pop concerts and festivals.

Local highlights: Mass gatherings – local and national guidelines

It is, of course, not possible to anticipate every eventuality when planning for mass gatherings. Where specific risks are identified, modifications to the plan can be made. Any proposed response should involve parties with knowledge of the local environment and those with experience in previous and similar events. Any planned response to an incident should use existing emergency service hierarchies, and major incident roles must be allocated to people of relevant experience. The allocation of roles should take place at a briefing before the event starts so that personnel can familiarise themselves with their roles before spectators arrive. Senior members of each emergency service in attendance should always be in communication during the event.

TRAINING

Having staff in place prior to a mass gathering event is of little value unless they are competent to deal with likely eventualities. On-site exercises are useful to ensure a coordinated response. Paper and table-top exercises can also help to reinforce this.

SUMMARY

- A significant amount of planning is required to prepare for a major incident response at a mass gathering event. This amount of planning may also be dictated by legislation.
- Unlike other major incident responses, considerable thought can be given to the scene set-up and response prior to the event.
- The management structure at a mass gathering event is frequently in place prior to the event, helping to ensure a rapid response to any incident that occurs.

CHAPTER 22

Natural disasters

After reading this chapter you should be able to answer the following questions:

- What are natural disasters?
- What are common types of natural disaster?
- What is man's impact on the frequency and severity of natural disasters?
- Why is there a need for planning for natural disaster?
- What are natural disaster mitigation techniques?

INTRODUCTION

Natural disasters are often devastating and have caused massive loss of life, an inestimable number of injuries and rendered millions homeless over recorded time. They can be classified into different types (Table 22.1).

Table 22.1: Classification of natural disasters

Geological	Meteorological	Biological
Earthquake	Cyclone, hurricane, and typhoon	Flu and other pandemics
Tsunami	Floods	Famine
Volcano	Fires	Pests
Landslide and avalanches	Heatwaves	

In this chapter the mechanism for each type of natural disaster (except for biological types) is discussed, together with mitigation and response as appropriate.

The number of natural disasters is likely to increase as man's effect on nature increases. There is always the threat that a single natural disaster may have the potential to threaten human-kind. Some texts have termed this a 'mega-disaster'. Evidence of this type of disaster exists – for example the ending of the Cretaceous period (and the disappearance of the dinosaurs amongst most of the rest of the planet's life forms) 65 million years ago.

GEOLOGICAL DISASTERS

Earthquakes

Earthquakes have caused enormous casualties over time as shown in Table 22.2.

Table 22.2: Sites, dates, and deaths from earthquakes

Site	Date	Deaths/injuries
Shaanxi, China	1556	830,000 dead
Lisbon, Portugal	1755	60,000–100,000 dead
Izmit, Turkey	1999	17,100 dead
Bam, Iran	2003	31,000 dead
Kashmir, northern Pakistan	2005	90,000 dead, 110,000 injured
Yogyakarta, Indonesia	2006	6200 dead, 46,000 injured
Shaanxi, China	2008	65,000 dead

Relief expertise is growing rapidly. Significant advances include the caching of large supplies of basic shelters, tents and bedding. Urban Search and Rescue (USAR) teams with specific training and equipment are becoming expert in finding and retrieving live victims from rubble many days after an earthquake.

Tsunamis

Tsunamis (from the Japanese words for harbour (*tsu*) and wave (*nam*i)) are large waves created by sudden movements in the sea bed, usually by earthquakes, volcanoes (e.g. Krakatau, Indonesia, 1883), landslides, and meteorite ember strikes. The devastating tsunami on 26 December 2004, affected northern Sumatra/Aceh, Malaysia, Thailand, Myanmar, Sri Lanka, and the Maldives, and beaches as far away as Madagascar and East Africa. Estimates put the final death toll at over 300,000.

Mitigation techniques for tsunamis include an early warning system together with systems of alerts and sirens in towns and villages across vulnerable regions. Major projects are now underway to reforest mangrove tidal plains, particularly around towns and cities.

Volcanoes

Volcanic eruptions can range from the gentle to the explosive and catastrophic. Several large eruptions have produced massive local loss of life, such as Tamboro, Sumbawa, Indonesia in 1815, killing 92,000.

Mitigation techniques for volcanic eruption depend on seismic activity and motion sensors, satellite imagery, and thermal monitoring to alert scientists of impending eruption.

Landslides/avalanches

Landslides are mass movements of soil/mud and rock, often triggered by heavy rain, an earthquake, or volcanic eruption. One example is the landslide of mining waste that occurred in Aberfan, Wales, in 1966, burying 144 people, including 116 school children.

Mitigation planning for all forms of avalanche and landslide centre around building controls, particularly in steep terrain with high precipitation (rain or snow). Building codes and deflection walls and roofs around towns and roads contribute to safety. Reforestation has helped prevent snow and soil/mud avalanches across the globe. Early warnings occur in some regions, and can allow high-risk areas to be evacuated.

METEOROLOGICAL DISASTERS

Hurricanes/tropical cyclones/typhoons

These are caused by tropical depressions of sufficient intensity to produce sustained wind speeds of greater than 63 km/hour. These storms have different names according to their location,

being called tropical cyclones in the Indian, South Pacific, or South Atlantic Oceans, typhoons in the rest of Asia, and hurricanes in the Americas and Caribbean. They require a sea surface temperature in excess of 27°C (81°F), and as sea temperatures rise scientists believe the rate, range, and ferocity of these storms will increase. Wind speeds govern the classification number of each storm.

Tropical storms occur in some of the poorest and most heavily populated areas of the world. The Category 4 cyclone, Nargis, hit Myanmar in May 2008. The actual casualty number is still uncertain, but ranges from 100,000 to 300,000. As well as destructive winds and heavy rains with flooding, cyclones can cause storm surges as strong winds push sea water toward the coast. Hurricane Katrina in August 2008, with Category 3 winds, caused some of the damage but it was the 8–10-metre (27–34-foot) storm surge that swamped the New Orleans levee sea defences, covered 80% of the city, and destroyed some surrounding towns. Official casualties are recorded at 1836 dead and 705 missing.

Mitigation planning takes the form of early warning systems managed by weather bureaux, and engineering design to protect low-lying areas like New Orleans. Public education on the need for personal cyclone shelters and emergency kits, including food for several days, can be broadcast before and during each cyclone season.

Cyclone and hurricane tracking allows governments to assess the threat and need for evacuation several days before they hit land. All these mitigation techniques have been implemented in developed nations with resources, but in areas of Bangladesh, India, and the Caribbean, no such warning systems or building codes occur and the threat of tropical cyclones remains extreme.

Floods

Flooding is the inundation of land by large amounts of water (Table 22.3) and can be a consequence of excessive precipitation or from storm surges (see previous section).

Table 22.3: Sites, dates, and deaths from floods

Site	Date	Deaths/injuries
Galveston, Texas, USA	1900	8000 dead
Yangtze, China	1931	400,000 dead

Fires

Wildfires, in grass or forest, can spread uncontrollably and pose a significant threat to human settlement and property. Fires in urban environments can also become uncontrolled, despite fire ‘watches’ and fire fighting services. The great fire of London in 1666 destroyed 80% of the city whilst a fire in Tokyo, Japan (after the devastating earthquake of 1923) killed thousands of the 143,000 casualties. Wildfires in Canberra, Australia in 2003 and in California in 2005 have caused significant damage to property and vegetation, and some loss of life.

Control and mitigation techniques for wildfires include back burning and ensuring fuel load (e.g. dry, dead vegetation) is kept under control before hot, dry conditions arrive, particularly around rural–urban interfaces. Mitigation techniques in urban environments include smoke detectors, fire extinguishing systems, and an effective fire fighting service in almost every town and city in the world.

Heatwaves

Heatwaves are defined as prolonged periods of excessively hot weather. There is no universally agreed temperature definition, rather it depends on exceeding the normal ambient temperature

scales for the area, often for several days in succession. In the United States, heatwaves kill more than hurricanes, tornadoes, lightning, and floods combined. The heatwave of New York in 1980 killed up to 1600 people, whilst the European heatwave of August 2003 is estimated to have caused 35,000 deaths.

The very young and old are particularly at risk. Cities display a phenomenon known as the 'urban heat island' due to heat absorption by fixed structures like roads and buildings. Mitigation of this phenomenon with parks and heat-dissipating buildings have recently become part of urban planning. Avoidance of power failures contributes to lives saved. Emergency 'cooling centres' may help, particularly for the elderly who may not be able to afford air-conditioning.

SUMMARY

- Natural disasters have befallen man since records began. Climate change and an increasing world population ensure that numbers will rise.
- Mitigation of natural disasters, particularly in resource-rich nations, has advanced significantly.
- Planning, in the form of engineering and building codes, early warning systems and evacuation, public education and stockpiling of equipment, has already proven effective.
- Mitigation techniques and planning is far cheaper and more effective in the long term than reaction and rebuilding after a natural disaster.
- Planning locally relevant and effective projects to mitigate local threats may prove a more cost-effective method of aid from rich to poor nations than disaster relief teams once a catastrophe has occurred.
- Response needs to be proportionate to need.

