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DISCLAIMER

JRCALC guidance is advisory and has been developed to assist healthcare professionals, together with patients, to make decisions about the management of the patient’s health, including treatments. It is intended to support the decision making process and is not a substitute for sound clinical judgement. Guidelines cannot always contain all the information necessary for determining appropriate care and cannot address all individual situations, therefore individuals using these guidelines must ensure they have the appropriate knowledge and skills to enable appropriate interpretation. Although some modification of the guidelines may be required by ambulance services to ensure they respond to the health requirements of the local community, the majority of the guidance is universally applicable to NHS ambulance services. Users should ensure they are using the most up-to-date version of the guidelines, the latest version is always available at www.nelh.nhs.uk/emergency

Whilst these guidelines cover the full range of paramedic treatments available across the U.K. they will also provide a valuable tool for ambulance technicians and other pre-hospital care providers. Many of the assessment skills and general principles will remain the same. Those not qualified to paramedic level must practise only within their level of training and competence.

Considerable effort has been undertaken to ensure the accuracy and consistency of these guidelines. If you find an error or omission would you please report it to us as soon as possible. Likewise any comments for future improvements would be welcomed.

Please contact:

Dr M W Cooke
Warwick Emergency Care and Rehabilitation
Warwick Medical School
University of Warwick
Coventry
CV4 7AL

Or e-mail your comments to: paramedic@warwick.ac.uk
ACKNOWLEDGMENTS AND COPYRIGHT

The 2004 edition of the JRCALC Guidelines builds upon the strong base of previous versions which have set the standard of care for ambulance paramedic practice in the U.K.

As always, JRCALC acknowledges the earlier work undertaken by Drs Chris Carney, John Scott, Iain McNeil and Matthew Cooke and by Andy Thurgood and Ian Todd, who between them are responsible for producing previous versions of this text. Previous financial contributions by QinetiQ are also recognised.

The methodology for the 2004 edition has built upon that previously found to be successful with extensive literature searching and a series of 2-day consensus conferences. To enhance the ownership of the Guidelines fourteen staff, representing ten ambulance services, were trained at the University of Warwick in the BestBETS methodology (www.bestbets.org). The benefit of the course was the production of 2 guideline related BETS by each person, and these further inform the evidence base of the text.

For 2004 a number of authors and groups have allowed their work to either be reproduced verbatim or used as the basis for individual chapters. These authors and groups are acknowledged in the text and JRCALC would like to express their gratitude. The sharing of evidence based material in this way demonstrates best practice and ensures that there is consistency not just between ambulance services but between us and other care providers.

Finally JRCALC would like to express their gratitude to Ian Todd at the University of Warwick without whose support these Guidelines would not have been possible.

Dr Simon Brown
Chair, JRCALC Clinical Guidelines Sub-committee

Dr Matthew Cooke
Project Director, University of Warwick

For Andrea, the patient who lit the torch
Acknowledgements and Copyright

BestBETS contributors

Steve Barnard Greater Manchester Ambulance Service
Sarah Black Westcountry Ambulance Service
Ian Brandreth Welsh Ambulance Service
Jeremy Brown Staffordshire Ambulance Service
Kath Charters Welsh Ambulance Service
Dave Coates Avon Ambulance Service
Paul Gowens Scottish Ambulance Service
Dave Greggs East Anglia Ambulance Service
Matt Hillis Royal Berkshire Ambulance Trust
Ian Jones Staffordshire Ambulance Service
Yvette LaFlamme Williams Welsh Ambulance Service
Steve Leaves Welsh Ambulance Service
Eleanor Thomas Mersey Regional Ambulance Service
John Wood Avon Ambulance Service

Consensus conference contributors

Mr N Barnes Dr J Fisher Ms R O’Shea
Mr R Beal Mr M Gough Prof T Quinn
Mr G Brown Dr J Hall Mr P Radoux
Dr S Brown Mr M Hillis Dr D Richardson
Dr G Bryce Mr A Howson Dr I Robertson-Steel
Dr C Carney Mr M Jackson Dr J Scott
Ms L Cave Dr D Janes Mr D Shepherd
Prof D Chamberlain Dr F Jewkes Mr D Tennet
Mr B Chambers Prof K Mackway-Jones Mr C Thomas
Ms K Charters Mr A Marsden Mr I Todd
Mr C Cessford Dr J Mayhew Mr A Thurgood
Dr T Clarke Dr C Melville Dr E Tunn
Mr D Coates Dr I McNeil Dr A van Dellen
Dr M Cooke Dr F Moore Mr D Walter
Mr M Cooke Mr S Nicholls Dr J Wardrope
Dr J Cox Dr A Noon Mr M Woollard
Dr R Fairhurst Mr B O’Neil Dr M Wyse

P.A. support

Claire Runaghan, University of Warwick
Jo Boocock, Two Shires Ambulance NHS Trust
Jennifer Parkinson, Two Shires Ambulance NHS Trust

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The Chief Executive
Ambulance Service Association
Friars House
157-168 Blackfriars Road
London, SE1 8EU
Telephone 020 7928 9620
CONSENT

Introduction

Patients have a fundamental legal and ethical right to determine what happens to their own bodies. Valid consent to treatment is therefore absolutely central in all forms of healthcare, from providing personal care to more invasive interventions. Seeking consent is also a matter of common courtesy between health professionals and patients.

It is not uncommon in pre-hospital situations for patients to refuse care or treatment. Although patients may refuse, there is still, in certain circumstances, an ongoing moral duty and legal responsibility for our staff to provide further intervention. This procedure provides guidance on how these situations should be managed.

The Department of Health (DoH) has issued guidance documents on consent, which may be consulted for good practice and legal guidance, (Reference Guide to Consent for Examination or Treatment, and secondly, Good Practice in Consent Implementation Guide)

Objectives

- to provide guidance to staff on the importance of gaining patient consent to treatment and care when appropriate
- to provide a definition of consent and the elements required to provide valid consent
- to provide direction for staff regarding their duty of care to patients without mental capacity
- to provide guidance to staff regarding our duty of care to children and young adults, whilst taking into account their mental capacity
- to provide a mechanism for staff to assess a patient’s level of capacity, whilst taking into account the pre-hospital environment and limitations of staff competencies
- to provide staff with direction on what treatment and transportation is appropriate for patients who lack capacity and are unwilling to travel to hospital
- to provide guidance to staff leaving patients on scene
- to provide guidance to staff when patient refusal to treatment may be overruled in extraordinary situations.

What is consent?

Before you examine, treat or care for, adult patients with capacity you must obtain their consent. Consent is a patient’s agreement for a health professional to provide care. Whilst in other clinical settings consent is often in writing, this is more unusual in a pre-hospital setting. In an emergency setting it is not expected for consent to be obtained in writing, but staff should seek verbal, or in the absence of this, non-verbal consent.

Patients can change their minds and withdraw consent at any time. If there is any doubt, you should always check that the patient still consents to your caring for or treating them.

For consent to be valid, staff should ensure that a patient:

- has capacity to take the particular decision
- has received sufficient information about the seriousness and nature of their injury or illness
- is not acting under duress.

Capacity, information and duress

For a person to have capacity, he or she must be able to comprehend and retain information material to the decision, especially regarding the consequences of having or not having the intervention in question, and must be able to use and weigh up this information in the decision-making process. Adults are always assumed to have capacity unless demonstrated otherwise. If you have doubts about their capacity, the question to ask is: “can this patient understand and weigh up the information needed to make this decision?” Staff should remember that patients may have capacity to consent to some interventions but not to others.

In practice patients also need to be able to communicate their decision. Care should be taken not to underestimate the ability of a patient to communicate, whatever their condition.

Many people with learning disabilities have the capacity to consent if time is spent explaining to the individual the issues in simple language, using visual aids. Health professionals should take all steps that are reasonable in the circumstances to facilitate communication with the patient, using interpreters or communication aids as appropriate, whilst allowing for the urgency of the situation.

Adults are presumed to have capacity, but where any doubt exists the health professional should assess the capacity of the patient to take the decision in question. This assessment and the conclusions drawn from it should be recorded in the patient report form.

If a patient refuses treatment or care, ambulance staff must assess whether the patient has capacity to make their own decisions that will indicate whether staff still have a legal duty to provide care or treatment.
Patients need sufficient information before they can decide whether to give their consent, for example, information about the benefits and risks of the proposed treatment and alternative treatments. If the patient is not offered as much information as they reasonably need to make their decision, and in a form they can understand, their consent may not be valid. Agreement by the patient, where the person does not know what the intervention entails, is not “consent”.

To be valid, consent must be given voluntarily and freely, without pressure or undue influence being exerted on the patient either to accept or refuse treatment. Such pressure can come from partners or family members as well as health or care professionals. Professionals should be alert to this possibility and where appropriate should arrange to see the patient on their own to establish that the decision is truly that of the patient.

Refusal to consent

Many patients the ambulance service attend refuse treatment and often appropriately remain on scene. However, we have a responsibility to provide treatment against a patient’s wishes in specific circumstances. Appendix A provides a flow chart to guide staff through the consent process, taking into account the seriousness of a situation and the patient’s mental capacity. This should provide staff with the support to implement the training and knowledge acquired.

Adult patients with capacity

Adult patients with capacity are entitled to refuse treatment and this decision must be respected, even when it is clearly detrimental to their health. If, after discussion of possible treatment options, a patient refuses all care, this fact should be clearly documented on the patient report form.

Where a patient has refused a particular intervention, staff should ensure that they continue to provide any other appropriate care to which they have consented. The patient should be aware that they are free to change their mind and accept treatment later.

Adults with capacity suffering from a non-life threatening incident or illness

Whilst we are legally obliged to accept a decision made by a patient with capacity, efforts should be made to encourage care to be provided in alternate ways, e.g. through a GP visit or NHS Direct. If the patient’s clinical assessment removes concerns regarding any more serious illness or injury the patient report form should be completed, ideally signed by the patient, and detailing the assessment of capacity and any advice provided to the patient.

Adults with capacity suffering from a life threatening injury or illness

If a patient is assessed as having capacity, their decision should be respected. However, it is unusual for a patient to refuse life saving treatment and the underlying reasons for the refusal, e.g. terminal illness, should be recorded on the patient report form.

It is recommended in all such cases patients should be referred to a GP, who should be requested to fully assess the patient’s capacity and if necessary facilitate a full psychiatric assessment.

In these difficult situations assessment of capacity may, in practice, be uncertain. Irrespective of the outcome of the capacity assessment tool, if a patient is physically assessed to be critically ill, current practices of ongoing persuasion should continue with the aim of persuading the patient to obtain care. If this is unsuccessful, a GP or psychiatrist should attend urgently to carry out further extensive assessment of the patient’s capacity and to co-ordinate care. In the absence of one of these professionals, consideration should be given to a sector officer attending the scene.

A patient report form should be completed detailing advice and guidance given to the patient, or any referral to specialist staff, ideally signed by the patient and witnessed by a third party.

Adults without capacity suffering from a non-life threatening injury or illness

If an adult does not have capacity, staff are obliged to act in the patient’s best interest. The level of intervention will depend on the severity of each situation. Crews should not attempt to forcibly remove patients, however, there is a duty upon the ambulance service to arrange further care, if necessary, through the patient’s GP or other health care professional. Alternatively, if the patient is in the care of an adult with capacity, they should be involved in the provision of care. This may mean less serious situations may be resolved by providing advice to the carer, or possibly through NHS Direct or a chemist.

