Reviews in Medicine

Accident and emergency medicine – II

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Triage

The principle of prioritization by degree of urgency obviously benefits patients whose condition is critical. This practice should be instilled in all who work in accident and emergency medicine. The Patients' Charter³⁰⁰ highlights the importance of triage and states that patients should be seen immediately and their need for treatment assessed. Triage derives from the French word meaning 'to sort' and the term is familiar both to doctors working in the forces and to those in accident and emergency medicine.^{301–305} In the context of health care provision, triage has been utilized for decades by the armed forces to sort battle casualties into orders of priority for the purpose of treatment. Subsequently, the system has proven to be of great benefit to patients treated by the emergency services.

The practice of triage has been shown to decrease waiting time and to utilize resources more effectively, thus increasing patient satisfaction. As a consequence of having been triaged, anxiety is reduced and the patient and accompanying family members are happy that the victim has been assessed by a suitably qualified person.^{306–308} A recent publication, however, has expressed some reservations.³⁰⁹

Triage should allow for the early identification of complications as well as providing an opportunity to educate the patient in the correct use of the facilities in that the so-called 'inappropriate' attender can be directed to his or her general practitioner where this is the correct course of action.^{310–314}

At present there is no uniform national policy on triage and the responsibility for running local schemes is accepted by the health authority with protocols and guidelines drawn up at that level.³¹⁵

There exists a need for a more formal system of education for the post-registered nurse in the function of triage.^{307,316} The method of education existing at present ranges from a series of postal 'triage dilemmas' to a formal programme in triage complete with written examination.^{317,318} Studies show that nurses consistently give patients a higher priority than do clinicians.^{319,320}

Telephone triage

It is common practice amongst paediatricians in the United States to provide advice over the telephone. Guidelines with protocols exist which are laid down by the American Pediatric Association.^{321,322}

Protocols have been developed for use by a nurse practitioner to provide telephone triage³²³ and this concept of 'extended triage' has been adopted in Preston's Accident & Emergency (A & E) Department^{324,325} where general practitioners, other primary health carers and prospective patients are encouraged, where practicable, to telephone the department and speak to the triage nurse before they attend. The triage nurse will then discuss the appropriateness and timing of the visit. Implementation of such a policy may be one answer to the unpredictable and increasing heavy workload.

In conclusion, triage acknowledges the principle of planned patient care and begins a process which is logical and systematic in its approach to nursing in the A & E Department. Triage is essential if accident and emergency nursing is to be practised well and indeed, since the Patients' Charter, such a service will be expected.

The accident and emergency nurse specialist

Nursing staff in accident and emergency departments are now taking on more 'extended roles'. The hope is that these additional skills will make for more rapid and efficient patient care, improve the

job satisfaction of the nursing profession and ensure more efficient use of medical time. The term and role preferred by the British Association for Accident and Emergency Medicine (BAEM) is the accident and emergency nurse specialist.³²⁶ This nurse would have a range of skills all of which require separate teaching, testing and certification and are listed below: (1) triage; (2) treatment of minor injuries and referral back to general practitioners if more appropriate; (3) ordering of simple X-rays; (4) resuscitation skills including Advanced Trauma Life Support (ATLS) and Advanced Cardiac Life Support (ACLS); (5) suturing; and (6) plastering.

Nurse practitioners (NP) have been introduced to A & E departments in an attempt to alleviate the waiting times caused by ever increasing numbers of patients.³²⁷ The NP was established in the United States in the 1960s and has been evaluated in a number of different settings^{328–333} both in family and hospital practice. Studies have shown that patient satisfaction is high after treatment with NPs^{334–336} and this has led to the concept being extended to the accident and emergency department.^{337–341} Now the NP's role in the emergency department is expanding with ideas such as the implementation of fast-track nurse practitioners³⁴² and their use with the trauma team.³⁴³

In the UK, interest in NPs started in the 1980s with work at Oldchurch Hospital, Romford.^{344–346} The legal position in this country has not yet been precisely defined and NPs are required to act within strict protocols approved by their health authorities.³⁴⁷ In the USA, the NPs still have difficulty with existing prescribing legislation³⁴⁸ and there is marked variation from one state to the next.³⁴⁹ At present, no nationally agreed system of training exists in the UK but the Royal College of Nursing has made recommendations.³⁵⁰

There is also some dispute as to the precise role of the NP. However, a good definition has been formulated by the Medical Care Research Unit (MCRU) which is as follows: 'A nurse practitioner is a nurse who is authorised to assess and treat new patients making a first attendance at an accident and emergency department, either as an alternative to the patient being seen by a doctor, or in the absence of a doctor in a department where a continuous medical presence is not maintained'.³⁴⁸

The MCRU has conducted a randomized controlled trial of NP and junior doctor treatment of minor injuries and a nationwide survey of the prevalence, distribution and scope of NP services in A & E departments. Of 465 departments, 'official' NP schemes were operational in 27 (6%) and 'unofficial' schemes in 159 (34%).