CHAPTER 23

Uncompensated major incidents

After reading this chapter you should be able to answer the following questions:

- What is an uncompensated major incident?
- What factors contribute to making an incident uncompensated?
- How may treatment aims be changed during an uncompensated major incident?

INTRODUCTION

An uncompensated incident occurs when the medical resources mobilised in response to a major incident are inadequate to deal with the number of casualties, that is, 'load exceeds capacity'. Most uncompensated major incidents are a result of *natural* events such as floods or earthquakes, in which case these incidents are also *compound*. Occasionally, *man-made* incidents can be of such magnitude that the casualty load exceeds the capacity of the health system. An example of an uncompensated man-made incident was that in Bhopal, India on 3 December 1984 when a valve on a tank of methyl isocyanate burst, releasing a toxic cloud that killed an estimated 8000 people and left 170,000 disfigured or disabled.

Key point

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

The capacity of a health system to respond to the patient load in a major incident varies between countries and between regions within a country. A bomb blast leaving 200 live casualties in the middle of London is likely to be a compensated major incident, whereas the same event in Mogadishu, Somalia is likely to be uncompensated. Similarly, a major incident involving 20 live casualties in the remote Scottish Highlands or the Australian outback is likely to remain an uncompensated incident for many hours, resulting in potential increased morbidity and mortality. A major incident may move from being initially uncompensated to become compensated as more resources are mobilised to treat casualties.

Key point

A major incident may move from being initially uncompensated to become compensated as more resources are mobilised to treat casualties.

FACTORS CONTRIBUTING TO AN INCIDENT BEING UNCOMPENSATED

For a given live casualty load, it is the capacity of the health system *during the major incident response* that determines whether the incident will be compensated or uncompensated. If there is a lack of *surge capacity planning*, a *lack of resources*, or *compounding factors* in the incident the health capacity will be diminished and the incident is more likely to be uncompensated.

Surge capacity planning

Historically, major incident planning evolved in response to deficiencies identified when a major incident had recently occurred. Increasingly, more strategic planning is a funded priority; this involves a risk assessment (at local, regional, and national levels) and the development of integrated multi-agency plans to meet the needs of potential incidents. Planning for major incidents has become a political priority in many parts of the world due to recent ‘spectacular’ terrorist incidents.

Planning for major incidents can greatly enhance available resources at the time of an incident by focusing local resource to the major incident, using disaster stockpiles, using other agency’s resources and using novel resources that are not part of day-to-day operations. For larger incidents, regional, national, and even international resources may need to be mobilised. Written and practiced plans are essential, as are negotiated inter-agency agreements so that at the time of the response all parties are aware of their roles and responsibilities.

Major incident planning creates ‘surge capacity’ in the system, which may be many times the normal day-to-day operational capacity (Box 23.1). In the modern health environment, where hospitals often run at 90–100% bed occupancy and use ‘just in time’ supplies, there is very little ‘slack’ in the system to face the casualty load of a major incident.

Box 23.1: Creating surge capacity in the health system

- | | |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Command and control | <ul style="list-style-type: none"> • Intra- and inter-agency agreements and written protocols • Succession planning built into the command structure so that there is a wide pool to call upon rather than just a few individuals |
| Communications | <ul style="list-style-type: none"> • Deploying a separate ‘medical’ radio net or having additional handsets to link into the ambulance radio net • Deploying satellite phones • Having protected mobile phone handsets if the cellular network is shut down in response to a terrorist event |
| Treatment | <ul style="list-style-type: none"> • Equipment/consumables: disaster stockpiles or ‘pods’ • Bed spaces: rapid discharge rounds; buying step-down beds, e.g. in local hotels; sharing load amongst local and regional hospitals; sharing specialist unit (e.g. burns unit, intensive care unit) workload through a national network • Staffing: importing regional staff to fill rosters; using medical students as ‘runners’; using GPs and retired medical practitioners |
| Transport | <ul style="list-style-type: none"> • Using ambulances from the region • Using coaches/buses from commercial companies • Using military assets for transport |

Without effective planning, even small incidents, apparently within the theoretical capacity of the local health system, can become uncompensated because resources are not available in the right place at the right time. The larger the casualty load, the greater the need for mobilisation of resources and the greater the need for effective planning at every level.

Fixed resources

Resources (e.g. hospital beds, operating theatres, staff, ambulances, helicopters, communications, roads, Police Service, Fire Service) are largely fixed in a particular area. The resources present are determined by wealth and population. Thus, for a given live casualty load, poorer nations and remote regions are more likely to experience an uncompensated major incident.

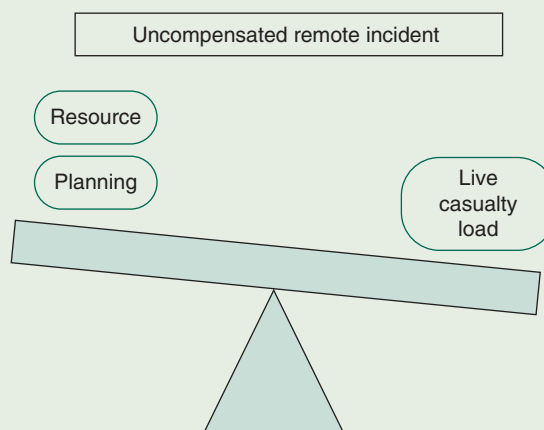
Compounding factors

A compound incident is one where the infrastructure involved in the major incident response is damaged at the time of the response. Compounding factors remove resources and disrupt plans (i.e. diminish the capacity of the health system to respond to the major incident) and so increases the chance of the load exceeding capacity. Compounding factors in an incident can be isolated to one part of the system or generalised and affect all or most of the infrastructure in a community. They are summarised in Table 23.1.

Table 23.1: Compounding factors in a major incident

Compounding factors	Examples
Transport damage	Flood, earthquake, severe weather (aircraft cannot fly), terrorism target
Hospital damage	Flood, earthquake, severe weather (e.g. cyclone), power failure to hospital with no back-up supply, terrorism target
Communication damage	Overload of a cell phone net by a worried population, equipment failure, weather conditions preventing satellite phone use, terrorism target
Widespread infrastructure damage	Natural disaster, war, civil unrest, massive man-made incident

Case study 23.1: Remote major incident: Australian outback 2008

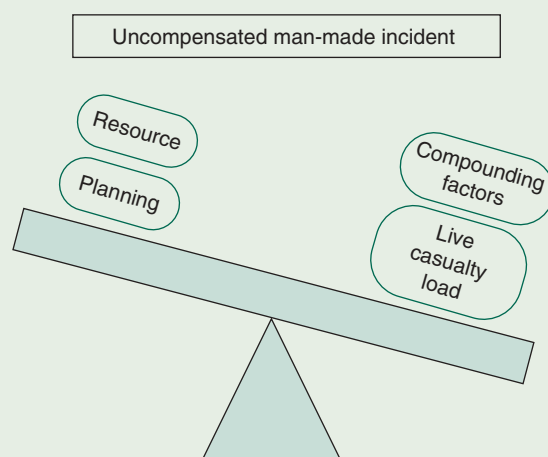


A single vehicle rollover in the Australian outback at night, on a dirt road 300km from the nearest hospital, 10km from the nearest airstrip, and 30km away from the only local health facility. Local resources consisted of a remote clinic with one nurse, one aboriginal health worker, one four wheel drive ambulance, one satellite phone, and some medical supplies. Additionally, there was one policeman and a police vehicle. The nurse used the satellite phone

to call the retrieval service coordinator about 2 hours after the crash, and the call was escalated to the duty emergency physician. The satellite phone reception was intermittent due to cloud cover but eventually the transmitted information indicated that 17 people were travelling in the vehicle, one was dead (an infant), one was unconscious, and 'lots' had severe injuries. On this information a local major incident was declared and two fixed wing aircraft (each with a two-stretcher capacity), two retrieval doctors, two nurses, and an aerial retrieval major incident cache was dispatched along with a road ambulance with a paramedic crew. Hospital staff were put on standby. The first medical team arrived at the scene about 4 hours after the crash. Prior to the arrival of the medical teams some patients were spinally immobilised but collars had run out, most patients had had analgesia, a hypotensive patient had used up all the available crystalloid, and splints had been made from branches of wood. The unconscious patient was left in the recovery position and a decision made to concentrate on the other casualties. The initial responders not only had to tend to the injured but also had to switch on the runway lights and ferry the arriving medical teams and the patients to and from the aircraft (each round trip from the scene taking an hour). The initial responders also knew all the casualties personally and some were family members. Following arrival of the medical teams, the injured underwent a MIMMS sort. One casualty was ventilated at-scene (subdural), one had an O negative transfusion (splenic laceration and pelvic fracture), and all patients had analgesia and first aid (six of the patients had hip dislocations). A satellite phone link was re-established enabling a full injury and time of arrival list to be transmitted. This resulted in the receiving hospital being able to de-escalate its response so that staff were not unnecessarily fatigued.