A patient report form should be completed with details of any advice provided to the patient or carer. If a carer is on scene, they should ideally, sign the document, which should be witnessed.
Adults without capacity suffering from a life threatening injury or illness

If an adult is not capable of making their own health care decisions, based on an assessment of their capacity, the ambulance service has a responsibility to consider intervention against a patient’s wishes. Whilst it would be good practice to involve carers, the urgent circumstances may not allow this to take place.

This intervention must also depend on a physical assessment, which considers the likelihood of the risk to the patient of loss of life or limb. If it is felt that it may reasonably be expected that, without treatment, there would be a significant and irreversible deterioration in health, we have a legal duty to safely intervene and provide care. If we do not intervene a court of law may request staff to explain the reasons for not acting in the patient’s best interest. In practice, the police should be requested to provide assistance on scene if removal of the patient by force is required. Police should be aware of our legal responsibilities and provide the necessary level of support. If the urgency of the situation allows, additional support may be provided by the attendance of a sector officer.

It must be stressed that staff should only intervene if it is safe to do so. If it is reasonable for staff to judge intervention would place them under intolerable risk, intervention may be delayed until these risks can be removed.

It is important that the patient report form is fully documented to indicate that action was taken in the patient’s interests.

The greater the clinical risk of the incident, the greater the understanding required of the person accepting responsibility for the patient and the lower the threshold for contacting other agencies. Only after confirming that the above criteria have been met should ambulance staff deem it appropriate to leave a patient in that person’s care.

Children and young people

The legal position concerning consent and refusal of treatment by those under the age of 18 is different from the position for adults, in particular where treatment is being refused.

Young people aged 16–17 are presumed to be able to consent to their own medical treatment. As for adults, staff shall ensure that consent is valid, i.e. given voluntarily by an appropriately informed patient, capable of consenting to the particular intervention. It is, however, good practice to involve the young person’s family in the decision-making process, unless the young person specifically wishes to exclude them.

Critical situations involving children and young persons involving a life threatening emergency may arise when consultation with either a person with parental responsibility is impossible, or the persons with parental responsibility refuse consent despite such emergency treatment appearing to be in the best interests of the child to prevent grave and irreversible mental or physical harm. In such cases the courts have stated that doubt should be resolved in favour of the preservation of life and it will be acceptable for staff to undertake treatment to preserve life or prevent serious damage to health.

With patients under the age of 16, staff should obtain consent from any one person with parental responsibility. As is the case where patients are giving consent for themselves, those giving consent on behalf of child patients must have the capacity to consent to the intervention in question, be acting voluntarily, and be appropriately informed and be in the best interests of the child. In the absence of a person with parental responsibility, staff must act in the child’s best interest.

Withdrawal of consent

A patient with capacity is entitled to withdraw consent at any time, including during the performance of a procedure. Where a patient does object during treatment, it is good practice for the practitioner, if at all possible, to stop the procedure, establish the patient’s concerns, and explain the consequences of not completing the procedure. If stopping the procedure at that point would genuinely put the life of the patient at risk, or there is a significant risk to staff’s health and safety, the member of staff should continue until this risk no longer applies.

Advance refusals of treatment

Patients may have a “living will” or “advance directive” although it is not legally necessary for the refusal to be made in writing or formally witnessed. This specifies how they would like to be treated in the case of future incapacity. Case law is now clear that an advance refusal of treatment that is valid, and applicable to subsequent circumstances in which the patient lacks capacity, is legally binding. An advance refusal is valid if made voluntarily by an appropriately informed person with capacity. Staff should respect the wishes stated in such a document.

In a pre-hospital emergency environment, there may be situations where there is doubt about the validity of
an advance refusal. If staff are not satisfied that the patient had made a prior and specific request to refuse treatment, they should continue to provide all clinical care in the normal way.

Self harm

Cases of self harm present a particular difficulty for health professionals. Where the patient is able to communicate, an assessment of their mental capacity should be made as a matter of urgency. If the patient is judged not to have capacity, they may be treated on the basis of temporary incapacity, as outlined above. Similarly, patients who have attempted suicide and are unconscious should be given emergency treatment, unless staff are made aware of the existence of a living will.

In a pre-hospital setting, an incident of self harm may require urgent intervention, such as in the case of a toxic drug overdose. If the patient refuses treatment, and the delay caused to clinical intervention is tolerable, the patient’s GP should be requested to urgently attend the patient and fully assess their level of capacity. If the incident is more critical and there is insufficient time to arrange additional health care professionals, crews currently overcome most situations with commendable determination to act in the best interests of the patient and these practices should continue.

Staff usually act intuitively to assess whether they perceive a patient is at risk of suicide. An assessment tool is provided in the mental health section. It should be realised that this is only an additional support to staff and that it aims to identify specific areas that staff should be conscious of when deciding to leave a patient on scene.

Clinical photography and conventional or digital photography

Photography of a patient is not permitted unless it is directly to benefit the patient’s treatment. Photographs should be retained in the patient’s hospital file and no other copies are permissible.

Exceptions to the principle of consent

The Public Health (Control of Disease) Act 1984 provides that, on an order made by a magistrate, persons suffering from certain notifiable infectious diseases can be medically examined, removed to, and detained in a hospital without their consent. Such persons must either be suffering from grave chronic disease or be aged, infirm or physically incapacitated and living in insanitary conditions. These situations are extremely rare and staff should request a sector officer to attend such incidents.

Decontamination due to chemical or biological incident. If a patient refuses decontamination treatment, responsibility lies with the ambulance officer in charge of the incident, in liaison with the Police, HEPA and Public Health laboratories to decide on an appropriate course of action.

With thanks to London Ambulance Service NHS Trust
**Consent**

**Appendix A**

**CREW CALLED TO SCENE AND PATIENT CLINICALLY ASSESSED**

1. **Treatment and care required in opinion of crew**
   - **YES**
     - Does the patient consent to treatment?
       - **YES**
         - Treat and transport
       - **NO**
         - Complete the test for refusal to consent. Record findings on form.
   - **NO**
     - Does the patient consent to treatment?
       - **YES**
         - Treat and transport
       - **NO**
         - Refer to dedicated service or GP

2. **Is the patient capable of consent?**
   - **YES**
     - Crew to act in patient's best interest
   - **NO**
     - **Is there a risk to the life of the patient or others?**
       - **YES**
         - **Immediate risk**
           - Act under the Doctrine of Necessity and seek assistance from the police to convey a patient if necessary
         - **No immediate risk**
           - If crew concerns remain about the mental welfare of a patient, make referral to the patient's GP and record all actions on PRF
       - **NO**
         - **Do you have unresolved concerns for the patient’s welfare?**
           - **No immediate risk**
             - Consider providing advice and guidance or refer to GP & document
           - **Immediate risk**
             - Continue to persuade patient. Consider GP to fully assess capacity. Sector officer attendance

**No immediate risk**

**Immediate risk**
PATIENT CONFIDENTIALITY

Introduction
Ensuring patient confidentiality is a fundamental requirement of all health care employees.

Police and Fire Service
The Ambulance Dispatch / Control Centre has a requirement to immediately inform the Police when road traffic and industrial accidents have occurred, or in cases of sudden or suspicious death. They must also inform them when a serious criminal event has, or is suspected to have occurred, such as an assault or rape.

The process of informing the Police in other situations such as overdose with, or use of, illegal drugs by a patient is almost certainly a breach of confidentiality and must not occur.

The release of (Ambulance Dispatch / Control Centre) tapes with conversations between the Trust and a member of the public may only occur if the Trust has received the express written permission of the patient (or legal representative if the patient is deceased). Data Protection Act documentation must also be completed by the Police and submitted when requesting copies of tapes. In the case of a criminal act having occurred, the Police are entitled to request copies of relevant tapes but must still produce the relevant documentation.

Press
A patient’s personal details or any information about their condition or injuries must NOT be revealed to the Press or a member of the public. It is reasonable however to make a general statement such as “the patient had suffered serious injuries” provided there is no identification of the patient during the process.

Radio Messages
Before passing confidential information over the air, the channel should be secured wherever possible. (Many people scan the air waves).

Clinical Record
The clinical record (including any attachments such as ECG strip or photograph) is a legal document and the Ambulance Service is obliged to retain the forms for between eight and twenty-five years, depending on the type of incident. Patient Report Forms are strictly confidential and should not be left lying around in the vehicles, Ambulance Stations, standby points or in hospital.

Subtlety and discretion is required when filling in personal details e.g. patients suffering from HIV. Information written in the clinical record is regarded as clinical information being passed from one carer to the next related to the care of that patient. Factual information or genuine suspicions passed in this way do not present problems, but unfounded or speculative comments are both unacceptable and unprofessional. Expressing concerns to another member of the clinical team is not in any way a breach of confidentiality and is to be encouraged.

Exercising judgement on the sensitivity of information on certain aspects of the patient’s history is essential.

REMEMBER:
- regard all information as confidential
- be especially careful with the security of written records
- beware of careless talk, as people can often overhear information.

All these points will minimise the risk of breaching confidentiality.

Bear in mind at all times that your documentation may from time to time be subpoenaed by a Court to assist the Court to reach a conclusion. Your standard and details of documentation at the time may therefore be open to examination and discussion in a very public arena and this should always be borne in mind when completing forms.
PROFESSIONAL STANDARDS

Introduction
Every member of the Ambulance Service would like to be regarded as a professional provider of pre-hospital care. The public regard for ambulance staff is high, and our improved performance both clinically and operationally is doing much to improve our status with the medical and nursing professionals with whom we work.

One of the requirements of professionalism is the need to perform consistently to a high standard, despite the mood of the moment, or the nature of the last job. This puts severe demands on crews’ tolerance at times, especially with those “regular patients”, or where alcohol, verbal or even physical abuse are involved.

Equally, the satisfaction of walking away from a successful patient care episode with a very satisfactory patient outcome provides a very unique type of reward.

Registration
The paramedic profession is now registered under the Health Professions Council who set standards of proficiency, conduct, performance and ethics. Failure to meet these standards could, in the worst cases, result in removal from the register which would prevent a paramedic practising anywhere in the NHS or UK Public Sector (e.g. the Prison Service).

The standards documents are available to download at http://www.hpc-uk.org but in summary include the requirements to:
- act in the nest interests of your patients, clients and users
- respect the confidentiality of your patients, clients and users
- keep high standards of personal conduct
- provide any important information about conduct, competence or health to the hpc or other relevant regulators and professional bodies
- keep you professional skills and knowledge up to date
- act within the limits of your knowledge, skills and experience and, if necessary, refer the matter to another professional
- maintain proper and effective communications with patients, clients, users, carers and other professionals
- effectively supervise tasks you have asked others to carry out for you
- gain informed consent to give treatment (except in an emergency)
- keep accurate patient, client and user records
- deal fairly and safely with the risks of infection
- limit your work or stop practising if your performance or judgement is affected by your health
- carry out your duties in a professional and ethical way
- behave with integrity and honesty
- make sure that your behaviour does not damage your profession’s reputation.

Approach
The presentation of a professional image, coupled with a high level of professional competence is essential to allow ambulance staff to function with patients, professional colleagues and the public.

Patient care skills commence on arrival at the incident. A courteous approach, with an introduction of both crewmembers is an essential start to a professional relationship with the patient and their relatives. All necessary equipment must be taken to the patient, as it looks amateur and unprofessional to have to dash back immediately to the vehicle for equipment that should have been taken to the patient’s side.

In an emergency, one has only seconds to obtain the patient’s trust and that initial approach will create a lasting impression to the patient, of both the crew and the Ambulance Service as a whole.