A two-day retrospective census of NP activity in selected A & E departments was carried out. This revealed that the highest percentage of NP management occurred in minor departments (over 40%),

the next highest (30%) in ophthalmic departments and only 3% in major departments. The NP's caseload consisted mainly of trauma patients and three conditions made up approximately 65% of this. These were the most superficial type of wound, contusions and abrasions. Such patients required fewer investigations to be performed on them, needed a more limited range of treatment, rarely needed referral and were almost always discharged back to their own homes. Extrapolation from their data revealed that 390,000 (3.1%) patients a year could have received their clinical management from a nurse practitioner.

NPs are presently fulfilling a limited range of functions in a minority of A & E departments. There is, however, scope to broaden the range and increase the number of patients treated, though audit will be necessary to monitor the clinical effectiveness of the NP.

Disaster planning and response

Disasters are tragedies on a scale sufficient to overwhelm a community by physically and psychologically traumatizing its population and devastating its homes and businesses. These disasters may be natural³⁵¹ or man-made.^{352,353}

The 1990s have been declared the International Decade of Natural Disaster Reduction by the United Nations General Assembly. In recent years, many disasters have occurred. These include the Armenian earthquake,³⁵⁴ as well as that in Iran,³⁵⁵ the Lockerbie^{356–358} and Kegworth air crashes,^{359–361} the Clapham Junction train crash,³⁶² the Peterborough lorry explosion,³⁶³ the Hillsborough disaster,^{364–365} the nuclear accident at Chernobyl,³⁶⁶ the Enniskillen and Brighton bombings, the King's Cross and Bradford City fires, the sinking of *The Herald of Free Enterprise*, the Hungerford shootings and the *Piper Alpha* offshore fire.

In order to lessen the impact of a major disaster or accident and provide adequate care for the potential survivors, the community as a whole, and the medical community in particular, must have a planned practical response to these catastrophes.^{367–370} A disaster plan coordinated by experienced leaders will save lives. As far as is possible, it is necessary to have planned an effective response to the many scenarios which present so that everything possible is done.^{371–374}

Disaster planning

Disaster planners must consider events which have occurred both in the UK and the rest of the world, and learn from them the value of an integrated response.^{375,376} Guidelines on the preparation for

and planning of responses to disasters can be found in a number of useful papers.³⁷⁷⁻³⁸⁵

Table XVI lists the phases involved in a disaster.

To provide an optimal disaster response, hospitals need to develop their own *major disaster plan*. To do this successfully the institution needs to:

1. Document the potential disasters which may occur within their own region as well as those which are possible in adjacent regions as they may well be expected to take overspill patients.
2. Develop a flexible protocol for and appropriate response to each of these disasters with an organized, logical and realistic plan in accordance with existing local resources.
3. Establish communication and cooperation with regional disaster agencies.
4. Practice, evaluate and update the disaster response plan on a regular basis.
5. Help to educate the public about the correct response to a disaster.

In order to anticipate the likely needs, planners must initially identify the many problems a disaster poses. This is one of the most contentious aspects of planning.^{386,387} The specific effects of relevant toxic materials and radioactive contaminants must be documented and appropriate countermeasures prepared.³⁸⁸⁻³⁹¹ A careful review of resources, personnel, supplies and facilities are required in order to ensure the greatest relief for the greatest number.^{392,393}

A disaster plan should allow for a graded response. The disaster severity scale has been modified so that it can be used prospectively during the management of an incident. This will allow the coordinators to make repeated estimations of the medical severity index of the disaster as it unfolds and to gauge the capacity of the medical services to cope with the situation.^{394,395}