Learning points: The incident was initially uncompensated. The minor compounding factor of poor satellite communications did not hamper the response. Treatment aims were altered for the unconscious patient due to lack of resources. The incident became compensated with the arrival on-scene of additional resources.

Case study 23.2: Man-made major incident: Bali bombings 2002

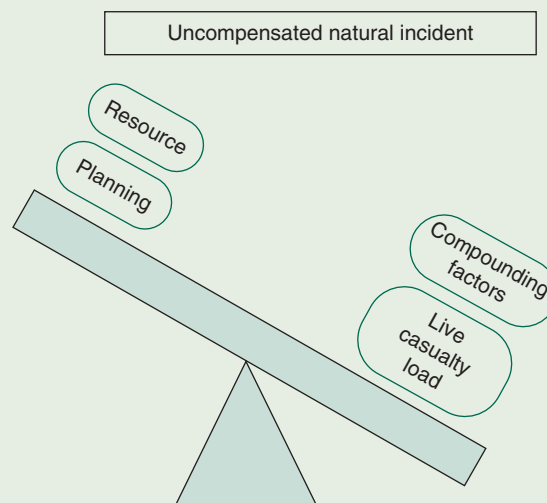


Terrorist bombs in a Bali nightclub killed 202 people, 88 of whom were Australian. Over 150 were left critically injured, many of whom were also Australian. With little idea of the casualty load due to a lack of a reliable scene assessment, the Australian government sent military Hercules aircraft with medical teams from the closest Australian hospital to retrieve the most seriously injured. Sixty-two patients with major injuries (blast and thermal injury) were

retrieved to the Royal Darwin Hospital (the closest Australian hospital to Bali) – the last arriving 48 hours after the blast. Because of a lack of scene assessment, the retrieval teams did not have some equipment (e.g. sufficient numbers of sterile scalpels for the scores of escharotomies performed). In Bali most medical supplies had run out, and patients were found with dressings but no fluid resuscitation as this too had run out. Many were waiting to have urgent operative intervention. The Royal Darwin Hospital mobilised 1600 local staff and flew in an interstate burns team. Ambulances to transport the patients from the airport to the hospital were mobilised from throughout the region (from up to 750km away). The injured were resuscitated (many requiring ventilation when standard burns fluid resuscitation commenced) and both ‘rescue’ and definitive operations were performed. The Australian Burns Plan was activated and 40 patients with severe burns were flown out to major burns centres across the continent within 48 hours of arrival in Darwin. It is estimated that 500 Australians with minor injuries made their own way back home and were treated at local hospitals in Australia.

Learning points: The major incident was uncompensated in Bali. The incident (for the Australian casualties) was compensated on arrival in Australia 1–2 days after the initial blast. Regional and national plans were activated and resources mobilised across the nation. Gold Command was held by the Australian government.

Case study 23.3: Natural major incident: Hurricane Mitch, Honduras 1998



Mitch, initially a category 5 hurricane (290km/hour sustained winds with higher speed gusts) swept across Honduras, Nicaragua, El Salvador, Guatemala, and Belize in October 1998. It caused an estimated 10,000 fatalities with possibly a further 10,000 missing. Hardest hit was Honduras where floods and mudslides destroyed 25 towns, 70% of the nation's crops, and most roads and bridges. Hundreds of thousands of people were displaced with many still unable to return to their homes over a decade later. It is estimated that rebuilding will take a further 10 years to reach the infrastructure levels present in 1998 and that the hurricane has delayed economic development by 40–50 years. In that time there may be another natural disaster.

Learning points: This was a natural major incident that deserves the term ‘catastrophe’. This compound incident, which destroyed infrastructure across many nations, never became compensated in terms of treatment for the injured and it is affecting people's lives a decade later and will do so for many years to come.

RESPONSES TO UNCOMPENSATED INCIDENTS: ALTERED TREATMENT AIMS

There is always a time after the ‘big bang’ of a major incident when little appears to be happening for the injured. This is the time lag between the initiation of the response and the arrival of resources at the right place to help the injured. A large number of live casualties, compounding factors, and lack of resources (e.g. remoteness) can create an incident in which there are significant delays in getting help to the casualties or getting the casualties to help – during this period the incident is uncompensated. Escalation of the incident response from local to regional to national may eventually bring enough resource to bear to make the incident compensated. This period may be hours to days, or the incident may never become compensated.

During the uncompensated phase of an incident, medical care can still be given to casualties although treatment aims may have to be altered to ensure that ‘the most good is done for the most people’. At the scene and in hospitals there may be use of the ‘expectant’ category in patients who would, under better circumstances, be offered life-saving procedures. Operatively, the treatment strategy may, for example, change from limb reconstruction to amputation. In a viral respiratory pandemic there may be rationing of invasive ventilation support to those with the highest chance of survival (e.g. the young and those with no co-morbidities). The decision to alter treatment aims in any incident should be taken at the highest available level. In a remote incident this may be the most senior doctor present at-scene (if there is no communication with Gold Command), but in most uncompensated incidents the decision should occur at Gold Command.

Key point

During an uncompensated major incident treatment aims may have to change; the decision to do this should be made at Gold Command.

In compound uncompensated incidents involving an entire region (e.g. a tsunami, earthquake, or cyclone), the medical response is usually almost entirely from out of the region and can take days or weeks to arrive in sufficient mass to be effective. In these circumstances government and non-governmental agencies have to prioritise aid aims in much the same way as treatment aims are altered in smaller scale events. The priority is no longer those injured (many of whom will already be dead) but the uninjured survivors, and aid is directed to safe water, safe sanitation, food provision, shelter, and communicable disease prevention (to ensure ‘the most good is done for the most people’).

SUMMARY

- In an uncompensated major incident the load of live casualties is greater than the capacity of the system.
- A major incident may move from being initially uncompensated to become compensated as more resources are mobilised to treat casualties.
- Available resources, planning, and compounding factors influence the capacity of the health system to respond to a major incident.
- During an uncompensated major incident treatment aims may have to change; the decision to do this should be made at Gold Command.



PART VII

Appendices

APPENDIX A

Psychological aspects of major incidents

INTRODUCTION

This appendix considers the psychological effects of disasters as they affect both the rescuers and the rescued. Three states will be discussed:

- Immediate effects.
- Early effects.
- Late effects.

Psychological problems are common in the injured, in uninjured survivors and in those involved with the rescue operation following a major incident. Many more people than are physically injured can be expected to have a psychological injury. The psychological aspects will be considered here in terms of immediate, early, and late problems.

Key point

Psychological problems are common. They occur in the injured and uninjured survivors, and the rescuers.

IMMEDIATE

Initially both the injured and uninjured survivors may be anxious and upset about their injuries or about having narrowly missed being killed. These people may also be upset about friends and relatives who have been killed or injured, or who are missing.

It is less common for the rescuers to be overcome by the situation because they will be part of a coordinated and ordered response and will have seen cases of significant trauma prior to the incident. Each commander should, however, be alert to the signs of stress and fatigue in his or her workers and be prepared to withdraw affected individuals from the scene.

EARLY

Survivors may feel guilty at having lived through the experience when a friend or relative has died or blame themselves for their death or injury: *'If I hadn't wanted to go to Madrid that day . . .'*. Equally, those injured may feel anger and resentment towards a perceived guilty party. Such emotions should be anticipated and help offered. Follow up can be particularly difficult. For example, an uninjured survivor of a transport disaster in one part of the country may be discharged from hospital, return home, and suffer such feelings in isolation.

Health Service staff who are used to dealing with suffering on an individual basis may be overwhelmed by the magnitude of the human disaster. No one is immune but junior staff can be particularly vulnerable.

Efforts must be made to offer support to all those involved using appropriate resources.

Local highlights: Support and counselling

Managers may wish to hold a short debriefing for their staff after the 'stand down' has been announced. More importantly, there should be an opportunity for mutual support both immediately and once people have had a chance to consider the events. Open discussion should be encouraged.

Ambulance services may find it difficult to hold combined debriefing sessions after the event as personnel may have attended from throughout the operational area and from neighbouring ambulance services. It is imperative, therefore, to ensure that all personnel are contacted and support made available through 'peer support' and that occupational health systems are in place.

Key point

Anticipate problems and pre-empt them with adequate, early, mutual support.

Compulsory debriefing is at best ineffective and at worst may increase later problems.

LATE

Some of those exposed to an incident may suffer the symptoms of *post-traumatic stress disorder* (PTSD). These symptoms may persist for years after the incident. Warning signs include unpleasant flashbacks or nightmares, poor work performance, anxiety, depression, or fear of associated events (such as travelling on a train after a rail incident). Formal psychiatric help may be needed.

In addition, members of staff who were not directly involved in the response to the incident may have psychological issues due to feelings of inadequacy and being unable to help. Consideration must be given to the monitoring of this group of staff as well.

APPENDIX B

The media

INTRODUCTION

The media can, on occasion, be useful to major incident commanders. For example, local radio or television broadcasts can be used to reach off-duty staff or potential blood donors. More commonly, however, the media are regarded as a hindrance. It is now usual for a large number of newspaper, radio, and television reporters to attend the scene of any large incident within a very short time. Initially these are likely to be local reporters, but national and international interest must be anticipated. Firm control is needed, while allowing the media adequate access to report the incident.