Treatment
Explaining procedures, and the need to perform them, to the patient and relatives is essential. There is sometimes a feeling that procedures need doing with such urgency that explanations can come later. However, we must consistently remember that time coupled with simple TLC (Tender Loving Care) and provision of basic ambulance aid skills must always come first, and even in life-threatening emergencies, should always be provided alongside rapid resuscitation procedures.
S.T.A.R. C.A.R.E.

STAR CARE is a simple checklist that you can use to analyse almost any patient care issue you might encounter. Go through the list in order from top to bottom, and ask yourself if your care meets each criterion. If it does, the chances are you can defend your actions in almost any forum.

It is a simple collection of ethical standards that apply to any pre-hospital care situation and could well be adopted by all Ambulance staff as a guiding light to their practice in the field. Using these headings and standards, we can assess our clinical judgements as well as our interpersonal skills.

<table>
<thead>
<tr>
<th>Safe</th>
<th>Were my actions <strong>safe</strong> – for me, for my colleagues, for other professionals and for the public?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team-based</td>
<td>Were my actions taken with due regard for the opinions and feelings of my colleagues, including those from other agencies?</td>
</tr>
<tr>
<td>Attentive to human needs</td>
<td>Did I treat my patient as a <strong>person</strong>? Did I keep him/her warm? Was I gentle? Did I use his/her name throughout the call? Did I tell him/her what to expect in advance? Did I treat his/her family and/or relatives with similar dignity and respect?</td>
</tr>
<tr>
<td>Respectful</td>
<td>Did I act toward my patient, my colleagues, first-responders, hospital staff and the public with the kind of <strong>respect</strong> that I would have wanted to receive myself?</td>
</tr>
<tr>
<td>Customer – accountable</td>
<td>If I were face-to-face right now with the <strong>patient</strong> I dealt with on this incident, could I look them in the eye and say “I did my very best for you”.</td>
</tr>
<tr>
<td>Appropriate</td>
<td>Was my care <strong>appropriate</strong> – medically, professionally, legally and practically, considering the circumstances I faced?</td>
</tr>
<tr>
<td>Reasonable</td>
<td>Did my actions <strong>make sense</strong>? Would a reasonable colleague of my experience have acted similarly, under the same circumstances?</td>
</tr>
<tr>
<td>Ethical</td>
<td>Were my actions and answers to these questions <strong>fair and honest</strong> in every way?</td>
</tr>
</tbody>
</table>
STREET SAFETY

Introduction

The vast majority of the public pose no threat to ambulance staff. The green uniform and increasing public awareness of its association with ambulance staff, has assisted in identifying us as a medical service.

However, in situations where violence has occurred or is in progress when the crew arrive, tempers are flared, and one cannot assume that all those present want the victim to be assisted and resuscitated. In addition when emotions and alcohol levels are high, normally sensible individuals behave irrationally, and ambulance crews may become a focus of aggression.

Firstly, approach all situations of violence with a silent approach, and cut out emergency lights prior to approaching the scene.

On approach to the scene, announce “Ambulance Service” loudly enough for the victim and carers to be aware of your approach. NEVER adopt an aggressive manner in response to verbal aggression, and keep an even, reasonable tone in conversation.

Always watch the individual’s hands, as these are parts that can cause you injury, with or without weapons.

Ask the victim to move his hands to a point where you can see them, on the basis of wanting to check radial pulses.

Take immense care in exposing, for examination, any victim of street violence. The possibility of syringes and exposed needles being in pockets, is always present and is a major hazard to ambulance staff for HIV or Hepatitis exposure.

Always wear protective gloves

Do not put your hands where you cannot, or have not looked first.

Ironically, most dangerous situations are the ones where danger is least suspected. If there is even slight doubt, the attendant should assess the situation, taking the hand portable radio or mobile telephone, whilst the driver remains in the relative safety of the vehicle, ready to summon assistance. If in doubt, hold back until police assistance arrives.

Patient Evacuation in Violent Situation

In violent trauma situations, where the patient or crew is in a hazardous situation, consider rapid evacuation on a spinal board to the vehicle with minimal basic strapping and spinal immobilisation.

Spinal cord injury from stab wounds or gunshot wounds tends to be caused by direct injury, rather than due to the unstable vertebral injury of blunt trauma.

So, if under threat, or in the case of a critical or a Cardiac Arrest victim of violence, perform rapid scene evacuation, with ABC resuscitation en route to hospital.

Firearms incidents

Coping with victims of firearms assaults is sadly an increasing problem. When combined with other acts of violence, such as stabbings and physical assaults, these cases make up a significant proportion of emergency ambulance calls.

Police Firearms Unit are deployed on a daily basis to genuine or suspected firearms incidents. There are specialised Armed Response Vehicles (ARV) on call 24 hours a day.

A full specialist firearms team takes about an hour to deploy in support of the ARVs. They may have specialist first aiders who are tactically trained to work closely with the firearms team. Any incident likely to produce casualties should lead to a call for emergency ambulance support.

Attending the Scene

In an established firearms incident, the ambulance should be directed to rendezvous with the tactical advisor at the firearms unit control vehicle, or respond to an agreed rendezvous point. These units are sited in secure areas away from the incident, and should be in contact with the team on the ground.

There are occasions when the ambulance crew will arrive at an unannounced firearms incident, before a firearms team arrives. In the event the crew should try to liaise with the ARV crew, (these are the only officers carrying firearms) or alternatively, the police officer in charge. They will be attempting to secure the scene. The crew MUST NOT enter the scene without confirmation of its safety.
If crews are deployed to a known or suspected firearms incident, where an ARV crew or firearms team are not in attendance, they _MUST NOT_ enter the scene without confirmation that police are present and the scene is _SECURE_.

A staging point near to the location _MUST be used until_ the scene is known to be secure.

If the crew arrive with no warning of an incident and are threatened by an armed assailant, attempt to drive away from the gunman, and straight out of the situation.

**Taking Cover**

If out of the vehicle, attempt to escape from the scene, or take cover but wherever possible _NOT_ behind the ambulance or any police vehicles, which will act as a visual focus for the gunman.

Do _NOT_ take cover squatting behind a vehicle, as a bullet fired at the ground near to the vehicle, will ricochet off the ground and pass parallel to it around 6 inches from the ground.

_Bullets pass straight through ambulance or car bodies and doors, house doors and most walls._ In addition to still having enough energy left in them to kill, these bullets will now drag fragments of car or house door through the body as they hit it.

Suitable cover may be found behind a substantial tree, in a thick earth walled ditch, behind a _substantial wall_ (most bullets will pass right through single brick and breezeblock walls), or the engine block of a vehicle.

**What is a safe distance?**

Distance away from the weapon is no safety factor. At 150 metres, a 12 bore shotgun may inflict fatal wounds, even with unmodified buckshot. Other modified shot is even more lethal. Rifles have a far greater lethal range and their bullets will pass easily through vehicles at up to 600 metres.

Handguns are less accurate, but even at 100 – 200 metres can cause major or fatal injuries.

On the basis therefore that the lethal range of most weapons is great, and most cover available is readily penetrated by the majority of bullets, **the safest distance from an armed assailant is the greatest possible distance.**

**General measures**

If the vehicle has to be abandoned, shut off the radio, as one leaves the vehicle. Gunmen have been known to listen into radio traffic, and can be forewarned of planned manoeuvres by the emergency services.

After escaping the scene, **arrange to rendezvous with the police at a safe location away from the scene to brief them.** Otherwise you are forcing them, unbriefed, into the same situation from which you have just escaped. Try to gather as much information about the situation as possible to pass on to the firearms team. The type of weapon, any other weapons, hostages, the layout of the scene and emotional state of the gunman, may be useful.

**Police approach**

Officers from the firearms team are routinely armed with 9mm pistols, and MP5 or similar carbines. They have other more specialised weapons for specific uses. They use ballistic protection vests, providing upper trunk protection against most types of projectile. However, the officer, if hit, will still be knocked off his feet, and suffer _substantial chest blunt trauma_, even though bullet penetration may be prevented.

The ARVs provide an initial response, whose role is assessment and containment, and they will deploy to contain the gunman within a secure (sterile) area, and evacuate the public, where they are at risk.

Clearly, the specialist firearms team’s approach is to negotiate a peaceful end to any situation, but if required they have the ability, skill and firepower to resolve any situation.

The specialist firearms unit is deployed to provide more manpower and to tactically advise senior officers in managing the situation. Police dogs are also used in some circumstances, and have a renowned inability to differentiate between the good and bad guys when tackling running targets!

The team has separate command vehicles and should have access to an armoured vehicle for casualty evacuation, which is protected against all but armoured rounds.

**Casualty evacuation**

In firearms situations, where a threat still exists, it is unlikely that ambulance staff will be permitted forwards, unless it is viewed as essential for a Paramedic to accompany the team in the armoured vehicle. This vehicle will permit only minimal space for...
treatment as the team will also be in the vehicle, so the order of the day will be snatch rescue with minimal care, until in a secure setting.

ABC care is all that will be possible, so oropharyngeal airways, hand suction, bag and mask, and large wound dressings will be the required kit.

Forensic evidence
Ambulance crews are dealing daily with forensic evidence, often without realising its significance. For instance, successful accident investigation at any fatal or serious RTA may depend on undisturbed accident debris on the carriageway, which crews often innocently disturb or even worse drive over on leaving scene.

Scenes of violence, however, and known crime scenes should alert one immediately to the need to preserve evidence. (See Out of Hospital Deaths Guideline). The preservation of evidence is entirely secondary to the need to save life. Managing to perform life saving procedures with minimal disruption of the crime scene is the ideal compromise.

Consider all the patient’s clothing, possessions etc as evidence. Avoid cutting through bullet and stab wound tears in clothing, when exposing the patient, and note wound appearances. If any items are collected from the patient during transport or transfer, retain these in a clean plastic bag, and hand them personally to a police officer, ensuring that the receiving hospital is made aware of any medication or information which may be relevant to treatment.

Take note of scene details, especially the position of the patient prior to removal, and position of any possible weapons or cartridge cases, relative to the patient. Make every attempt not to touch or displace these objects.

Document these findings as soon as possible after the event as a Police statement will invariably be required. Responding paramedic officers and immediate care doctors may carry Polaroid or digital cameras, which may be useful to record events if time permits.

Civil disorder
Whilst street fights are a part of the usual Friday night activities, rioting is a rare occurrence.

However, the build up to, or aftermath of major football matches, or other large events or demonstrations regularly threaten the possibility of mass violence, and civil disorder.

The Ambulance Service approach to this situation, should be similar to that for the smaller scale incidents as outlined previously. There is no point in driving into the middle of a civil disturbance whilst fighting is still in progress, as the same tempers are likely to indiscriminately target any white vehicle with blue lights.

Vehicles should be held nearby at a safe staging point, and moved in under Police direction to collect casualties. Protective helmets with visors down, and high visibility jackets should be worn.

REMEMBER, in a riot situation, a safe area at one moment can be in the midst of the fighting the next. Be on your guard and DO NOT TAKE RISKS.

Never underestimate how frightening and dangerous it is being stuck in the middle of a riot.

Vehicles should NOT proceed into the area using blue lights and sirens.

Again, once out of the vehicle, identify yourselves verbally as “Ambulance Service” and spend minimal time providing care on the street. Retrieve the patient to the ambulance, and provide care en route out of the scene.

Your approach and especially your attitude and body language can have a profound effect on the behaviour of a disturbed individual. Always bear this in mind when approaching or talking to patients, and remember being from the “Ambulance Service” does not ensure your protection.

If you come under threat, or the target of missiles, withdraw, with the patient if possible.

Summary
Violent situations are a common part of emergency ambulance duties. In the vast majority of situations, crews are not at risk. However, in recent years, despite this, ambulance staff have been assaulted, stabbed, and even shot.