Disaster drills are essential to rehearse and evaluate the plans. These may range from a tabletop exercise to a full-blown rehearsal in the field with simulated patients. The response to the exercise must be evaluated by impartial referees and a critique prepared. The plan can be modified as lessons are learned.^{396,397} Each catastrophe

teaches us something new³⁹⁸⁻⁴⁰⁴ and Rutherford has recommended a National Centre for Disaster Teaching and Research.⁴⁰⁵ If executed correctly, a realistic exercise allows the major disaster plan to be accurately and objectively evaluated.^{406,407}

Disaster response

Amongst the difficulties most frequently encountered are those that result from communication failures either due to equipment malfunction or human error.^{408,409} Planners must consider how to provide accurate up-to-date information to victims, relatives and the media. The disaster plan must anticipate the need for supplies, both basic, for example, food, blankets, etc., and the more esoteric, for example, specific antidotes to toxic chemicals. These supplies must be obtained, transported and distributed optimally.⁴¹⁰⁻⁴¹⁷

Mobile medical teams operating on site require personnel familiar with and able to work in the out-of-hospital environment. They must also be fully equipped, easily identifiable and able to work well both within their own teams and with the other teams in the pre-hospital setting. Hospital personnel who are unused to out-of-hospital working should, as far as possible, be allocated tasks which are familiar to them. If they are required to work outside these areas then they will need at least basic training, knowledge of the disaster plan and the guidance of protocols.⁴¹⁸

Sophisticated search and rescue equipment is being continually developed, improved and deployed. Such equipment is an essential component of any disaster plan and the coordinators should be familiar with its potential and limitations.⁴¹⁹

The role of other specialists such as anaesthetists,^{420,421} paediatricians,⁴²¹⁻⁴²³ the ambulance service,⁴²⁴ nursing staff,^{425,426} members of the British Association of Immediate Care (BASICS)⁴²⁷ and the voluntary societies⁴²⁸ need to be delineated.

Accurate documentation of events following a disaster is vital. Patients must be correctly identified and their location recorded. These mobile teams should try to provide the receiving hospital with an on-going record of the condition of the victims, detailing their treatment and evaluating their response to therapy.

Triage⁴²⁹⁻⁴³³ in a disaster is based on the likelihood of survival, given the resources available at the time. The medical team on site will assess each patient's injuries, and designate priorities for treatment and extrication. The decision to provide care is based on three factors: the patient's condition and accessibility; the availability of personnel, time and supplies; and the presence of actual potential dangers.^{434,435} Personnel problems include the inevitable mass arrival of well-meaning volunteers⁴³⁶ who can cause chaos by, for instance,

Table XVI Phases

Initial response
Search and rescue
Triage
Casualty clearing station
Accident & emergency department and hospitals
Transportation
Temporary mortuary
Record keeping
Post-disaster actions

blocking access routes.

During mass casualty events psychological trauma is an important cause of morbidity among survivors and rescue personnel, and there is always a need for crisis intervention following a disaster.⁴³⁷ Steps should be taken to prepare and provide social and psychological support in the aftermath of such disasters, as help at the appropriate stage to those in need of support can alleviate the suffering and reduce the likelihood of long-term problems amongst both victims and rescuers.^{438–444} The Psychiatric Section of the Royal Society of Medicine held a symposium on the psychiatric aspects of disaster in 1990^{445–450} which provided much useful information. A Disasters Working Party has been set up and funded by the Department of Health, and amongst its suggestions was one that Health Authorities should consider the introduction of a social and psychological support plan. Their recommendations divided the response to the event into three stages:

1. Impact stage, the time of the occurrence of the disaster and immediate rescue period. During this period, the main focus is in giving succour to individuals at the scene or at collecting points, rest centres or hospitals.
2. Continuing work over the subsequent weeks.
3. Longer term response over the subsequent months/years.

It needs to be recognized that the targets of post-traumatic stress⁴⁵¹ include families and close friends of the deceased, those who have been injured, those caught up in the disaster but not physically injured, spectators, rescue workers^{444,452} and wider sections of the community whose lives have in some way or other been affected or disrupted. The report recommends that the development of training programmes should be part of the planning process. The specific requirements of vulnerable groups such as children, was also stressed.^{453–456}

Forensic considerations in disasters include legal aspects, the recovery, transportation and the final disposition of the dead which is effected by forensic mass fatality teams.^{457,458}

A symposium on the medical response to major disasters was held in Stoke on Trent in 1989. This attempted to address a number of issues concerning disaster management in the UK and overseas.³⁷⁹ The response to the question 'Are we ready for the next disaster?' was recently answered by Professor Brian J. Rowlands⁴⁵⁹ as 'No, but we shall cope if it happens.' He stated that the correct response in the 1990s should be 'Yes, because we have a trauma system capable of delivering high quality care to all trauma victims.'