AT THE SCENE

The management of the media is the responsibility of the Police. The media expect to be given the opportunity to report and the privilege of access to photograph, film, and talk to key personnel. Uncontrolled, they may contaminate the scene of crime, obstruct the emergency services, and intrude upon the dignity of the injured. If over-restricted, they may resort to unethical tactics to obtain the information they need to meet their production deadlines. However, properly respected, they can be controlled with regular information, interviews with senior officers, and photographic opportunities.

Box B.1 lists the key areas to address that will produce good media relations while maintaining control.

Box B.1: Requirements for effective media handling

- Creation of a media rendezvous point
- Restriction of access to the scene
- Provision of a Media Liaison Officer
- Consideration of the provision of a media centre
- Provision of regular information updates to coincide with television/radio bulletins
- Strict maintenance of an even-handed approach
- Provision of a public relations manager in extended incidents

Media representatives attending the scene should be given a *rendezvous point* which is beyond the outer cordon. This will allow control of all personnel entering the scene to be maintained. Access of media to the scene may be allowed and passes issued to clearly identify the individuals. It is likely that only a limited number will be given this privilege, for security and safety reasons, and the media should be allowed to choose who their representatives will be (picking, for example, a television crew, a newspaper reporter, a radio crew, and a

photographer – known as a ‘media pool’). It is unwise to favour particular representatives, as others will be encouraged to get the information they need by any means, regardless of whether they have to resort to unreliable eye witnesses or threaten the security of the scene. Parking space for outside broadcast units should be considered, so that access routes are not restricted by large vehicles. Rules for aerial photography must be decided upon early and emergency flying restrictions imposed if necessary. Helicopters are commonly used by the media but the resultant noise and downdraft may inhibit the work of rescuers, produce hazards from flying debris, and destroy or alter forensic evidence.

The *Media Liaison Officer* from each of the emergency services should provide information updates at regular, specified intervals, therefore encouraging the media to wait for this information rather than searching for their own. It is important to avoid injudicious suppositions as to the cause of the incident, which cannot fully be known in the early phases of the rescue operation, and to concentrate on commenting on how the rescue is progressing.

This is aided by directing all information through one individual. The media will be offered brief interviews with emergency service commanders and this can include the Ambulance and Medical Commanders. It is wise to prepare a statement rather than allow a free question interview. Box B.2 shows the likely flow of questions and Box B.3 shows a checklist that can be used when preparing for a media interview. The Medical Commander should brief his or her staff on how to react to an approach by the media; estimates of the number of casualties or dead should not be given unless these have been confirmed.

Box B.2: Anticipated progression of questions

- What happened?
- What are the injuries/fatalities?
- What are you doing about it?
- ↓
- Why did it happen?
- ↓
- Who is responsible?

Box B.3: Checklist for a television interview

Before the interview

- Think of your objectives – what are the points you want to get across?
- Ask what the first question will be
- Ascertain what the ‘wind up’ signal is
- Check your appearance

During the interview

- Always assume you are on the air
- Look straight at the interviewer, not the camera
- Avoid jargon, swearing, lying, fidgeting, and losing your cool
- Sell yourself: others will be only too ready to criticise
- Express sympathy for the injured/dead and their families
- Express admiration for the rescue workers and your own staff

After the interview

- Stand still until it is clear you are off the air
- Distribute copies of any prepared statement

A *media centre* should be considered in a large or prolonged incident; it will be the responsibility of the Police and the local authorities to organise this. It may initially be in a command vehicle or a nearby building and will provide a focal point for continuing media coordination. It should contain communications equipment, an area for briefings, an area to monitor current media broadcasts and possibly accommodation for the reporters.

A *public relations manager* can contribute significantly to the smooth handling of the media and running of the media centre. Suitable individuals should be identified in the planning stages and invited to attend management planning meetings.

AT THE HOSPITAL

The emphasis of media attention will often shift from the scene to the hospitals after the initial rescue phase. The hospital's management should make provision for a mini-media centre where the media can assemble, obtain refreshment, and be briefed at regular intervals. Telephones should be available (direct line, avoiding the hospital switchboard). As at the scene, considerate timing of briefings 30–60 minutes before the main news bulletins will be appreciated and will encourage cooperation.

Senior medical and nursing staff should be aware of the vulnerability of patients, relatives, and staff to intrusive interviews and should not allow such interviews to interfere with the welfare of patients and the delivery of care. Statements relating to the condition of individual patients or the hospital's response to the major incident are best made by a senior doctor.

APPENDIX C

Logs

INTRODUCTION

In most domains, the emergency services have a statutory responsibility to respond to and manage major incidents. This will be subject to scrutiny after the event and incident commanders at all levels must be in a position to provide evidence that these responsibilities have been discharged.

Organisations have a corporate responsibility to ensure adequate training and exercising has taken place to support this process.

At an inquiry, individuals and their employing organisation will be asked:

- What was your role?
- Were you appropriately trained to undertake this?
- Were your decisions and actions justifiable?
- Do your logs confirm this?

In order to do this, commanders must ensure that contemporaneous records are maintained throughout the incident.

RECORD KEEPING

Good record keeping does not happen by accident and commanders must be appropriately trained in it.

Records may take the form shown in Box C.1.

Box C.1: Record keeping

- Written/policy logs
- Control room logs
- Voice recordings on and off site
- Electronic logs
- Video evidence

The logs must include the times at which events occurred, what was decided and why, who was consulted and at what level, how decisions were implemented and whether decisions were reviewed, and whether checks on implementation occurred.

The rationale for decisions is likely to be evaluated. In particular, evidence of review and evaluation, options appraisal, consultation with others, consideration of outcomes, and assurances about effectiveness of implementation will be challenged.

Written logs

Written logs are the most common form of record keeping by commanders. Inquiries have often commented on their inadequacy.

‘Unfortunately, it is not possible to examine in detail the London Ambulance Service’s response to the Edgware Road explosion . . . because *records of the response were not maintained*. The time line *provided to us* by the London Ambulance Service contains *no entries* beyond 9.21 am . . . This failure to maintain records is not unique to the Ambulance Service; the London Fire Brigade has also commented . . . on the failure to record information about its response and the need to do so in future.’ [emphasis added]

London Assembly Report of the 7 July Review Committee, 6 June 2006

As part of their planning, organisations need to ensure facilities exist to undertake this logging function. This may require commanders to have a dedicated ‘loggist’ from early in the incident.

Control room logs

In many countries, voice recordings (from initial calls to the end of the incident) will be made automatically. Additional logs, including command and control for a major incident, may also be undertaken by control room staff.

Incident commanders may establish additional control room logs to record further information regarding the incident.

Voice recordings

Voice records may be used outside the control room environment using portable recorders. The likely quality of these recording should be considered. These should not be used as the primary logging system.

Electronic logs

Depending on resources available there may be an opportunity to have scribes detailing log entries electronically. Robust back-up systems are required and data protection issues must be considered.

Video evidence

Video information may be recorded by the emergency services, media, or the public and provided as evidence after the event.

Key point

Information recorded after the event will not have the same weight as records made at the time.

AFTER THE EVENT

Immediate

As soon as practically possible, copies of any logs should be made by each organisation as the original logs may be required as evidence.

Later

Major incidents will often be the subject of some form of formal inquiry. Commanders will be accountable at several levels, for example:

- Internal major incident review.
- Public inquiry.

- Coroner's inquest.
- Parliamentary inquiry.
- Criminal prosecution.
- Media scrutiny.

These are often high-pressure events; however, the better the quality of recording of the history of events, the less stressful this is likely to be. Actions will be judged on the rationality and reasonableness of the decisions, and this will often be established in light of the evidence from the logs.

APPENDIX D

Responsibility for the dead

PRONOUNCING DEATH

At the scene of a major incident it would be usual to regard a casualty as dead if the casualty does not breathe when their airway is opened (Chapter 15) during primary triage (the triage sieve). Any health professional who has been taught the triage sieve algorithm can therefore 'diagnose' death. The process of formally 'pronouncing life extinct' has typically been the role of a medical practitioner at a later stage in the incident.

In the company of a police officer, a medical practitioner will need to carry out a more thorough conventional examination to formally pronounce that death has occurred. This would include confirming the presence of apnoea, asystole (no palpable pulse), and fixed dilated pupils. Since the death is sudden and typically unexpected, the case will be subject to coronial investigation and the provision of a 'death certificate', defining the cause of death, will be done by the Coroner. This will usually involve a post-mortem examination and usually requires an inquest.

LABELLING THE DEAD

It is important to clearly label the dead using the triage card system when this has been determined. If this is not done, rescue personnel will repeatedly revisit and reassess a body, wasting valuable clinical time when resuscitation capacity is limited.

On diagnosis of death, a 'Dead' triage label should be fastened to the patient in a clearly visible position. The information that should be recorded is shown in Figure D.1.