Becoming more “street wise”, and alert to danger in violent situations, can assist in preventing ambulance staff becoming innocent victims.

The care of patients will always come first. However, that requires an intact Paramedic and Technician, and care of personal safety should enhance the chances of achieving this objective.
INTRODUCTION
This section outlines the common drugs currently available for administration by ambulance staff.

LEGAL CONSIDERATIONS
Drugs administered by ambulance staff fall into two categories, non-prescription drugs such as aspirin and those that are controlled under the Medicines Act 1968 and are designated prescription only medicines (POMs). Under normal circumstances POMs can only be prescribed by a qualified doctor (or dentist) but exemptions exist which allow suitably trained ambulance paramedics to administer these drugs in specified circumstances.

SAFETY ASPECTS
Always check drugs to ensure the correctness of:
- TYPE
- PACKAGING INTACT
- CLARITY OF FLUID
- EXPIRY DATE
INTRODUCTION
There are a number of drug routes that appropriately trained ambulance personnel can use to administer drugs. These are divided into enteral routes (i.e. via the gastro-intestinal tract) and parenteral routes, which includes all routes other than the alimentary canal.

ENTERAL ROUTES
Oral – Drug is swallowed and is absorbed into the blood from the gut. Effects usually start 30–40 minutes after administration. In serious trauma or illness absorption may be delayed.

Sublingual – Tablets or aerosol spray is absorbed from the mucus membrane beneath the tongue. Effects usually occur within 2 – 3 minutes.

Rectal – Drug is absorbed from the wall of the rectum. This route is used for patients who are having seizures and who cannot be cannulated without risk to themselves or ambulance personnel. Effects usually occur 5–15 minutes after administration.

PARENTERAL ROUTES
Intravenous (IV) – Direct introduction of the drug into the cardiovascular system that normally delivers the drug to the target organs very quickly.

Intramuscular (IM) – Injection of the drug into muscle, which is then absorbed into the blood. Absorption may be decreased in poor perfusion states.

Subcutaneous (SC) – Injection of the drug into subcutaneous tissue. This has a slower rate of absorption than from IM injection.

Endotracheal (ET) – Facilitates the rapid absorption of drugs from the bronchial tree when administered through an ET tube. Often used as a secondary route in cardiac arrest patients when IV access has not been established. Drug doses must be doubled and the drug “blown down” to maximise effectiveness. Absorption is variable.

Nebulisation (Neb) – Liquid drugs agitated in a stream of oxygen create fine droplets that are absorbed rapidly from the lungs.

Intra-osseous (IO) – A rigid needle inserted directly into the bone marrow. Resuscitation drugs and fluid replacement may be administered by this route. Absorption is as quick as by the intravenous route.

DRUG PRESCRIBING TERMS
In the case of prescription medicines a variety of abbreviations are used, some of which are described below:-

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bd</td>
<td>Twice daily</td>
</tr>
<tr>
<td>CD</td>
<td>Controlled drug e.g. morphine</td>
</tr>
<tr>
<td>EC</td>
<td>Enteric coated</td>
</tr>
<tr>
<td>IM</td>
<td>Intramuscular</td>
</tr>
<tr>
<td>IV</td>
<td>Intravenous</td>
</tr>
<tr>
<td>MR</td>
<td>Modified release</td>
</tr>
<tr>
<td>POM</td>
<td>Prescription only medicine</td>
</tr>
<tr>
<td>pr</td>
<td>Per rectum (Rectally)</td>
</tr>
<tr>
<td>prn</td>
<td>When required</td>
</tr>
<tr>
<td>qds</td>
<td>Four times a day</td>
</tr>
<tr>
<td>SR</td>
<td>Slow release</td>
</tr>
<tr>
<td>SOS</td>
<td>When required</td>
</tr>
<tr>
<td>tds</td>
<td>Three times a day</td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>INDICATIONS</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Pre-filled syringe or ampoule containing 1 mg of adrenaline (epinephrine) in 1 ml (1:1,000) ADM.</td>
<td>Cardiac arrest</td>
</tr>
<tr>
<td>Pre-filled syringe containing 1 mg of adrenaline (epinephrine) in 10 ml (1:10,000) ADX.</td>
<td>Anaphylaxis</td>
</tr>
</tbody>
</table>

**ACTIONS**

Adrenaline is a sympathomimetic that stimulates both alpha- and beta-adrenergic receptors. As a result the **myocardial** and **cerebral** blood flow is enhanced during CPR and CPR becomes more effective due to increased peripheral resistance maintaining a central blood reserve.

Reverses allergic manifestations of acute anaphylaxis.

Relieves bronchospasm in acute severe asthma.

**CONTRA-INDICATIONS**

Do not give repeated doses of adrenaline in hypothermic patients.
DOSAGE AND ADMINISTRATION

The intravenous route is vastly superior to ET in cardiac arrest and should always be used in preference.

Cardiac arrest

ADULTS
1 mg of 1:10,000 initial dose by rapid IV bolus 2 mg via ET tube).

Repeat every 3 minutes of ongoing arrest.

CHILDREN
10 micrograms/kg IV (100 micrograms/kg via ET tube).

Consider second or subsequent doses of 100 micrograms/kg IV if cardiac arrest secondary to circulatory collapse (e.g. septicaemia).

Anaphylaxis

If ANY indication of anaphylactic reaction (swelling of the mouth and throat, wheezing, stridor and hypotension), use pre-filled syringe or ampoule containing adrenaline 1 mg in 1 ml (1:1,000) by intramuscular injection.

ADULTS (>12 YEARS OF AGE)
500 micrograms (0.5 ml) IM of 1:1,000, into the antero-lateral aspect of the thigh or upper arm. Repeat after 5 minutes if necessary.

Half dose in pre-pubertal children even if >12 years.

CHILDREN (6-11 YEARS)
250 micrograms (0.25 ml) IM of 1:1,000, into the antero-lateral aspect of the thigh or upper arm. Repeat after 5 minutes if necessary.

CHILDREN (6 MONTHS – 5 YEARS)
120 micrograms (0.12 ml) IM of 1:1,000, into the antero-lateral aspect of the thigh or upper arm. Repeat after 5 minutes if necessary.

CHILDREN (<6 MONTHS)
50 micrograms (0.05 ml) IM of 1:1,000, into the antero-lateral aspect of the thigh or upper arm. Repeat after 5 minutes if necessary.

Asthma

ADULTS
500 micrograms (0.5 mg) SC/IM of 1:1000, into the antero-lateral aspect of the thigh or upper arm. Repeat after 5 minutes if necessary.

CHILDREN
10 micrograms/kg SC/IM of 1:1000, into the antero-lateral aspect of the thigh or upper arm. Repeat after 5 minutes if necessary.
**PRESENTATION**
300 mg aspirin (acetylsalicylic acid) in tablet form (dispersible)

**INDICATIONS**
Adults with central chest pain, possibly of cardiac origin, unless aspirin is contraindicated. Aspirin should be administered to any patient with chest pain unless the diagnosis is very clearly non-cardiac.

**ACTIONS**
Has an anti-platelet action which reduces clot formation.
Analgesic, antipyretic and anti-inflammatory.

**CONTRA-INDICATIONS**
Known aspirin allergy or sensitivity.
Children under 16 years
Current treatment with anti-coagulants
Haemophilia or other clotting disorders

**CAUTIONS**
As the likely benefits of a single 300mg aspirin outweigh the potential risks, aspirin may be given to patients with:
- asthma
- pregnancy
- kidney or liver failure
- gastric or duodenal ulcer

**DOSAGE AND ADMINISTRATION**
**ADULTS**
Adults with apparent, suspected or possible myocardial infarction

1 x 300 mg tablet chewed or dissolved in water.

**SIDE EFFECTS**
Gastric bleeding
Wheezing in some asthmatics

**ADDITIONAL INFORMATION**
In suspected MI a 300 mg aspirin tablet should be given regardless of any previous aspirin taken that day

Aspirin is contra-indicated in children under the age of 16 years as it may rarely precipitate Reye’s Syndrome. This syndrome is very rare and occurs in young children, damaging the liver and brain. It has a mortality rate of 50%.
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>INDICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-filled syringe containing 1 mg atropine in 10 ml</td>
<td>Cardiac arrest, after administration of adrenaline, in the management of asystole or PEA with a rate of 60 or below.</td>
</tr>
<tr>
<td>Pre-filled syringe containing 3 mg atropine in 10 ml</td>
<td>Symptomatic bradycardia in the presence of ANY of these adverse signs:</td>
</tr>
<tr>
<td>ACTIONS</td>
<td>● absolute bradycardia (Pulse &lt;40bpm)</td>
</tr>
<tr>
<td>May reverse effects of vagal overdrive.</td>
<td>● systolic blood pressure &lt;90mmHg</td>
</tr>
<tr>
<td>May increase heart rate by blocking vagal activity in sinus bradycardia, 2nd or 3rd degree heart block.</td>
<td>● paroxysmal ventricular arrhythmias requiring suppression</td>
</tr>
<tr>
<td>Enhances A-V conduction.</td>
<td>● inadequate perfusion causing, for example, confusion etc.</td>
</tr>
<tr>
<td></td>
<td>Where there is a high risk of asystole:</td>
</tr>
<tr>
<td></td>
<td>● recent asystole</td>
</tr>
<tr>
<td></td>
<td>● Mobitz II AV block</td>
</tr>
<tr>
<td></td>
<td>● complete heart block with wide QRS complexes</td>
</tr>
<tr>
<td></td>
<td>● ventricular pauses &gt;3 seconds.</td>
</tr>
<tr>
<td></td>
<td>Organophosphate poisoning.</td>
</tr>
<tr>
<td></td>
<td>CONTRA-INDICATIONS</td>
</tr>
<tr>
<td></td>
<td>Should NOT be given to treat bradycardia in suspected hypothermia.</td>
</tr>
<tr>
<td></td>
<td>SIDE EFFECTS</td>
</tr>
<tr>
<td></td>
<td>Dry mouth, visual blurring and pupil dilation.</td>
</tr>
<tr>
<td></td>
<td>Confusion and occasional hallucinations.</td>
</tr>
<tr>
<td></td>
<td>Tachycardia, and in the elderly, retention of urine may occur.</td>
</tr>
</tbody>
</table>
### DOSAGE AND ADMINISTRATION

The intravenous route is vastly superior to ET in cardiac arrest and should always be used in preference.

#### ADULTS
**Asystole / PEA with a rate of 60 or below**
- 3 mg IV injection as single dose (or 6 mg – in volume not exceeding 10-20 ml – by endotracheal administration if IV injection not possible)

**Symptomatic bradycardia**
- Give 500 micrograms (0.5 mg) IV
- If no improvement give further 500 micrograms (0.5 mg) IV.
- Maximum dose in bradycardia = 3 mg.

**Organophosphate poisoning**
- Initial dose of 2 mg IV/IM.

In organophosphate poisoning the doses required may be very high and on line medical support should be sought before giving further atropine.

The emergence of atropine side effects (dry flushed skin, dilated pupils and tachycardia) suggests that a sufficient dose has been given.

#### CHILDREN
**Bradycardia in children is most commonly caused by HYPOXIA, requiring immediate ABC care, not drug therapy.**

For administration only in cases of bradycardia caused by vagal stimulation (such as suction or intubation) or organophosphate poisoning.

**Bradycardia**
- 20 micrograms/kg (minimum 100 micrograms, maximum 600 micrograms) once only

**Organophosphate poisoning**
- 20 micrograms/kg (minimum 200 micrograms, maximum 600 micrograms) initially
- much larger doses may be required for which online medical support should be sought.