Monitoring in emergency medicine

Whilst there is no substitute for good clinical observation we continue to be aided by a variety of useful monitoring devices.⁴⁶⁰ Of necessity, monitoring in the pre-hospital setting is simple and non-invasive. In the accident and emergency department more complex invasive monitoring may be introduced such as central venous, pulmonary artery and peripheral artery monitoring.

The traditional methods of monitoring in the accident and emergency department include temperature, pulse rate, blood pressure, electrocardiogram (ECG), respiratory rate and forced expiratory volume (FEV₁). Recently technological advances have enabled a variety of non-invasive monitors which are invaluable in the emergency setting. These include non-invasive automated blood pressure (NIBP) measurement, transcutaneous oxygen^{461–463} and carbon dioxide detection,⁴⁶⁴ pulse oximetry,⁴⁶⁵ capnography and the measurement of cardiac output.^{466,467}

End-tidal carbon dioxide monitoring

Capnography is a valuable tool to assess ventilatory failure in conditions such as asthma, chronic obstructive lung disease and coma. In conditions of cardiovascular stability, the end-tidal CO₂ concentration bears a constant relationship to PaCO₂. If the alveoli from all areas of the lung are emptying synchronously, end-tidal CO₂ will be synonymous with alveolar PCO₂.⁴⁶⁸ There are many clinical applications for the use of capnography as a non-invasive tool. End-tidal monitoring enables identification of inadvertent misplacement of an endotracheal tube in the oesophagus. In addition, monitoring will warn of sudden changes in the breathing circuit such as those due to a disconnection, leaks, obstruction, twisting of tubes, or ventilator or valve malfunction.⁴⁶⁹ End-tidal monitoring has been used to aid blind nasal intubation, and to monitor cardiopulmonary resuscitation as it was shown that the return of spontaneous circulation precedes a palpable pulse.^{470,471} The measurement of end-tidal CO₂ as a guide to the probability of survival needs further evaluation.^{472,473} Carbon dioxide analysers vary in their accuracy and response times⁴⁷⁴ and inaccuracy may exist if the response time is too slow particularly where respiratory rates are high.⁴⁷⁵

The value of end-tidal measurement to confirm correct placement of the endotracheal tube in the operating room^{476,477} was confirmed some time ago. This monitoring technique has great potential for use in the emergency setting where the procedure is often performed in less than ideal circumstances and by personnel other than anaesthetists.⁴⁷⁸ This potential has been confirmed using a small, dis-

posable FEFtm end-tidal CO₂ detector. Another recent application of the device in the pre-hospital setting is during helicopter transfer.⁴⁷⁹

The monitor uses a colorimetrically controlled reaction to allow estimation of the end-tidal CO₂. In the non-arrested patient, it allows verification of tracheal location of the endotracheal tube, although careful attention to ensure the correct placement is still appropriate.⁴⁸⁰ In the arrested patient interpretation requires caution. It may indicate an absence of cellular metabolism, inadequate cardiopulmonary resuscitation or incorrect tube placement.

Pulse oximetry

The early detection of hypoxia can be difficult if only clinical symptoms and signs are relied on. Arterial blood gas analysis is useful but invasive. Pulse oximetry allows for a continuous, reliable, non-invasive estimation of the PaO₂ and has been heralded as 'a fifth vital sign'.⁴⁸¹ The importance of monitoring arterial oxygen saturation during anaesthesia has been emphasized in the General Professional Training Guide published by the Faculty of Anaesthetists of the Royal College of Surgeons of England.⁴⁸² It offers an increased margin of safety that patients should not be denied.⁴⁸³

The history and principles of pulse oximetry have been reviewed in a number of articles.^{484–488} Pulse oximetry is based upon differences in the optical transmission spectrum of oxygenated and deoxygenated haemoglobin. Pulse oximeters measure the absorbance of light at two wavelengths, 660 nm (where there is a maximum difference in absorbance between oxygenated and deoxygenated blood) and the control wavelength of 940 nm. The probe is fixed to a finger, toe, nose, ear-lobe or forehead and contains an emitter and a detector for light at the two wavelengths. The relative amount of haemoglobin present in solution and its degree of oxygenation can be determined. Studies have shown a close correlation between pulse oximeter saturation and arterial haemoglobin saturation in conscious volunteers⁴⁸⁹ during anaesthesia⁴⁹⁰ in critically ill adults^{491–495} and in critically ill children.^{496–498}