The Medical Commander may appoint a medical practitioner to the role of Mortuary Officer; it will be this doctor's responsibility to formally pronounce death, label the bodies at-scene, and (in collaboration with the Police Service) establish a Body Holding Area.

PROBLEM / MAIN DIAGNOSIS
DEAD
Death Pronounced: _____
Time: _____ Date _____
Name of Doctor: _____
Signature _____
Witnessed by PC: _____
Number: _____
Name: _____

Figure D.1: Triage card record of death

MOVING THE DEAD

A major incident will often be regarded by the Police as a potential scene of crime. The dead form part of the forensic evidence. The position they are found in may be important, both to the criminal investigation and also to determine identity. For these reasons, the dead (or body parts) should not be moved without both Police authorisation and appropriate documentation. Each separate body part should be labelled without assumption as to which body a part belongs to.

If it is necessary to move a body to gain access to the living, then the urgency of the situation should be assessed. Saving life has precedence over the preservation of forensic evidence, so movement of a body without permission for the delivery of life-saving treatment to a live casualty is justifiable (Box D.1).

Box D.1: Reasons for moving the dead

- To gain access to the living and aid in their rescue
- To prevent destruction of a body or body part by fire or chemical

The Police should be notified as soon as possible. The original position should be recorded as clearly as possible and a note should be made of where the body (or part) has been moved to.

In some exceptional circumstances, it may be necessary to dismember a body, perhaps to gain essential rapid access to a live casualty. A description of injuries to the body (possibly photographic) will be important, together with a clear outline of the actions undertaken by the rescuers.

TEMPORARY MORTUARY

When a body or body part is moved from the scene (possibly via a Body Holding Area), it is eventually transported to a mortuary where a forensic pathologist can examine it. In smaller incidents, this may be a fixed and permanent facility identified for the purpose, but in larger events a temporary mortuary may be established. The decision as to whether a temporary

mortuary is established is usually made because of the need to identify bodies when identification is difficult. The Police will have total control of the temporary mortuary. The medical issues to consider when choosing a temporary mortuary are listed in Box D.2.

Box D.2: Temporary mortuary

- Capacity
- Low ambient temperature
- Privacy and security
- Adequate sanitation and waste handling
- Changing and rest areas for staff
- Facility for X-ray and other forensic pathology investigations
- Link to the Family Assistance Centre and Welfare Centre

For most incidents, potential temporary mortuaries have often been identified at the planning stage. Large public buildings such as sports halls or aircraft hangers are often appropriate. A temporary facility may be constructed specifically for the purpose and be removed when this work is completed.

If an incident occurs some distance from a designated area, a Body Holding Area may be set up at the scene. This must be out of sight of the media and the public, and should preferably be protected from the elements. A number of refrigerated lorries might be options to consider.

All live casualties should be evacuated from the scene before transport is used for the dead.

IDENTIFYING THE DEAD

This is the responsibility of the Police. It may be possible to identify the individual from clothing, personal documentation, or personal effects. Caution must be taken as a coat or other garment may have been placed over a body to provide some dignity and may not belong to that body. Personal effects such as rings, watches, or wallets must not be removed from bodies for safe keeping since these may also be clues to the deceased's identity.

Because of the possible uncertainty, the identification of a body by simple means such as personal effects is rarely sufficient and techniques such as forensic dentistry and DNA matching may also be used.

Information on the identity of people who may have been involved in an incident is often available to friends and relatives. Typically a 'help line' is established as a point of contact with information being collated by the Police Casualty Bureau. Specific proformas and questioning systems are used to query contacts to help determine the identity of the dead.

APPENDIX E

Radio use and voice procedures

INTRODUCTION

After reading this appendix you should understand the techniques used to carry out the following practical procedures and voice procedure (Boxes E.1 and E.2). This appendix will discuss the use of very high frequency (VHF) radios, ultra high frequency (UHF) radios, and TETRA (airwave) hand-held terminals. The process of voice procedure does not differ but the practical procedures will (Chapter 13).

Box E.1: Practical procedures

- Turn the radio on and transmit a message
- Change the radio battery

Box E.2: Voice procedure

Radio shorthand

- Glossary
- Phonetic alphabet
- Numbers and figures

Basic message handling

- Initiating a call
- Replying to a call
- Replying to a group call
- Ending a message
- Offering a message

Advanced message handling

- Corrections
- Repeating a message
- Long messages
- Relaying a message

The radio check

RADIO USE

Turning the radio on and transmitting a message

The reader should refer to Figure E.1, which shows a hand portable VHF radio.

1. Turn the radio on; many models will produce an audible 'beep'.
2. Select the channel you require.

Local highlights: Channel usage

3. *Listen* (or *look* at the 'channel busy' light) before transmitting to ensure that the channel is clear.
4. Transmit by depressing the 'press to talk' (PTT) button on the side of radio. Wait 1 second before starting the message.
5. Hold the radio upright about 4–5 cm from your mouth and speak.
6. Release the PTT button to listen to the reply.

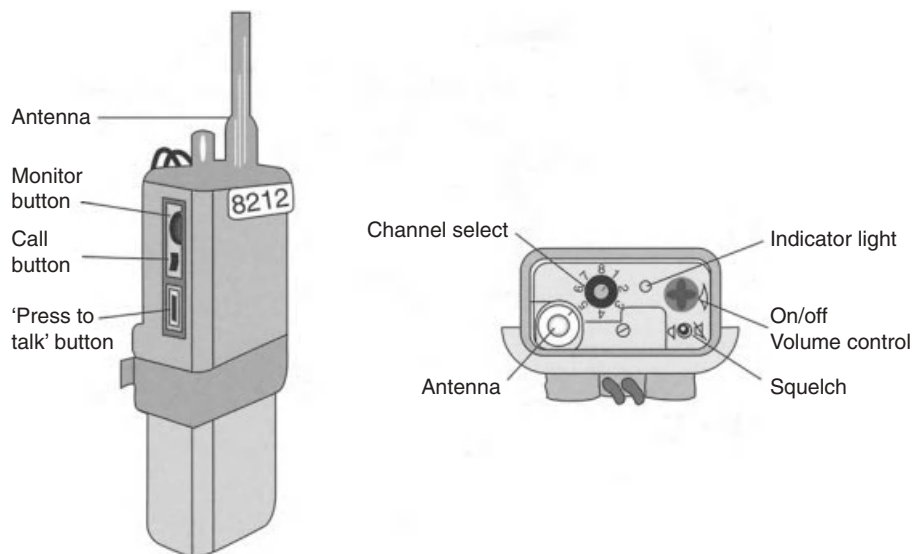


Figure E.1: The radio working parts

Changing the battery

If the messages you receive are crackled or broken, it is likely that the battery is low. Some radios will show a 'battery low' warning on the LCD (liquid crystal display) screen and/or give an audible warning. If the battery is low, change it as follows:

1. Turn the radio off.
2. Engage the battery release switch and slide off the battery.
3. Slide on the new battery.
4. Turn on the radio.
5. Perform a radio check.

VOICE PROCEDURE

Principles

The fundamentals of a good radio message are:

- Clarity.
- Accuracy.
- Brevity.

Clarity can be achieved by attention to the following characteristics of the voice:

- **Rhythm.**
- **Speed.**
- **Volume.**
- **Pitch.**

Remember *RSVP*.

The *rhythm* should be steady; the *speed* should be slightly slower than normal speech; for adequate *volume* it is not necessary to shout but whispering will be ineffective unless the radio has a specific whisper mode; and the best *pitch* is that of a female voice, so men (with lower voices) should make a conscious effort to raise their pitch.

To achieve *accuracy* and *brevity* requires discipline and practice. Air time is a valuable commodity. The system of radio voice procedure shown in this book is based on military voice procedure but examples of alternative systems are given where appropriate.

Radio shorthand

Glossary

Brevity can be facilitated by using a number of special words that act as a verbal shorthand. These are given in Box E.3.

Box E.3: Radio shorthand

Over	The speaker now wishes the receiver to talk
Out	The conversation is finished
OK	I understand
Roger	I understand
Go ahead	I am ready to receive your message
Send	I am ready to receive your message
Acknowledge	Tell me you have received my message
Say again	Repeat what you said
ETA	Estimated time of arrival
ETD	Estimated time of departure
Wait	I cannot reply within the next five seconds
Wait out	I cannot reply, I will contact you later
Standby	Stay alert, further information to follow

Other words may be in use locally. If so, it is essential that their full meaning is known and understood by all the users of the net.

Local highlights: Local radio shorthand phrases or words

The following terminology is *not* acceptable (Box E.4).

Box E.4: Unacceptable radio shorthand

Over and out	It is either over or out
Rodger dodger	Slang
Ten four	Slang

It is also not appropriate to swear on the radio and it is advisable to avoid comedy ('send the Rover over, over!'). It is wise to remember that the radio net will be monitored by Ambulance Control and messages will be recorded, may be monitored by the media and will be analysed in any subsequent inquiry.

Phonetic alphabet

Difficult or important words should be spelt to avoid confusion. Rather than saying 'ay, bee, see, dee' a phonetic alphabet is used to give each letter a distinct sound: 'alpha, bravo, charlie, delta . . .'. These are listed in Box E.5.