### ADDITIONAL INFORMATION

May induce tachycardia when used after myocardial infarction, which will increase myocardial oxygen demand and worsen ischaemia. Hence, bradycardia in a patient with an MI should ONLY be treated if the low heart rate is causing problems with perfusion, such as hypotension (systolic blood pressure <90 mmHg).
###PRESENTATION
Ampoule containing 600 mg of benzylpenicillin as powder.

###ACTIONS
Antibiotic active against a range of bacteria.

###INDICATIONS
The initial treatment of meningococcal septicaemia, characterized by the signs and symptoms indicative of meningococcal septicaemia (as below) AND the presence of a non-blanching rash (if the rash is not present treat the shock and keep looking for the rash). The signs and symptoms are:

- respiratory rate and effort – raised
- heart rate – raised (relative bradycardia is a very late sign)
- capillary refill >2 seconds, skin cold to touch (especially in extremities). Skin may appear mottled (early in illness skin may be warm)
- oxygen saturation may be poor or unrecordable (due to poor perfusion)
- temperature – raised (peripheral shutdown or any antipyretics given may mask this)
- rigors
- vomiting/diarrhoea/abdominal pain
- rash – develops into petechial, bruise like purpuric rash or blood blisters. May be no rash
- pain in joints, muscles and limbs
- seizures
- level of consciousness:
  - early in shock – alert/able to speak
  - as shock advances – babies become limp, floppy and drowsy; older children/adults may develop difficulty in walking/standing, drowsy, confused

- some symptoms may be absent and the order in which they appear may vary.

Meningococcal septicaemia is commonest in young children and young adults. It may progress rapidly and the sooner benzylpenicillin is administered the better the outcome.

###CONTRA-INDICATIONS
Genuine penicillin allergy (see page 2).
PENICILLIN ALLERGY

Antibiotic allergy – This will be a very difficult judgement for ambulance staff as many members of the public think that they have a penicillin allergy because of minor gastrointestinal upset or other minor symptoms.

Do NOT give penicillin if the history is suggestive of unconsciousness, collapse, swelling, difficulty in breathing or rash on previous administration of penicillin.

Penicillin MAY be given if the history is suggestive only of diarrhoea, vomiting or other gastrointestinal upset on previous administration as this is related to the side effects of penicillin rather than an allergy to it.

If in doubt do NOT give penicillin and ensure rapid transport to hospital with an appropriate alert message. Document your consideration of penicillin and your reasons for not administering it.

SIDE-EFFECTS

In the context of meningococcal septicaemia the release of toxins into the blood stream may actually make the patient feel worse initially and can cause sudden hypotension. Where vascular access is available fluid therapy at 250 ml for adults, up to 20 ml/kg for children should be commenced en route unless the journey time is short.

Hypersensitivity reactions, including urticaria, fever, joint pain, angio-oedema, anaphylaxis and convulsions may occur.

Gastrointestinal upset (diarrhoea, vomiting etc) is a recognised side effect of high dose antibiotic therapy.

DOSAGE AND ADMINISTRATION

Administer en route to hospital (unless already administered by G.P. etc).

Dissolve 600 mg benzylpenicillin in 10 ml water for injections and give, according to the dosage chart below, by slow IV injection.

If it is not possible to gain rapid vascular access, the drug should be given by the IM route, as detailed below, into the antero-lateral aspect of the thigh or upper arm – preferably in an area that is well perfused. For IM use, 600 mg benzylpenicillin should be dissolved in 2 ml water for injections.

IV (or IO) route (600mg in 10ml)

<table>
<thead>
<tr>
<th>AGE</th>
<th>DOSE</th>
<th>VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>300mg</td>
<td>5ml</td>
</tr>
<tr>
<td>1 – 9 years</td>
<td>600mg</td>
<td>10ml</td>
</tr>
<tr>
<td>&gt;9 years and</td>
<td>1.2g</td>
<td>20ml</td>
</tr>
<tr>
<td>Adult</td>
<td></td>
<td></td>
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</tbody>
</table>

IM route (600mg in 2ml)

<table>
<thead>
<tr>
<th>AGE</th>
<th>DOSE</th>
<th>VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>300mg</td>
<td>1ml</td>
</tr>
<tr>
<td>1 – 9 years</td>
<td>600mg</td>
<td>2ml</td>
</tr>
<tr>
<td>&gt;9 years and</td>
<td>1.2g</td>
<td>4ml</td>
</tr>
<tr>
<td>Adult</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### PRESENTATION
Ampoule containing 10 mg chlorphenamine malleate in 1 ml.

### ACTIONS
An antihistamine that blocks the effect of histamine released during a hypersensitivity (allergic) reaction. Also has anticholinergic properties.

### INDICATIONS
Severe anaphylactic reactions, secondary to IM adrenaline.
Symptomatic allergic reactions falling short of anaphylaxis but causing patient distress e.g. severe itching etc.

### CONTRA-INDICATIONS
Known hypersensitivity
Children less than 1 year of age

### CAUTIONS
- Hypotension
- Epilepsy
- Glaucoma
- Hepatic disease

### DOSAGE AND ADMINISTRATION

<table>
<thead>
<tr>
<th>Age</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult &gt;12 years</td>
<td>10mg</td>
</tr>
<tr>
<td>Child 6-12 years</td>
<td>5mg</td>
</tr>
<tr>
<td>Child 1-6 years</td>
<td>2.5mg</td>
</tr>
</tbody>
</table>

Give by SLOW intravenous (IV) injection over 1 minute.

### SIDE EFFECTS
- Sedation
- Dry mouth
- Headache
- Blurred vision
- Psychomotor impairment
- Gastro-intestinal disturbance
- Transient hypotension
- Convulsions (rare)

The elderly are more likely to suffer side-effects.

Due to the sedative and psychomotor side effects, anyone receiving chlorphenamine should be advised against driving or undertaking any other complex psychomotor skills.
### PRESENTATION
Ampoule containing 10 mg diazepam in an oil-in-water emulsion making up 2 ml of milky white fluid (Diazemuls).

Rectal tube containing 2.5 mg, 5 mg or 10 mg diazepam in 2.5 ml volume (Stesolid)

### ACTIONS
Central nervous system depressant, acts as an anti-convulsant and sedative.

### INDICATIONS
- Prolonged or repeated fits – not secondary to a hypoxia or hypoglycaemia.
- Status epilepticus
- Eclamptic fits
- Symptomatic cocaine toxicity (severe hypertension, chest pain or fitting).

### CAUTIONS
Respiratory depression.

Should not be used if alcohol, anti depressants or other CNS depressants have been taken.

Recent doses by carers/relatives should be taken into account when calculating the maximum cumulative dose.
**DOSAGE AND ADMINISTRATION**

<table>
<thead>
<tr>
<th><strong>Diazemuls</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adult (age 12 years+)</strong></td>
<td>10 mg IV given SLOWLY, titrated to response</td>
</tr>
<tr>
<td><strong>If required:</strong></td>
<td>Repeat after 5 mins 20 mg max</td>
</tr>
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<table>
<thead>
<tr>
<th><strong>Rectal Diazemuls</strong></th>
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<tbody>
<tr>
<td><strong>Adult (age 12 years+)</strong></td>
<td>10 mg rectally</td>
</tr>
<tr>
<td><strong>If required:</strong></td>
<td>Repeat after 5 mins 20 mg max</td>
</tr>
<tr>
<td><strong>Child 6-12 years</strong></td>
<td>10mg rectally, repeat once</td>
</tr>
<tr>
<td><strong>Child 1-5 years</strong></td>
<td>5mg rectally, repeat once</td>
</tr>
<tr>
<td><strong>&lt;1 year</strong></td>
<td>2.5mg rectally, repeat once</td>
</tr>
</tbody>
</table>

If a SINGLE dose of diazepam has been given by the PR route and IV access is subsequently available a SINGLE dose of IV diazemuls may be given in place of the repeat PR dose where required.

**ADDITIONAL INFORMATION**

The intravenous route is preferred for terminating fits and thus, where IV access can be gained rapidly, Diazemuls should be the first choice. Early consideration should be given to using stesolid when IV access cannot be rapidly obtained, which is particularly likely in the case of children. In small children stesolid should often be considered the first choice treatment and IV access sought subsequently.

Diazepam should only be used if the patient has been fitting for >5 minutes (and is still fitting), or if fits recur in rapid succession without time for full recovery in between. There is no value in giving this drug “preventatively” if the fit has ceased. In any clearly sick or ill child, there must be no delay at the scene while administering the drug, and if it is essential to give diazepam, this should be done en route to hospital.

Care must be taken when inserting the rectal tube and this should be inserted no more than 1 inch in children and 1½ – 2 inches in adults. (All tubes have an insertion marker on nozzle.)

**SIDE EFFECTS**

Respiratory depression may occur, especially in the presence of alcohol, which enhances the depressive side effect of diazepam. In addition, nalbuphine and opioid drugs also enhance the cardiac and respiratory depressive effect of diazepam.

Hypotension may occur. This may be significant if the patient has to be moved from a horizontal position to allow for extrication from an address. Caution should therefore be exercised and consideration given to either removing the patient flat or, if fitting has stopped and it is considered safe, allowing a 10 minute recovery period prior to removal.

Drowsiness and light-headedness, confusion and unsteadiness.

Occasionally amnesia may occur.
For convenience nitrous oxide 50% – oxygen 50% is referred to as Entonox because of the UK Ambulance staff’s familiarity with this name.

**PRESENTATION**
Entonox is a combination of nitrous oxide 50% - oxygen 50%. It is stored in medical cylinders that have a blue body with white shoulders.

**ACTIONS**
Inhaled analgesic agent.

<table>
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<tr>
<th><strong>INDICATIONS</strong></th>
<th>Moderate to severe pain</th>
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| **CONTRA-INDICATIONS** | Chest injuries and other conditions when a pneumothorax is suspected, as it may expand this (unless a chest drain is in situ).  
Severe head injuries with impaired consciousness, as it will further impair consciousness.  
Decompression sickness (the bends) where Entonox will expand the size of nitrogen bubbles within the blood stream, further aggravating the problem. Anyone who has been diving within the previous 24 hours should be considered at risk.  
Violently disturbed psychiatric patients. |
| **CAUTIONS** | When >50% oxygen required  
Alcohol or drug intoxication where the concept of self-administration may not be understood. Also, Entonox may increase the effects of these substances  
Young children and others who cannot understand instructions for self administration  
Conditions involving air containing closed spaces (e.g. bowel obstructions) as nitrous oxide diffusion may increase the pressure and thus pain felt by the patient  
Should not be used for extended periods in those with sickle cell crisis |
### DOSAGE AND ADMINISTRATION

#### ADULTS
Entonox should be self-administered via a facemask or mouthpiece, after suitable instruction. It will take about 3-5 minutes to take effect, but it may be 5-10 minutes before maximum effect is achieved.

#### CHILDREN
Entonox is safe to use with children provided they are capable of following the administration instructions.

Hospital A&E staff should be informed when Entonox has been used.

### SIDE EFFECTS
Minimal side effects.

### ADDITIONAL INFORMATION
Administration of Entonox should be in conjunction with pain score monitoring.

Entonox has major advantages:
- analgesic effect is rapid, with minimal side effects
- no cardiac or respiratory depression
- can be self-administered
- analgesic effect rapidly reverses, so as not to mask symptoms
- the 50% oxygen concentration is valuable in many medical and trauma conditions.