The use of pulse oximetry to detect hypoxaemia has also been confirmed in the accident and emergency department^{499–501} in children with asthma,^{502,503} croup⁵⁰⁴ and in adults with asthma.⁵⁰⁵ Pulse oximetry during apparent tonic-clonic seizures may help to identify patients with low arterial oxygen tension who need immediate intervention.⁵⁰⁶

The value of measuring oxygen saturation has been confirmed during patient transfer in the hospital setting,⁵⁰⁷ in the pre-hospital setting,^{508,509}

at the roadside⁵¹⁰ where pulse oximetry was performed on 25 patients with severe injuries. The pulse oximeter was found to be of benefit in detecting and monitoring hypoxia in patients with airway obstruction, depressed respiration due to head injury, and in closed chest injuries.

Complications related to the use of pulse oximetry are few, but burns and skin necrosis have been reported as having been caused by the monitor probes.^{511–513} Limitations of the use of pulse oximetry include: poor perfusion – shock, hypothermia; movement artefact; severe anaemia; carboxyhaemoglobin; electrical interference; and optical interference, for example, nail polish.^{515,516}

The use of pulse oximetry has allowed the monitoring of procedures carried out under sedation such as the manipulation of fractures/dislocations and during endoscopy. These have been shown to produce transient hypoxia.⁵¹⁷ Other uses include accurate monitoring of the systolic blood pressure,⁵¹⁸ as a non-invasive assessment of peripheral arterial occlusive disease⁵¹⁹ and for assessment of collateral blood flow to the hand.⁵²⁰ Pulse oximetry has been used to monitor pregnant patients and their infants at delivery and on the neonatal intensive care unit^{521,522} and on the fetus before and during labour.⁵²³

The practical considerations and potential errors of pulse oximetry must be understood by those interpreting the oxygen saturation.^{524–527} While the value of pulse oximetry in the pre-hospital setting requires further evaluation, its use as a non-invasive tool in the emergency department is already established and substantially reduces the need for arterial blood gas analysis.^{528,529}

Intraosseous infusion

The technique of intraosseous infusion has recently been resurrected. It was originally used extensively in the 1940s after which it fell into obscurity due to improvements in the type and quality of intravenous catheters available. Its recent resurgence has been seen primarily in the management of paediatric emergencies both in the emergency department itself and in the pre-hospital setting.^{530–532}

Immediate vascular access is required in paediatric cases in the following circumstances: cardiopulmonary arrest, severe burns, prolonged status epilepticus, hypovolaemia and septic shock.^{533–535} In many cases, rapid intravenous access is not easily obtained and intraosseous infusion is a relatively safe, easy and effective means of obtaining vascular access. It is recommended for life-threatening emergencies in young children in whom other methods of access have failed.⁵³⁰

It was possible to undertake intraosseous infusion using a bone marrow needle⁵³⁶ but more recently, specifically designed intraosseous needles have become available. Fluids, blood products and a wide variety of pharmacological agents including dopamine, dobutamine, adrenaline, lignocaine, sodium bicarbonate, anaesthetic drugs and glucose can be administered via the intraosseous route.^{537–540} Comparison studies of intraosseous, central intravenous and peripheral intravenous infusions of emergency drugs such as adrenaline, sodium bicarbonate, calcium, hydroxyethyl starch, dextrose and lignocaine have shown the intraosseous route to be as effective.⁵⁴¹

Serum drug levels from a single intraosseous attempt in non-traumatized bone have proved comparable to levels from intravenous drug infusions. However, in the clinical situation, inexperienced personnel may make multiple intraosseous attempts, which could allow significant extravasation from multiple intramedullary entrance sites. Serum drug levels arising from multiple intraosseous attempts in traumatized bone were compared with those arising from single intraosseous attempts in non-traumatized bone and resulted in the serum drug concentration level falling rapidly.⁵⁴² The dosage and rate of infusion of drugs and fluids are essentially the same as with intravenous infusion.⁵⁴³

It has been shown that intraosseous access can be successfully achieved in the pre-hospital setting^{544,545} and in approximately 85% of cases it takes less than one minute.⁵⁴⁶ Its use is becoming more widespread and can be successfully sited in flight.⁵⁴⁷ Training for intraosseous infusion is now becoming standardized.⁵⁴⁸ Contra-indications to intraosseous infusion include ipsilateral fractures, osteoporosis, osteogenesis imperfecta and infection at the site of insertion.