Box E.5: The NATO phonetic alphabet

A Alpha	N November
B Bravo	O Oscar
C Charlie	P Papa
D Delta	Q Quebec
E Echo	R Romeo
F Foxtrot	S Sierra
G Golf	T Tango
H Hotel	U Uniform
I India	V Victor
J Juliet	W Whiskey
K Kilo	X X-ray
L Lima	Y Yankee
M Mike	Z Zulu

Numbers and figures

For accuracy, the pronunciation of numbers is stressed (Box E.6). Long figures are spoken whole, then repeated digit by digit.

Key example

Mike One, I have nineteen, figures wun-niner, casualties for evacuation, over.

Control, Roger, figures wun-niner casualties for evacuation, over.

Mike One, OK, over.

Control, out.

Box E.6: Number pronunciation

1	Wun	6	Six
2	Too	7	Seven
3	Thuree	8	Ate
4	Fower	9	Niner
5	Fiyiv	0	Zero

It should be stressed that although this is the ideal method of pronouncing numbers, it can be as easily achieved by saying each number clearly and with limited accent.

A common mistake is to add an 'a' to the end of each number, e.g. wuna, tooa, thureea, etc. and this should be avoided.

Basic message handling**Initiating a call**

1. To start a message, say the call-sign of the station being called.
2. Next state who you are.
3. Finish the message with 'over' (to indicate that the other station can now speak).

Key example

Control, from Mike One, over.

It is also acceptable to initiate a message in the following ways.

- Mike One to Control, over.
- Hello Control, this is Mike One, over.

Replying to a call

Prefix each message you send with your own call-sign.

Key example

Control, go ahead, over.

Mike One, send resupply of bandages to Casualty Clearing Station, over.

Replying to a group call

Occasionally Control or another station will call all the stations on the net. Replies should be in alpha-numerical order. Each station is allowed 5 seconds during which to reply. After this time the next station should reply.

Key example

All stations Mike from Control, acknowledge my last message, over.

Mike One, OK, over.

Mike Two, OK, over.

5-second pause

Mike Four, OK, over.

Control, OK, out to you Mikes One, Two, and Four, Mike Three from Control, acknowledge my last message, over.

Mike Three, OK, over.

Control, OK, out.

Note the use of the phrase 'out to you' in this example to indicate to selected stations that there is no further requirement to reply.

Ending a message

A conversation can be finished by using the word 'out'. Only one user needs to say 'out'.

With twin frequency transmissions it is important that Ambulance Control always says 'out', even where Control did not initiate the message. This is because all stations can hear Control but not each other and will wait until they hear the word 'out' to know that they can send a message. This becomes unnecessary when transmitting on an open channel but it is still appropriate to maintain radio discipline.

Key example

Mike One, end of message, over.

Control, Roger, out.

Offering a message

Theoretically, on a constantly monitored radio net it should not be necessary to 'offer' a message. That is to say, you should be able to move straight into the text of the message. However, experience shows that messages *do* need to be offered as the recipient is not always fully alert and may not be in a position to write things down.

1. Initiate the call as shown above.
2. Indicate that you have a message to send.
3. Finish the transmission with 'over'.
4. Send your message when prompted.

Key example

Control from Mike One: message, over.

Control, go ahead, over.

Mike One, require resupply of dressings at Casualty Clearing Station, over.

Control, Roger, resupply in figures one-zero minutes, over.

Mike One, OK, out.

Advanced message handling**Corrections**

From time to time you will make errors when sending a message. These errors must be corrected as follows:

1. As soon as an error has been made, say 'wrong'.
2. Follow this with the correct message.
3. If necessary, repeat the correct message for clarity.

Key example

Control from Mike One, I have now moved to grid figures three-two-one-seven-six, **wrong**, grid three-two-one-**two**-seven-six, **I say again** three-two-one-two-seven-six, over.
Control, three-two-one-two-seven-six, over.
Mike One, correct, out.

Repeating

On a military radio net the instruction 'say again' is used for a message to be repeated; 'repeat' is reserved for artillery to fire again! On a civilian net it is acceptable to say 'repeat' to have a message repeated.

1. As soon as the message ends (and the sender says 'over') ask for the message to be repeated.
2. Finish your transmission with 'over' and wait for the repeat.

Key example

Mike One from Control, move now to command vehicle, over.
Mike One, say again, over.
Control, move now to command vehicle, over.
Mike One, Roger, over.
Control, out.

Repeating messages wastes air time. It is critical that individuals monitor their radio constantly so that message are picked up on their first transmission.

If only part of a message needs to be repeated, the part that requires repeating should be specified (Box E.7).

Box E.7: Instructions for repeating part of a message

Say again all after	Repeat everything after the specified word
Say again all before	Repeat everything before the specified word
Say again all between	Repeat everything between the specified words

Key example

Mike One from Control, incident commanders briefing at police command vehicle in figures two-zero minutes, over.
Mike One, say again all after **police**, over.
Control, command vehicle in figures two-zero minutes, over.
Mike One, Roger, over.
Control, out.

Long messages

Occasionally it is necessary to send a long message on the radio. A METHANE message is an example of this (Chapter 14). Long messages should be broken down into a series of shorter

messages and the receiver should be asked to acknowledge that they have received each part. Not only does this ensure accuracy but it gives the opportunity for others on the net to interrupt if they have a more urgent message.

Some emergency service radios are programmed to break transmission after a fixed time (e.g. 20–30 seconds), although this is unusual for Ambulance Service radios.

1. Offer a message and indicate that a 'long message' is to follow.
2. At frequent intervals (never longer than 30 seconds) ask the receiving station to 'acknowledge so far'.
3. Repeat any message fragment not received.
4. When certain that the message fragment has been correctly received, send the next part of the message.
5. Repeat steps 2 to 4 until the entire message has been sent.
6. End the message.

Key example

Control from Mike One, long message, over.

Control, go ahead, over.

Mike One, major incident declared time and figures one-five-zero-zero hours, over.

Control, major incident declared, over.

Mike One, exact location, railway cutting two miles west of Farnham, grid figures two-six-five-six-nine, over.

Control, exact location, railway cutting two miles west of Farnham, grid figures two-six-five-six-nine, over.

Mike One, passenger train derailment, fire present and potential electricity hazard, over.

Control, you have passenger train derailment, with fire and potential electricity hazard, over.

Mike One, access via Lord Road, spell Lima-Oscar-Romeo-Delta, Road from the south, rendezvous at Queen Victoria Public House, over.

Control, access via Lord Road from the south, rendezvous at Queen Victoria Public House, over.

Mike One, number of casualties estimated figures two-zero-zero, all services required, make ambulances twenty, over.

Control, number of casualties estimated figures two-zero-zero, all services required, make ambulances twenty, over.

Mike One, message ends, standby for further information, out.

Relaying a message

If all call-signs are not in contact with Control, it is sometimes necessary for messages to be passed to one call-sign via another. Each stage of this process must be accurate.

1. The initiator of the message offers a message to an intermediary.
2. The initiator indicates that message is to be passed to another call-sign (the final recipient).
3. The message is passed to the intermediary.
4. The intermediary acknowledges the messages and ends the call with the initiator.
5. The intermediary offers the message to the final recipient and indicates that the message is being passed from the initiator.
6. The message is passed to the final recipient.
7. The intermediary ends the call to the final recipient.
8. The intermediary calls the initiator and indicates that the message has been passed.

Key example

Mike One from Control, message for Mike Four, over.
 Mike One, send, over.
 Control, message for Mike Four, send two drug packs to the first carriage, over.
 Mike One, OK, out to you . . . Mike Four from Mike One, message from Control, over.
 Mike Four, send, over.
 Mike One, from Control, send two drug packs to the first carriage, over.
 Mike Four, OK, over.
 Mike One, out to you . . . Control from Mike One, message passed, over.
 Control, Roger, out.

The radio check and signal strength

It is important that all call-signs on a net know that they can communicate reliably with Control. This is achieved using the *radio check*. Radio checks can be initiated by Control or by other call-signs.

1. Initiate a call to the station or group of stations to be checked.
2. Indicate that a 'radio check' is being performed.
3. Finish the message with 'over'.
4. Await replies.
5. Indicate the results of the check to the station group of stations.
6. End the call.

Key example

All stations Mike from Control, radio check, over.
 Mike One, OK, over.
 Mike Two, OK, over.
 Mike Three, OK, over.
 Control, OK, out.

Stations should answer in numerical sequence with up to 5 seconds between stations (at 5 seconds the next station in sequence should answer). If a station cannot be clearly heard, the key words in Box E.8 are used.

Box E.8 Key words when the radio check is not OK

Difficult	Most words are heard but there is interference
Broken	Messages are heard intermittently
Unworkable	Only occasional words are heard – or interference only
Nothing heard	Nothing is heard at all

APPENDIX F

The hospital response

INTRODUCTION

The hospital's response to a major incident is dealt with in detail in *Major Incident Medical Management and Support: the practical approach in the hospital* and readers are referred there for a full account. This appendix provides an introduction for pre-hospital providers.