The usual precautions must be followed with regard to caring for the Entonox equipment and the cylinder must be inverted several times to mix the gas when temperatures are low.
**PRESENTATION**
Ampoules containing furosemide 50mg/5ml or
Ampoules containing furosemide 40mg/2ml or
Mini-jet containing furosemide 80mg.

**ACTIONS**
Furosemide is a potent diuretic with a rapid onset (within 30 minutes) and short duration.

**ADDITIONAL INFORMATION**
Nitrates are the first line treatment for acute pulmonary oedema. Use furosemide secondary to nitrates in the treatment of acute pulmonary oedema where transfer times to hospital are prolonged.

**INDICATIONS**
Pulmonary oedema secondary to left heart failure (LVF).

**CONTRA-INDICATIONS**
Pre-comatose state secondary to liver cirrhosis, severe renal failure with anuria.

**CAUTIONS**
Hypokalaemia (low potassium) could induce arrhythmias.
Pregnancy.

**DOSAGE AND ADMINISTRATION**
40mg furosemide IV, slowly over 2 minutes or
50mg furosemide IV, slowly over 2 minutes.
Maximum 120 mg (3x40mg) or 100mg (2 x 50mg) depending upon local presentation.

**SIDE EFFECTS**
Hypotension.
Gastro-intestinal disturbances.
### INDICATIONS

Hypoglycaemia, especially in known diabetics, where blood glucose level <3.0 mmol or if hypoglycaemia is clinically suspected and where oral glucose administration is not possible.

The unconscious patient where hypoglycaemia may be a possible cause.

### RELATIVE CONTRA-INDICATION

Low glycogen stores (e.g. recent use of glucagon).

### DOSAGE AND ADMINISTRATION

**ADULTS**

1 mg IM into the antero-lateral aspect of the thigh or upper arm.

**CHILDREN**

- Over 20 kg (6 years) 1 mg, IM.
- Below 20 kg 500 micrograms, IM.
- Age <1 month 100 micrograms, IM.

### SIDE EFFECTS

- Nausea, vomiting.
- Diarrhoea.
- Rarely, acute hypersensitivity reaction.
- Hypokalaemia.

### PRESENTATION

Glucagon injection, 1 mg of powder in vial for reconstitution with water for injections.

### ACTIONS

Glucagon is a hormone that induces conversion of glycogen to glucose in the liver, thereby raising the blood glucose level.

### ADDITIONAL INFORMATION

Generally the choice between the use of glucagon IM or glucose 10% IV as first line treatment of hypoglycaemia will be a clinical decision made by the paramedic taking into account all of the available information.

Glucagon should not be given by IV injection because of increased vomiting associated with IV use. Check blood glucose 5–10 minutes after administration to ensure it has improved to >5.0mmol/l.

Glucagon may be relatively ineffective in those who have already used up their body stores of glycogen (in particular hypoglycaemic children who are not diabetics). Glucose 10% may be preferable as first line treatment in such patients where IV access is rapidly obtainable.

Alcohol induced hypoglycaemia may render glucagon ineffective however a hypoglycaemic patient who is intoxicated may not fall into this category.

Hypoglycaemic patients who fit should preferably be given glucose 10% IV.
PRESENTATION
Packs containing 500 ml of 10% glucose solution (50 g).

ACTIONS
Reversal of hypoglycaemia.

ADDITIONAL INFORMATION
Generally the choice between the use of glucagon IM or glucose 10% IV as first line treatment of hypoglycaemia will be a clinical decision made by the paramedic taking into account all of the available information.

INDICATIONS
Hypoglycaemia, especially in known diabetics, where blood glucose level <3.0 mmol or if hypoglycaemia is clinically suspected and where oral glucose administration is not possible.

The unconscious patient, where hypoglycaemia may be a possible cause.

DOSAGE AND ADMINISTRATION

ADULTS
It is appropriate to cannulate with the largest bore cannula that can confidently be successfully placed and its position in the vein confirmed by a 10-20ml flush of sodium chloride 0.9%.

The glucose solution should be administered by IV infusion approximately 100ml (10g glucose) at a time.

The dose may be repeated after 5 minutes if there is no response.

If the patient has shown a partial response then further infusion may be necessary, titrated to response, up to a maximum of 300ml (30g) to restore a normal GCS.

If after the second dose there has been no response rapid transport should be initiated and the hospital pre-alerted.

Consideration should be given to alternative diagnoses or the likelihood of a third dose en route benefiting the patient.

CHILDREN <40 KG
When administering glucose 10% to children a single dose of 5ml/kg is recommended. In larger children this may equate to a volume in excess of 100ml. In this event glucose 10% should be administered as 100ml initially, followed by the remainder, up to 5ml/kg maximum after 5 mins.
### INDICATIONS
Cardiac chest pain due to angina or myocardial infarction.

Acute cardiogenic pulmonary oedema.

### CONTRA-INDICATIONS
- Hypotension (actual or estimated systolic blood pressure <90 mmHg).
- Hypovolaemia.
- Head trauma.
- Cerebral haemorrhage.

Sildenafil (Viagra) and other related drugs – glyceryl trinitrate must not be given to patients who have taken sildenafil or related drugs within the previous 24 hours. Profound hypotension may occur.

### DOSAGE AND ADMINISTRATION
**Sublingual**
Spray a dose (400 micrograms) under the patient’s tongue. Their mouth should then be closed. The effect of this first dose should be assessed over 5 minutes.

Where required, a second dose may be given, en route to the hospital, providing the systolic blood pressure is still >90 mmHg.

**Buccal**
Place one tablet between the upper lip and gum, which should be left to dissolve. If hypotension occurs the tablet may be removed and the site rinsed with water to prevent further absorption. Assess for effect whilst tablet dissolves and for 5-10 minutes thereafter.

### SIDE EFFECTS
- Throbbing headache.
- Flushing.
- Dizziness.
- Postural hypotension.
- Tachycardia.

These side effects are mainly related to a generalised vasodilation effect of this drug and are usually transient.

### PRESENTATION
- Metered dose spray containing 400 micrograms glyceryl trinitrate per dose.

Tablets containing glyceryl trinitrate 2, 3 or 5 mg for buccal administration (depends on local ordering).

### ACTIONS
A potent vasodilator drug, especially useful in case of coronary artery disease.

### ADDITIONAL INFORMATION
Glyceryl trinitrate causes vasodilatation, with enlargement of the venous system bed. This causes pooling of blood in the veins with reduction in “preload” to the heart. This relieves the work of the left ventricle, and secondarily reduces lung vessel congestion, lessening breathlessness and is the primary treatment in acute left ventricular failure.

When using buccal nitrates the patient may spit out the remainder of the tablet when their chest pain is relieved. This may avoid the onset of headache.
**PRESENTATION**
Ampoule containing 100 mg hydrocortisone as either sodium succinate or sodium phosphate in 1 ml.

**ACTIONS**
Glucocorticoid drug that reduces inflammation and suppresses immune response.

**INDICATIONS**
To control severe allergic states such as:
- severe or life threatening asthma – where call-hospital time is >30 minutes
- anaphylaxis.

**CONTRA-INDICATIONS**
Known allergy (which will be to the sodium succinate or sodium phosphate rather than the hydrocortisone itself).

**CAUTIONS**
None relevant to a single dose.

**DOSAGE AND ADMINISTRATION**

<table>
<thead>
<tr>
<th>Anaphylaxis or Asthma</th>
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<tbody>
<tr>
<td>Adult (&gt;12 years)</td>
<td>200mg</td>
</tr>
<tr>
<td>Child (&lt;12 years)</td>
<td>4mg/kg</td>
</tr>
<tr>
<td>Child (&lt;1 month)</td>
<td>2.5mg/kg</td>
</tr>
</tbody>
</table>

Give by SLOW intravenous injection over a minimum of 2 minutes to avoid side effects.

**SIDE EFFECTS**
Burning or itching sensation in the groin if administered too quickly.
**INDICATIONS**
Known or suspected hypoglycaemia in a patient with a sufficient level of consciousness for there to be no risk of choking or aspiration.

**CAUTIONS**
Reduced level of consciousness – patient may choke or aspirate. In such circumstances hypostop can be administered by soaking a gauze swab and placing it between the patient’s lip and gum to aid absorption.

**DOSAGE AND ADMINISTRATION**
Hypostop should be smeared into the gums for most rapid absorption although often the patient will also swallow some of the product. Blood glucose concentration should be measured after each dose. Assessment should be more frequent in children who should require a smaller dose for a response.

**SIDE EFFECTS**
None.

**PRESENTATION**
One box containing three single dose plastic tubes of 40% glucose gel (23g each).

**ACTIONS**
Rapid absorption through the buccal mucosa resulting in a rapid increase in blood glucose levels.

**ADDITIONAL INFORMATION**
Hypostop may be repeated as necessary in the hypoglycaemic patient although a failure to achieve effective results should prompt the use of glucagon or glucose 10% as an alternative.
PRESENTATION
Nebules containing ipratropium bromide 250mcg in 1ml or 500mcg in 2ml.

ACTIONS
Ipratropium bromide is an antimuscarinic bronchodilator drug. It may provide short term relief in acute asthma, but beta2 agonists (such as salbutamol) generally work more quickly. Ipratropium should be considered in acute severe or life threatening asthma or in cases of acute asthma or COPD which fail to improve with standard therapy (including salbutamol).

Ipratropium is considered of greater benefit in:
- children suffering acute asthma and
- adults suffering with COPD.

INDICATIONS
Acute severe or life threatening asthma (to be given concurrent with first dose of salbutamol).

Acute asthma unresponsive to salbutamol.

Exacerbation of chronic obstructive pulmonary disease (COPD), unresponsive to salbutamol.

CONTRA-INDICATIONS
None in the emergency situation.

CAUTIONS
Salbutamol should be used with care in patients with:
- glaucoma (protect the eyes from mist)
- pregnancy and breastfeeding.

DOSEAGE AND ADMINISTRATION

ADULTS (>12 YEARS)
0.5mg in nebuliser, nebulised with 6-8 litres per minute oxygen, once only.

Concurrent with first dose of salbutamol in acute severe or life threatening asthma.

Concurrent with the second or later dose of salbutamol in COPD or asthma unresponsive to salbutamol alone.

CHILDREN
6 – 11 years
0.5mg once only.

12 months – 5 years
0.25mg once only.

<12 months
0.125mg once only.

SIDE EFFECTS
Headache.
Nausea and vomiting.
Dry mouth.
Difficulty in passing urine and/or constipation.
Tachycardia / arrhythmia.
Paroxysmal tightness of the chest.
Allergic reaction.
## Indications
Ventricular fibrillation (VF)/pulseless ventricular tachycardia (VT) which is unresponsive to other forms of treatment (consider administration after first three shocks).
Symptomatic ventricular tachycardia.

## Contra-Indications
Known allergy to lidocaine or other local anaesthetics.
- Where amiodarone has already been administered.
Bradyctardia.
Asystole.
Torsades de pointes.
Paroxysmal VT secondary to underlying bradycardia.
Porphyria.

## Dosage and Administration
### Adults
**VF/Pulseless VT**
- IV: 100mg.
- ET: 200mg.

**Symptomatic ventricular tachycardia**
- IV: 50-100mg given slowly over 2-3 minutes.
- Repeat if necessary after 15-20 minutes to a maximum of 200mg.

## Side-Effects
CNS excitation including convulsions.
Fall in blood pressure because of myocardial depression.
Bradyctardia.
Cardiac arrest.