The optimal insertion site for intraosseous infusion is the proximal tibia but the distal tibia and distal femur may be used in decreasing order of preference. A point in the mid-line of the flat antero-medial surface of the tibia is chosen, two finger breadths below the tibial tuberosity. The patient's leg should be restrained, with a small support placed behind the knee. Using an aseptic technique the skin is punctured with a scalpel and the intraosseous needle introduced at an angle of 60–90° in the direction away from the growth plate. The needle is advanced with a boring or screwing motion into the marrow cavity. Correct location of the needle is signified by decreasing resistance on entering the marrow cavity. The needle is stabilized in the cortex and the position verified by aspiration of bone marrow and/or by easy flushing, without infiltration, of 5–10 ml of normal saline. The needle should stand upright without support and should then be secured with tape. Flushing with

heparinized saline will prevent clotting.

Complications of intraosseous infusion occur infrequently but local extravasation of fluid, cellulitis and skin necrosis, pain, fractures, growth plate abnormalities, osteomyelitis, fat and bone marrow emboli and compartment syndrome have been reported.^{549–555} The complications are more common with prolonged usage and intraosseous infusion should be discontinued as soon as conventional access is attained.

Medical anti-shock trousers

Pneumatic compression as a method to maintain blood pressure in hypovolaemic shock and hypotensive surgical patients was first described by Crile in 1903.⁵⁵⁶ The use of medical or military anti-shock trousers (MAST), also known as the pneumatic anti-shock garment (PASG), was described by Cutler and Daggett⁵⁵⁷ during the Vietnam war. Kaplan *et al.*⁵⁵⁸ first used MAST in civilian pre-hospital medical care and it became increasingly used by paramedics in the United States.⁵⁵⁹

Many studies have suggested the clinical efficacy of MAST in review articles^{560–562} and more specifically in trauma,⁵⁵⁷ including control of haemorrhage in severe pelvic and lower extremity fractures,^{563–565} in surgical haemorrhage^{566,567} and in the therapy of electromechanical dissociation.⁵⁶⁸

The physiological effects of the MAST remain poorly understood but it was initially postulated that they 'autotransfused' blood from the lower extremities and the abdomen. This helped to maintain mean arterial pressure and cardiac output by increasing the central blood volume.⁵⁶⁹ Autotransfusion of amounts from 750 to 2000 ml of blood from the lower part of the body has been suggested^{570–573} but autotransfusion, although shown to occur in healthy volunteers, is unlikely to be of significant benefit in hypovolaemic shock because of the small amount of translocated blood.⁵⁷⁴

The haemodynamic consequences of inflation of MAST in normovolaemic individuals have been investigated by two-dimensional echocardiography⁵⁷⁵ and direct pressure monitoring during cardiac catheterization.⁵⁷⁶ It was shown that several haemodynamic parameters alter (including right and left ventricular end-diastolic pressure and pulmonary capillary wedge pressure) but essentially that an increase in arterial pressure was associated with an increase in the systemic vascular resistance and in the afterload.

Besides the autotransfusion effect and the redistribution of blood volume, the other mechanisms of action postulated include tamponade splintage, and non-receptive stimulation.⁵⁷⁷ Caution is required in patients whose cardiac function is

compromised as the changes in afterload and pulmonary capillary wedge pressure may cause problems.^{578,579} Other untoward effects of the MAST include compartment syndrome⁵⁸⁰ with sequelae such as amputation, myoglobinuric renal failure⁵⁸¹ and death. Guidelines have been suggested to avoid these complications.⁵⁸²

In 1985, a prospective randomized study of MAST⁵⁸³ found no benefit and a more recent clinical trial based on the findings of a continuous study in 911 injured patients with systolic blood pressures of 90 mmHg or less confirmed this.⁵⁸⁴ Patients were randomly assigned to a MAST or no-MAST protocol and the survival rate of the no-MAST patients was significantly better (31% MAST vs 25% no-MAST mortality rate).