COMMAND AND CONTROL

It is important to ensure that the hospital plan specifies who is in control of the response and how the early (on-site) controllers will hand over control to more senior personnel who arrive later. In most cases control will be via a senior doctor, a senior nurse, and a senior manager working together to coordinate the response.

Local highlights: Command and control of the hospital response

Key point

The Health Service response at the hospital is controlled by the hospital coordination team.

KEY AREAS

A senior nurse should ensure that the clinical areas are prepared to receive casualties and should delegate the running of each area to a senior nurse from that area. The key clinical areas are listed in Box F.1.

Box F.1: Key clinical areas

- Triage
- Priority 1 (**immediate**) and 2 (**urgent**)
- Priority 3 (**delayed**)
- Pre-operative and post-operative ward
- Admissions ward
- Theatres
- Intensive care

A senior manager will be responsible for coordinating the non-clinical areas and requirements. The key administrative areas and their uses are listed in Table F.1.

Table F.1: Key administrative areas

Key area	Use
Staff reporting	All staff report here
Volunteer reporting	Students and volunteers report here
Hospital Information Centre	Information on all casualties, admitted or discharged, collated here
Discharge and reunion area	Relatives/friends of those being discharged to wait here
Bereaved relatives area	Breaking of bad news and counselling
Hospital enquiry point	Directed enquiries about patients to be made here
Press area	Media briefed here
Blood donation	If required

STAFF CALL-IN

Staff will be called in using a cascade system; those key staff called first will arrange for others from their department to be called. The switchboard will usually have the responsibility to alert the key staff, but this will be done by role rather than name; staff lists held for this reason must be kept up to date. If applicable, direct dial lines or public pay phones in each department should be used for the staff call-in, thus avoiding the busy hospital switchboard. In some departments, the cascade system may be achieved by staff telephoning each other from home.

PREPARATION

Areas identified for immediate reception of casualties should be cleared as far as is practicable. Patients waiting for minor treatment in the emergency department should be advised to attend their general practitioner, or to attend a hospital distant from the incident. Wards designated as pre-operative reception and post-operative recovery should be cleared. Inpatients in the designated wards should be discharged where appropriate, or moved to low-dependency areas.

ACTION CARDS

On arriving at the hospital, staff should attend the staff reporting points for task allocation. Those in key positions should be familiar with the hospital's major incident plan and therefore aware of their initial responsibilities. If this is not the case, then the action cards giving a brief description of the duties of the individual will be distributed. An example is given in Box F.2. The action cards for key personnel will be part of the main hospital plan; those for junior members of staff may have to be prepared by individual departments.

Box F.2: Example of an action card for a senior emergency physician**Responsibilities**

- Overall control of the reception areas
- Staffing of key appointments in the reception areas
- Control of initial reception and management
- Initial triage of major incident casualties
- Assistance to the Medical Coordinator after the reception phase has ended
- Operational debriefing of emergency department medical staff involved in the major incident response

Immediate action

- Assume control of the reception areas
- Ensure preparation of the reception areas is complete
- Ensure that the following posts are filled: senior surgeon and senior physician. If not appoint suitably senior doctors until the key personnel arrive
- Assess the number of casualty treatment teams required immediately in the reception areas and inform the Medical Coordinator
- Ensure major incident casualties are triaged as follows:
 - Priority 1, immediate:** casualties requiring immediate life-saving procedures
 - Priority 2, urgent:** casualties who will require surgery or other intervention within 6 hours
 - Priority 3, delayed:** less serious cases not requiring immediate treatment
- Continue to assess the situation and, if necessary, establish a further priority as follows:
 - Priority 4, expectant:** casualties whose injuries are so severe that they cannot survive in the circumstances
- As further casualty treatment teams are required inform the Medical Coordinator
- As casualty transfer teams are required inform the Medical Coordinator
- Liaise with the senior nurse in the emergency department regarding senior nurse staffing and supplies in the reception areas
- Liaise with the Senior Duty Clerk in the emergency department regarding documentation in the reception areas
- Constantly monitor the triage, treatment, staffing, documentation, and supplies in the reception areas
- Once the reception phase is over assist the Medical Coordinator to control the hospital response

Priorities during the incident

- Overall control of the reception areas
- Triage in the reception areas
- Control of staffing in the reception areas
- Control of treatment in the reception areas
- Control of documentation in the reception areas
- Control of supplies in the reception areas
- Assisting the Medical Coordinator to control the hospital response

TEAM ORGANISATION

The effective management of the hospital response is centred on the organisation of personnel into teams with specific tasks. These teams include the following:

- Casualty treatment teams.
- Casualty transfer teams.
- Operating teams.

The treatment and transfer teams will be based in the initial treatment areas in and around the emergency department. These teams should be controlled by a team coordinator. The team coordinator will be located in the reporting area and will form medical and nursing staff into teams as they become available.

Local highlights: Team organisation

Key point

An effective hospital response is centred around forming personnel into teams with particular tasks.

TREATMENT

In a major incident there will be surgical and medical casualties. The proportions will depend upon the nature of the incident. A bomb will produce multiple surgical patients, whereas a crowd crush will produce multiple patients requiring cardiopulmonary resuscitation. Team composition will have to reflect the nature of the demand. Clinical activity in each area will be controlled by senior clinicians. In the priority 1 (immediate) area there will be a senior surgeon (usually the duty consultant surgeon) and a senior physician (either a consultant physician or intensive care specialist), who will direct the treatment and transfer teams. These senior clinicians will also supervise treatment within the priority 2 (urgent) area. Responsibilities in the priority 3 (delayed) area can be separate from this.

The senior surgeon should ensure that the highest priority surgical casualties are transferred directly to the operating theatres; once the capacity of the theatres is reached then further casualties should wait for surgery on the pre-operative ward. The senior surgeon should also appoint deputies to oversee activity in the operating theatres and on the pre-operative ward. Specifically, the senior surgeon in theatres will coordinate the operating teams, and any specialist surgeons needed for particular procedures; the senior surgeon in pre-op will coordinate the treatment teams on the pre-operative ward. Both will keep the senior surgeon informed of surgical matters in their area.

The senior nurse should nominate deputies to ensure that the pre-operative and surgical areas are adequately prepared and staffed to receive casualties. Following surgery, casualties will be transferred back to the pre-operative/post-operative ward, but if this is full then a further ward must be prepared. In hospitals where the emergency department has a 'short stay' or 'observation' ward or when there is a surgical assessment unit, then this ward is ideal for designation as the pre-operative/post-operative ward as it can usually be cleared rapidly in the event of a major incident. Additional wards can then be in the main hospital.

The senior physician should direct the transfer of the most seriously ill patients to the intensive care unit. The duty intensive care consultant should assess the bed availability in the

department and in surrounding hospitals; when the immediate unit is full, he or she should discuss the transfer of patients to intensive care units in other hospitals.

Those casualties who do not require immediate surgery or intensive care facilities will be transferred to an admissions ward.

Local highlights: Hospital treatment

STAFF RESPONSIBILITIES

Emergency department

The procedures for declaring a major incident and the immediate actions of the emergency department staff on receiving a major incident alert message are described above. It is worth restating that if a major incident has not been recognised by the Ambulance Service and declared at the scene, or if casualties arrive by self-evacuation at a nearby hospital very rapidly after the incident, then the emergency department must declare a major incident. In some instances it may be necessary only to activate a limited response of additional emergency department staff – this would be done by the duty emergency physician.

Many medical and nursing staff who are assigned to work in the treatment and transfer teams based in the emergency department will be unfamiliar with the detailed layout and, in particular, where equipment can be found. For this reason it is important to identify regular emergency department staff with a distinctive tabard so that they can provide assistance to those less familiar with the working environment.

Other departments

Each department is responsible for maintaining an up-to-date list of its doctors and nurses who can be called in from home in the event of a major incident. Junior medical staff resident within the hospital can be alerted by tannoy or pager and initially can institute the call-in of senior staff who are *on duty* at home. A member of staff can then be nominated to call those who are off duty, utilising a cascade system.

When staff arrive at the hospital, it is important that they do not simply go to their ward or department, but that they attend the staff reporting areas. Here they will be logged and senior personnel can be allocated key administrative roles if these are unfilled. Tabards and actions cards will be issued and staff directed to the team coordinator for allocation to a casualty treatment or transfer team, or to the senior surgeon for allocation to an operating team.

Transfer teams are required to look after those patients moving from the high-dependency areas (priority 1 and priority 2) to the operating rooms, pre-operative ward, or intensive care unit. Additionally, teams may be necessary for the secondary transfer of patients, for example to a neighbouring hospital's intensive care unit or to a specialist burns unit.

DOCUMENTATION

At the scene the casualty will have a triage label attached to them. If they are evacuated rapidly it is likely that very little, if any, additional information will be recorded. However, those casualties who have been trapped at the scene or received treatment in the Casualty Clearing Station

may have important clinical details regarding injuries, treatment, and serial observations recorded on this label. It is therefore important that if new documentation is instituted at the hospital, the pre-hospital information is not removed, but is kept with the patient.