## Presentation
Lidocaine 1% ampoules or mini-jet containing 100mg in 10ml.

## Actions
In the treatment of symptomatic VT.
Suppresses the automaticity of the His-Purkinje system.
Elevates the electrical stimulation threshold of the ventricles during diastole.
Lidocaine is also used as a local anaesthetic drug.
**PRESENTATION**
Ampoule containing metoclopramide 10mg in 2ml.

**ACTIONS**
An anti-emetic which acts centrally as well as on the gastro-intestinal tract.

**ADDITIONAL INFORMATION**
Metoclopramide should always be given in a separate syringe to morphine sulphate. The drugs must not be mixed.

**INDICATIONS**
The treatment of nausea or vomiting in adults over 20 years.
Prevention and treatment of nausea and vomiting following administration of morphine sulphate or nalbuphine.

**CONTRA-INDICATIONS**
Age less than 20 years.
Avoid in first trimester of pregnancy.
Renal failure.
Phaeochromocytoma.
Gastro-intestinal obstruction.

**DOSAGE AND ADMINISTRATION**
10mg IV once only, given over two minutes, prior to opiate administration.

Monitor pulse, blood pressure, respiratory rate and cardiac rhythm before, during and after administration.

**SIDE-EFFECTS**
Severe extra-pyramidal effects, more commonly in children and young adults. Drowsiness and restlessness. Cardiac conduction abnormalities following IV administration.
**PRESENTATION**
Morphine Sulphate 10mg/1ml.

**ACTIONS**
Morphine is a strong opioid analgesic drug for parenteral administration for pain relief. It is particularly useful for treating severe continuous pain of visceral or soft tissue origins. It produces sedation and euphoria as well as its analgesic effect, and may both depress respiration and induce hypotension.

**INDICATIONS**
- Pain associated with suspected myocardial infarction (analgesic of first choice).
- Severe pain associated with trauma.
- Severe pain from other causes.
- The decision about what constitutes severe pain and when Entonox should be tried prior to the use of morphine is a clinical decision.

**CONTRA-INDICATIONS**
- Do NOT give morphine in the following circumstances:
  - infants under one year of age
  - respiratory depression (Adult <10 respirations per minute)
  - hypotension (systolic blood pressure < 90mmHg in adults, <80mmHg in schoolchildren, <70mmHg in pre-school children)
  - head injury with significantly impaired level of consciousness (Glasgow Coma Score <12)
  - monoamine-oxidase inhibitor antidepressant (MAOI) type drugs
  - phaeochromocytoma (tumour on the adrenal gland). This is a rare condition which is usually unknown to the patient or has been identified and treated
  - known hypersensitivity to morphine.

**SIDE EFFECTS**
- Respiratory depression.
- Cardiovascular depression.
- Nausea and vomiting.
- Pupillary constriction.
CAUTIONS
Pregnancy (extreme caution, minimal dosages).

Morphine should be given with great caution to patients with chest injuries, particularly with any respiratory difficulty although if respiration is inhibited by pain, morphine may actually improve respiratory status.

Patients who have consumed significant volumes of alcohol.

Patients taking antidepressant, sedative or major tranquiliser drugs (e.g. phenothiazines), as these will potentiate the respiratory and cardiovascular depressant effects of morphine.

Patients with other respiratory problems e.g. asthma, COPD.

ADDITIONAL INFORMATION
Pain relief should be administered in conjunction with pain scoring.

Naloxone reverses the effects of morphine and should be given at once if there is any indication of respiratory or cardiovascular depression. It must always be immediately available.

Hypotension may be corrected by fluid therapy however caution should be exercised in the patient with cardiac inadequacy and this option is more appropriate to the trauma scenario.

Pupils may constrict after morphine administration, which may affect central nervous system assessment.

Morphine is a Class A CONTROLLED DRUG under Schedule 2 of the Misuse of Drugs Regulations of 1985, and must be stored and its prescription and administration documented in accord with these regulations.

Morphine is not licensed for use in children but its use has been approved by the Medicines and Healthcare products Regulatory Agency (MHRA) for “off label” use. This means that it can legally be administered under these guidelines by paramedics.

Morphine frequently induces nausea or vomiting, which in the case of myocardial infarctions may increase cardiac work. Slow IV administration of morphine and use of the lowest dose required to achieve analgesia will minimise this risk of vomiting, but the motion of the ambulance may exaggerate nausea.

Unused morphine in open vials or syringes should be discarded, preferably in the presence of a witness.

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## SPECIAL PRECAUTIONS

As stated above, morphine can react adversely with monoamine oxidase inhibitor antidepressant (MAOI) drugs (e.g. Parnate, Nardil etc), and other antidepressants or major tranquillisers. Patients who use monoamine oxidase inhibitor drugs in particular should carry an "MAOI" card, as these drugs may interact with various foods and drugs. Check to ENSURE the patient is NOT on these drugs and if they are – do NOT administer morphine.

All opioid drugs potentiate the central nervous system depressant effects of alcohol and should be avoided in patients who have recently taken significant amount of alcohol.

Opioid drugs further depress blood pressure in patients who are in shock, either from haemorrhage or cardiac causes, and this will produce marked, possibly irreversible HYPOTENSION in patients with hypovolaemia or cardiogenic shock.

Pre-hospital use of opioid drugs should be avoided in patients with significant head injuries as they may induce disproportionate respiratory depression and thus increase intracranial pressure.

## DOSAGE AND ADMINISTRATION (CONTINUED)

Morphine, when given IV takes a minimum of 2-3 minutes to begin to work, with the peak effect not being achieved for 10-20 minutes.

### CHILDREN OVER 1 YEAR

Morphine should be diluted with water for injections or sodium chloride intravenous infusion 0.9% to a concentration of 10mg in 10ml.

Ensure that naloxone is available and that the appropriate dose for the age/weight of the child is known before morphine is administered.

Administer 0.05ml/kg (equal to 0.05mg/kg) as an initial slow bolus over 2-3 minutes. If pain is not reduced to a tolerable level after 5-10 minutes then further doses of up to 0.05ml/kg, titrated to response, may be repeated up to 0.2mg/kg maximum.
**PRESENTATION**
Nalbuphine hydrochloride 10mg/1ml
(Available in either 1ml or 2ml ampoules).

**ACTIONS**
Nalbuphine is a strong opioid analgesic drug for parenteral administration.

**SPECIAL PRECAUTIONS**
Adverse reactions of nalbuphine with monoamine oxidase inhibitor antidepressant (MAOI) drugs (e.g. Parnate, Parstelin, Nardil). These drugs require the user to carry an “MAOI” card, as they may react with various foods and other drugs. Check to ENSURE patient is NOT on these drugs and if they are do NOT administer nalbuphine.

Opioid drugs potentiate the central nervous system depressant effects of alcohol and must be avoided in patients who have recently taken alcohol.

Opioid drugs further depress blood pressure in patients who are in shock, either from haemorrhage or cardiac causes, and this may produce marked HYPOTENSION in patients with hypovolaemia or cardiogenic shock.

Opioid drugs must be avoided in patients with significant head injuries as they may induce disproportionate respiratory depression and thus raise intracranial pressure.

**INDICATIONS**
Pain associated with suspected myocardial infarction.

Severe pain associated with trauma.

Severe pain from other causes.

The decision about what constitutes severe pain and when Entonox should be tried prior to the use of nalbuphine is a clinical decision.

**CONTRA-INDICATIONS**
Do NOT give nalbuphine in the following circumstances:

Where morphine has been given or is available for use (as this is the drug of choice whenever possible).

Respiratory depression (Adult <10 respirations per minute).

Hypotension (systolic blood pressure <90mmHg in adults, <80mmHg in schoolchildren, <70mmHg in pre-school children).

Head injury with significantly impaired level of consciousness (Glasgow Coma Score <12).

Monoamine-oxidase inhibitor antidepressant (MAOI) type drugs.

Phaeochromocytoma (tumour on the adrenal gland). This is a rare condition which is usually unknown to the patient or has been identified and treated.

Known hypersensitivity to nalbuphine.

**SIDE EFFECTS**
Respiratory depression.

Cardiovascular depression.

Nausea and vomiting.
CAUTIONS

Pregnancy (extreme caution, minimal dosages).
Nalbuphine should be given with great caution to patients with chest injuries, particularly with any respiratory difficulty although if respiration is inhibited by pain, nalbuphine may actually improve respiratory status.

Patients who have consumed significant volumes of alcohol.

Patients taking antidepressant, sedative or major tranquilliser drugs (e.g. phenothiazines), as these will potentiate the respiratory and cardiovascular depressant effects of morphine.

Patients with other respiratory problems e.g. asthma, COPD

DOSEAGE AND ADMINISTRATION

Administration should be in conjunction with pain score monitoring.

Due to the variable absorption rate of nalbuphine when given IM, particularly in the cardiac and trauma patient, this route should NOT be used.

ADULTS
10mg (1ml) of nalbuphine should be diluted in 9ml of water for injection or sodium chloride intravenous infusion 0.9% (total = 10ml).

An initial dose of up to 10mg (in the elderly consider less) should be given by intravenous injection over 30 seconds.

After three minutes, if the pain score dictates, a further dose of up to 10mg may be administered, again over 30 seconds, to a maximum of 20mg.

In medical cases, smaller doses tend to be more effective. In trauma rather larger doses may be needed to achieve effective analgesia.

If there is prolonged transfer time to hospital or the patient is trapped the above may be repeated after 30 minutes, if required.

Repeat to an overall maximum of 40mg.

CHILDREN

In children aged over one year the initial dose of nalbuphine is 150 micrograms/kg (to 5mg max) which may be repeated once if necessary to a maximum of 300 micrograms/kg (or 10mg).

ADDITIONAL INFORMATION

Naloxone has a good effect upon reversing the side effects of nalbuphine and should be given at once, if there is any indication of respiratory or cardiovascular depression.
<table>
<thead>
<tr>
<th><strong>PRESENTATION</strong></th>
<th><strong>INDICATIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Naloxone hydrochloride 400mcg/1ml ampoule.</td>
<td>Respiratory depression, depression of cardiovascular system and CNS depression associated with opioid overdose.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th><strong>ACTIONS</strong></th>
<th><strong>CONTRA-INDICATIONS</strong></th>
</tr>
</thead>
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<tr>
<td>Antagonism of the effects (including respiratory depression) of opioid drugs.</td>
<td>Neonatal patients of opioid addicted mothers as serious withdrawal effects may occur – emphasis should be on BVM ventilation and oxygenation.</td>
</tr>
</tbody>
</table>

Accidental overdose of opioid drugs, e.g. morphine, nalbuphine.

Overdose of some common analgesics, e.g. co-proxamol (Distalgesic) containing substances such as dextropropoxyphene and codeine (in combination with paracetamol) produce respiratory depression, which is reversed by naloxone.

Unconsciousness associated with respiratory depression of unknown cause, where opioid overdose is a possibility. (See the Unconscious Patient Guideline).
### DOSAGE AND ADMINISTRATION

**ADULTS**

Respiratory arrest / extreme respiratory depression

When the urgency of the situation outweighs the need for a controlled effect.

400 micrograms – IV bolus.

If there is no response administer further doses of 400 micrograms, every 2-3 minutes until an effect is noted.

Repeated doses may need to be given up to every 2-3 minutes en route to hospital, as the half-life of naloxone is short.

The maximum dose of naloxone is 10mg (equivalent to 25 repeat doses of 400 micrograms).

Respiratory Depression

If a more controlled effect is required, e.g. in known or potentially aggressive patients who are suffering respiratory depression rather than arrest dilute up 800 micrograms (2ml) of naloxone, into 8ml of water for injections or sodium chloride intravenous infusion 9% (to a total of 10ml). Administer IV by slow injection, titrated to response.