The routine use in the pre-hospital management of penetrating trauma management has also concluded that MAST provided no advantage with regard to survival and length of hospital stay. Other studies in penetrating thoracic wounds have shown the application of MAST to be detrimental to survival in animal models⁵⁸⁵ and in a retrospective study of penetrating cardiac trauma⁵⁸⁶ in 70 patients.

Military anti-shock trousers continue to be used. The physiological mechanisms of action still have to be further elucidated whilst the potential complications, some of which are serious, are more widely appreciated. While most observations in the past were based on animal studies or human volunteers, clinical studies are now providing new information that questions of the usefulness of MAST.⁵⁸⁷

Further work may develop criteria for its use in post-traumatic hypotension and surgical haemorrhage but its role in the routine pre-hospital setting is not supported.

Post-traumatic stress disorder

Post-traumatic stress disorder (PTSD)⁵⁸⁸⁻⁵⁹² is the emotional and behavioural disturbance that follows a recognized trauma, either psychological or physical. The diagnostic criteria for PTSD initially outlined by the American Psychiatric Association in 1980 and later revised in 1987, are summarized below.⁵⁹³

A. The person has experienced an event that is outside the range of usual human experience and which would be markedly distressing to almost anyone, for example, a serious threat to one's life or physical integrity; a serious threat or harm to one's children, spouse or other close relative or friend; sudden destruction of one's home or community; or seeing another person who has recently been or is being seriously injured or killed as the result of an

accident or physical violence.

B. The traumatic event is persistently re-experienced in at least one of the following ways:

1. Recurrent and intrusive distressing recollections of the event (in young children, repetitive play in which themes or aspects of the trauma are expressed).
2. Recurrent distressing dreams of the event.
3. Sudden acting or feeling as if the traumatic event were recurring, including a sense of reliving the experience, illusions, hallucinations, and dissociative (flashback) episodes, even those that occur upon awakening or when intoxicated.
4. Intense psychological distress at exposure to events that symbolize or resemble an aspect of the traumatic event including anniversaries of the trauma.

C. Persistent avoidance of stimuli associated with the trauma or numbing of general responsiveness (not present before the trauma) as indicated by at least three of the following:

1. Efforts to avoid thoughts or feelings associated with the trauma.
2. Efforts to avoid activities or situations that arouse recollections of the trauma.
3. Inability to recall an important aspect of the trauma (psychogenic amnesia).
4. Markedly diminished interest in significant activities (in young children, loss of recently acquired developmental skills such as toilet training or language skills).
5. Feeling of detachment or estrangement from others.
6. Restricted range of affect, for example, unable to have loving feelings.
7. A sense of a foreshortened future, for example, not expecting to have a career, marriage, children or a long life.

D. Persistent symptoms of increased arousal (not present before the trauma) as indicated by at least two of the following:

1. difficulty falling or staying asleep;
2. irritability or outbursts of anger;
3. difficulty concentrating;
4. hypervigilance;
5. exaggerated startle response;
6. physiological reactivity upon exposure to events that symbolize or resemble an aspect of the traumatic event, for example, a woman who was raped in an elevator breaks out in a sweat when entering any elevator.

E. Duration of the disturbance (symptoms in B, C and D) of at least one month.

The point prevalence of PTSD in the general population is about 1%, although the disorder is commoner in high risk groups, such as victims of personal attack,^{594,595} those involved in terrorist

bombings,⁵⁹⁶ those involved in wars,⁵⁹⁷ among victims of torture,⁵⁹⁸ and those involved in other disasters.^{599–604} Health professionals need support as well as victims.^{605–608}

The increased interest in the reactions of rescue workers has been accompanied by the development of programmes such as critical incident or stress debriefing. This is usually provided in groups by mental health professionals and peer support workers.^{609–611}

PTSD is chronic or recurring in a high proportion of patients and is associated with increased mortality, subsequent psychiatric illness, accidental and non-accidental death.^{612,613} The management of PTSD is currently being evaluated but presently includes debriefing, reassurance and support as the individual strives to incorporate the experience. For

more extreme reactions, psychotherapeutic techniques ranging from dynamic therapies to strict behaviour modifications may be helpful. Anxiolytics may palliate symptoms of anxiety and antidepressants reduce depressive and intrusive recollection phenomena.⁶¹⁴

The medical profession and other emergency care staff involved in accident and emergency work are now more fully aware of the psychological aspects of trauma.⁶¹⁴ That awareness should be reflected in planning, both to prevent and manage the psychological aspects of injury.^{615–617}

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Triage

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