In the initial reception area, each patient will be issued with major incident documentation and given an identification band with the corresponding number, which must not be removed under any circumstances. The senior nurse in each of the treatment areas is responsible for completing a casualty statement form at regular intervals and returning this to the Hospital Information Centre: the Admissions Officer can then maintain an accurate casualty state board.

Local highlights: Major incident documentation

APPENDIX G

Human factors

INTRODUCTION

There are a huge number of intrinsic and extrinsic factors that affect the performance of individuals and teams working in complex, high-pressure environments. Some 20 years ago, the aviation industry started to recognise that a knowledge of these factors, and how they impact on human performance, was critical to the maintenance of flight safety. Today, all airline staff undergo a rigorous *human factors* training programme that equips them with the tools to ensure that consideration of the safest option is at the centre of every decision. More recently, there has been a developing movement within health care to embrace these principles in pursuit of the highest quality and safest health care that we can provide.

This appendix provides a brief overview of the human factors that can affect the performance of individuals and teams.

HUMAN ERROR

Humans make mistakes. No amount of checks and procedures will mitigate this fact. Therefore it is vital that we aim to work in a way that, wherever possible, minimises the occurrence of mistakes and ensures that when they do occur, we minimise the chance of the error resulting in patient- or staff-related safety incidents.

ERROR CHAINS

Patient safety errors do not usually occur because of single mistakes. Behind any identified error (A) that leads to an untoward event (B), there is a sequence of factors that set up the conditions such that error A resulted in event B and without which event B would not have occurred. This is known as the error chain. James Reason showed this pictorially as what some would call the 'Swiss cheese' model (Figure G.1).

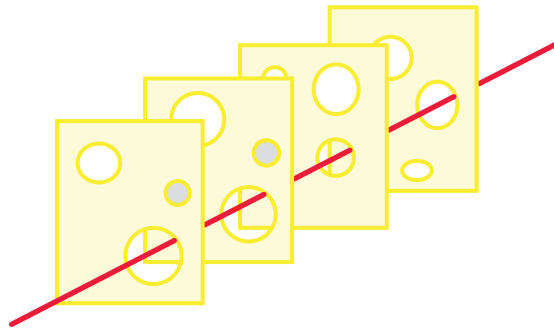


Figure G.1: The 'Swiss cheese' model

Each of the slices of cheese represents barriers which would, under ideal circumstances, prevent A leading to B. However, all checks and balances can fail at some stage. This is represented by the holes in the slices. For A to be followed by B, the holes need to line up through all the intervening slices. Simplistically viewed, the more checks that are put in place the less likely an error is to occur. However, increasing complexity can be counterproductive as humans will avoid or modify multiple steps to make life easier.

By convention, events or conditions that might be seen to be on the facilitative path to a critical incident are referred to as *red flags*. This approach is extremely useful. The more red flags that arise, the greater the risk of an adverse incident occurring and therefore the greater the need to alert the team to stop and review the situation.

COMMUNICATION

Problems with communication underpin a significant proportion of reported critical events. When the speaker and listener do not share the same language, the communication issues are obvious and normal practice would be to use an interpreter to facilitate dialogue. Many recognise the limitations of discussions carried out through a third party. However, little attention is paid to the issues that arise if one of the parties is communicating using their second language. Even when all parties are utilising their native tongue, non-verbal signals can carry as much information and meaning as the words themselves. With these facts in mind, it is not difficult to understand why miscommunication is commonplace. This is particularly true in cross-cultural communications where both verbal and non-verbal elements can be completely misinterpreted and also in situations where no face-to-face contact occurs, such as when a radio is being used.

Communication involves three distinct parts as shown in Box G.1.

Box G.1: Elements of the communication process

The sender	This is the process within which the originator of the message puts together the sentences in their mind in what they perceive to be a meaningful and contextual manner
The channel	This is the medium of communication chosen – verbal, non-verbal, or written
The receiver	This is the process within which the intended recipient makes sense of the information provided and due to multiple barriers, including euphemisms and localised terminology, is highly prone to distortion

The resulting outcome in a noisy, highly pressured major incident can be poor information exchange.

A technique that can be easily introduced to generate an improvement in communication is the *feedback loop*. The feedback loop is a process within which the receiver repeats the message back to the sender to acknowledge and clarify that it has been correctly deciphered. It is quick and simple, and easy to implement.

Body language and hierarchy

It is important to be aware of non-verbal signals. Postures that say 'I'm bored', 'I'm tired', or 'I don't value you' can serve to prevent the passing on of a key piece of information. The presence of a rigid hierarchy can be particularly dangerous, promoting a culture where junior staff do not feel empowered to speak directly to senior staff. Whilst clarity in command is important in major incidents, this needs to be balanced against the need to communicate freely.

Speaking up

A useful communication tool, utilised by the airline industry, is shown in the box below. This structure can be used by any person who is concerned that they have information that might be important to others on the team. The levels *probe*, *alert*, *challenge*, and *emergency* are utilised sequentially to express increasing concern. If a disaster is imminent, it is entirely appropriate to use the challenge or even emergency stages without recourse to the initial ones. This approach becomes even more powerful when embedded in working practice as both the speaker and the listener should recognise the level of the communication and react appropriately.

Stage	Level of concern
P Probe	<i>I think you need to know what is happening</i>
A Alert	<i>I think something bad might happen</i>
C Challenge	<i>I know something bad will happen</i>
E Emergency	<i>I will not let it happen</i>

SITUATIONAL AWARENESS

Good situational awareness is achieved when we have sufficient and correct information, have interpreted it correctly, and correctly project the outcome of an intervention into the future based on our current knowledge. If we have insufficient or incomplete information, we can draw the wrong conclusions about what is going on.

The way we perceive a particular situation is affected by the information conveyed via our own senses, our past experience, our level of alertness, our current workload, and the influence of intercurrent distractions. A common trap is to only see or register the information that fits in with a current mental model. This is known as a *confirmation bias*. When this occurs, information that confirms preconceptions or current hypotheses is favoured regardless of whether the information is true.

It is vital that everyone understands the concept of situational awareness and continually questions their own thought processes and those of others around them. It is also vital that the team share their impressions of the current situation. There is good evidence that the situational awareness of a well-functioning team is actually greater than the sum of its individual parts. This may be in part due to the elimination of bad data. Information or comments by others that challenge a current mental picture should be treated as a trigger to consider whether situational awareness is lacking. A discussion of the disparity should uncover the true picture. Problems occur when individuals either ignore or rationalise the errant data to fit into their current picture of the world rather than treat it as a challenge.

FATIGUE

Tiredness makes it more difficult to concentrate, slows reactions, and may affect mood; impatience, disinterest, and irritability can result. It is not difficult to appreciate that this is likely to impact negatively on the ability to function both as an individual and as part of a team.

Recognition of the impact of fatigue on the ability to perform carries with it important personal responsibilities. People should look to arrive at work rested and prepared for the day ahead. If unforeseen events intervene that result in us being unfit for work in any way, it is vital that we each take responsibility for flagging it up to colleagues and managers. They, in turn, must take appropriate steps to ensure that anyone reporting such concerns is supported and, where necessary, allowed to step down from front line duties until fit.

The discussion above is primarily focused on tiredness or fatigue due to lack of sleep. Illness, use of medications, alcohol, and personal stress can all manifest in a similar manner and should be sensitively examined and managed accordingly.

DECISION MAKING

Good decision making requires the assessment of all aspects of a problem, identification of the possible responses to the problem, consideration of the consequences of each of those responses and, finally, weighing up the advantages and disadvantages in order to draw a conclusion. This is followed by communication of the decision.

Good situational awareness is a basic prerequisite of this process. To achieve this, the decision maker must ensure they have all the key information. It will be gathered through a combination of first hand data and through two-way communication with the team. This highlights the need for continuous Scene Assessment. Decision makers should be alert to ambiguities or conflicting information. Any inconsistent facts should be treated as a potential marker for faulty situational awareness and never be brushed off as unimportant anomalies.

Unless there are time pressures, no decision-making process should be concluded until the team is satisfied they have all the information and have considered all the options. Where time is a pressure, a certain amount of pragmatism must be employed. There is plenty of evidence to confirm that practice and experience can mitigate some of the negative effects of abbreviating the decision-making process. Those making decisions under such circumstances need to remain consciously aware of the short-cuts they have taken. They should be ready to receive feedback from their team, particularly if any member of the team has significant concerns about the proposed course of action.

As discussed above, it is vital that team members feel able to raise their concerns and that the decision maker values and considers them appropriately.

LEADERSHIP: PEOPLE AND BEHAVIOURS

A discussion of the ways to optimise team performance on the basis of personality is a book in itself. Suffice to say, a degree of common sense goes a long way. Wherever possible, the adoption of a facilitative role can serve to draw the best from all members of the team. In ideal circumstances, every opportunity should be taken to debrief teams after an episode of working together. This can be enhanced where there is opportunity for the team to practice and reflect on their interactions in a simulated environment.

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