Aim to relieve respiratory depression, but maintain patient in “groggy” state.

**CHILDREN**

10 micrograms/kg IV/IM

If no response (or a partial but inadequate response), a subsequent dose of 100 micrograms/kg, IV/IM may be required (N.B. this is ten times the initial dose).

**NEONATAL**

100 micrograms (0.25ml). Single dose IM only.

### SIDE EFFECTS

In patients who are physically dependent on narcotic drugs violent withdrawal symptoms, including cardiac arrhythmias, may be precipitated by naloxone. Ideally, in these cases titrate the dose of naloxone as described above, to effectively reverse the cardiac and respiratory depression, but still leave the patient in a groggy state.

### ADDITIONAL INFORMATION:

Naloxone may be administered intramuscularly, undiluted, (into the outer aspect of the thigh or upper arm) when IV access is impossible, but absorption may be slow. Wherever possible, the IV route should be used.

Overdose with opioid drugs can be fatal as a result of respiratory and cardiovascular depression. The effects of naloxone are short lived and patients frequently relapse once the drug has worn off. All cases of opioid overdose should be transported to hospital, even if the initial response to naloxone has been good. If the patient refuses, consider, if the patient consents, a loading dose of 800mcg IM to minimise the risk described above.

Some prescription opioid drugs include:-

- Buprenorphine (Temgesic)
- Codeine (Used in combination in Codis, Diarrest, Migraleve, Paracodol, Phensedyl, Solpadeine, Solpadol, Syndol, Terpoin, Tylex, Veganin)
- Dextromoramide (Palfium)
- Dipipanone (Dicanol)
- Dextropropoxyphene (Used in combination in Distalgesic/co-proxamol)
- Diamorphine (“Heroin”)
- Dihydrocodeine (Co-dydramol, DF 118)
- Meptazinol (Meptid)
- Methadone (Physeptone, Methadose)
- Nalbuphine (Nubain)
- Morphine (Oramorph, Sevredol, MST Continus, SRM-Rhotard)
- Oxycodone (Oxycontin)
- Pentazocine (Fortral)
- Pethidine (Pamergan)
- Phenazocine (Narphen)

This list is not comprehensive, other opioid drugs are available.
### PRESENTATION
Oxygen is a gas, traditionally stored in medical cylinders that have a black body with white shoulders (UK). Newer lightweight cylinders may not follow this convention.

### ACTIONS
Essential for cell metabolism. Adequate tissue oxygenation is essential for normal physiological function.

### ADDITIONAL INFORMATION
**Caution:** Oxygen increases the fire hazard at the scene of an accident.

It is important to take into account 3 points when delivering oxygen therapy:
- flow rate
- mask and delivery system
- careful patient monitoring.

### INDICATIONS
- Hypoxia from any cause.
- Cardiac or respiratory arrest.
- Pulmonary disease (including chronic obstructive pulmonary disease).
- Significant trauma.

### CONTRA-INDICATIONS
- Paraquat poisoning.

### DOSAGE AND ADMINISTRATION
Medium to high flow oxygen should be used in ALL emergency situations. Care should be taken in patients who may have chronic obstructive pulmonary disease (see Cautions and COPD Guideline), but oxygen should never be withheld from patients who need it—including all cardiac chest pains and significant traumas.

The percentage oxygen concentration delivered to the patient is determined by the choice of mask and flow rate. It is important to administer the correct oxygen concentration/flow rate for the patient’s condition.

High-flow oxygen should be administered using a non rebreathing oxygen mask with a reservoir bag and with an oxygen flow rate sufficient to keep the reservoir bag fully inflated.

24-28% oxygen should be administered using a standard oxygen mask with a flow rate set accordingly (approximately 4-6 litres per minute).

Note that some patients will have special requirements for the delivery of oxygen. For example, laryngectomy and tracheostomy patients will need oxygen delivered via their stoma, rather than via mouth or nose. If special masks are not available a standard mask turned sideways over the opening may be used to good effect.

### SIDE EFFECTS
Usually none.

In patients with COPD who rely upon hypoxic drive for respiration there is a small risk that high-flow oxygen may cause respiratory depression or respiratory arrest. See the COPD Guideline for dealing with these patients.
### INDICATIONS
Relief of mild to moderate pain and/or high temperature.

Intended primarily for use in children but may also be applicable to adults.

### CONTRA-INDICATIONS
Known allergy to paracetamol containing products.

If a product containing paracetamol (e.g. Calpol, Disprol) has been given within the last four hours or if the maximum cumulative daily dose has been given then further paracetamol should not be given.

### DOSAGE AND ADMINISTRATION
Paracetamol is given as a single dose using a 5ml oral syringe.

**3 MONTHS TO 1 YEAR**
120mg or 125mg (depending on local presentation).
Repeat at not less than 4 hour intervals.
Maximum dose in 24 hours: 500mg (4 doses).

**1 TO 5 YEARS**
240mg or 250mg (depending on local presentation).
Repeat at not less than 4 hour intervals.
Maximum dose in 24 hours: 1g (4 doses).

**6 TO 12 YEARS**
480mg or 500mg (depending on local presentation).
Repeat at not less than 4 hour intervals.
Maximum dose in 24 hours: 2g (4 doses).

**ADULT (OVER 12 YEARS)**
960mg or 1g (depending on local presentation).
Repeat at not less than 4 hour intervals.
Maximum dose in 24 hours: 4g (4 doses).

### SIDE EFFECTS
Side effects are extremely rare.

### PRESENTATION
A solution or suspension containing paracetamol 120mg in 5ml or paracetamol 250mg in 5ml.

### ACTIONS
Analgesic (pain relieving) and antipyretic (temperature reducing) drug.

### ADDITIONAL INFORMATION:
Paracetamol should not be used as an excuse to leave a febrile child at home except where a full assessment has been carried out, the child has no apparent serious underlying illness and the child is referred to the general practitioner with the full consent of the parent (or carer).

Use of paracetamol in adults should be cautious as it would be inappropriate to encourage 999 calls solely for the administration of a readily available General Sales List (GL) medication.
**PRESENTATION**
Nebules containing salbutamol 2.5mg/2.5ml or 5mg/2.5 ml.

**ACTIONS**
Salbutamol is a selective beta-2-adrenoreceptor stimulant drug. This has a relaxant effect on the smooth muscle in the medium and smaller airways, which are in spasm in acute asthma attacks. If given by nebuliser, especially if oxygen powered, its smooth-muscle relaxing action, combined with the airway moistening effect of nebulisation, can relieve the attack rapidly.

**INDICATIONS**
Acute asthma attack where normal inhaler therapy has failed to relieve symptoms.

Expiratory wheezing associated with allergy, anaphylaxis, smoke inhalation or other lower airway cause.

Exacerbation of chronic obstructive pulmonary disease (COPD).

Shortness of breath in patients with severe breathing difficulty due to left ventricular failure (secondary treatment).

**CONTRA-INDICATIONS**
None in the emergency situation.

**CAUTIONS**
Salbutamol should be used with care in patients with:

- hypertension
- angina
- overactive thyroid
- late pregnancy (can relax uterus).
**DOSAGE AND ADMINISTRATION**

**ADULTS (>12 YEARS)**

5mg in nebuliser, nebulised with 6-8 litres per minute oxygen.

If there is no improvement in peak flow after five minutes, administer a further 5mg, nebulised with 6-8 litres per minute oxygen.

Otherwise there is no limit on the maximum number of nebulised doses a patient may have. Repeat doses should, however, be discontinued if the side effects are becoming significant (e.g. tremors, tachycardia >140 in adults etc.) This is a clinical decision by the paramedic.

**NB** Ensure pre- and post-nebulisation observations including peak flow readings are taken and documented.

**CHILDREN**

6 – 11 years

5mg.

Repeat as for adults.

12 months – 5 years

2.5mg.

In severe attacks nebulisation may need to be repeated every 15 – 30 minutes.

<12 MONTHS

Salbutamol is less effective in children < 12 months and a single dose of 2.5mg should be administered followed by high-flow oxygen therapy.

**SIDE EFFECTS**

Tremor (shaking).

Tachycardia.

Palpitations.

Headache.

Feeling of tension.

Peripheral vasodilatation.

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**ADDITIONAL INFORMATION**

In acute severe or life threatening asthma ipratropium should be given concurrently with the first dose of salbutamol. In acute asthma or COPD unresponsive to salbutamol alone a single dose of ipratropium may be given concurrently with the second or later dose of salbutamol.

Salbutamol often provides initial relief. In more severe attacks however, the use of steroids by injection or orally and further nebuliser therapy will be required. Do not be lulled into a false sense of security by an initial improvement after salbutamol nebulisation.

In life threatening or acute severe asthma – do not delay transportation. LOAD & GO to nearest suitable receiving hospital and provide nebulisation en route.
### PRESENTATION

500ml and 1,000ml packs of sodium chloride intravenous infusion 0.9%

5 and 10ml ampoules for use as flushes.

### ACTIONS

Crystalloid solution for fluid replacement

To establish and maintain the patency of a cannula or for flushing drugs through.

### INDICATIONS

Fluid replacement in hyperglycemic ketoacidotic diabetic coma and pre-coma.

May be used as an alternative to sodium lactate intravenous infusion for blood and fluid loss, to correct hypovolaemia and improve tissue perfusion.

Dehydration.

As a flush when an intravenous cannula is in situ and where drug therapy may not be desirable.

As a flush after drug administration.

### CONTRA-INDICATIONS

None.

### SIDE EFFECTS

Infusion of an excessive volume may overload the circulation and precipitate heart failure (increased breathlessness, wheezing and distended neck veins). Volume overload is unlikely if the patient is correctly assessed initially and it is very unlikely indeed if patient response is assessed after initial 250ml infusion and then after each 250ml of infusion. If there is evidence of this complication, the patient should be transported rapidly to the **nearest suitable receiving hospital** whilst administering high-flow oxygen.
**DOSAGE AND ADMINISTRATION**

**IN HYPERGLYCAEMIC KETOACIDOSIS**

**Adults**
250ml rapid IV.

Re-assess perfusion, pulse, respiratory rate and blood pressure wherever possible.

If these observations improve, reduce infusion rates.

If no improvement administer further 250ml boluses to 2 litres maximum.

**Children**
Up to 20ml/kg IV whilst monitoring physiological response.

If no improvement, administer up to a further 20ml/kg IV.

**IN HYPOVOLAEMIA**

**Adults**
250ml rapid IV.

Reassess perfusion, pulse, respiratory rate and blood pressure wherever possible.

If no improvement in hypovolaemia, give a further 250ml and reassess. Repeat as required to 2 litres maximum.

If hypotensive after infusing 2 litres and patient still trapped on scene, if medical support is not imminent, request online medical support.

Excessive raising of blood pressure may cause re-bleeding and further haemorrhage. Aim to maintain a systolic blood pressure of 90mmHg, measured accurately where possible or estimated by the presence of a radial pulse where time is critical.

If improved, slow infusion rate down.

If infusion is established as a precaution administer by slow rate to keep vein open.

**Children**
20mg/kg IV bolus should be drawn up. This dose should be administered whilst constantly reassessing the child's physiological signs. Stop when the desired effect has been achieved.

If necessary a further dose of up to 20mg/kg may be administered as above.

**AS FLUSH**

**Adult or child > 5 years**
2–5ml

10 – 20ml when using glucose intravenous infusion.

If infusion is established as a precaution.

Administer by slow rate to keep vein open.

**Child 0 – 4 years**
2ml

10 – 20ml when using glucose intravenous infusion.
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>INDICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>500ml and 1,000ml bags of compound sodium lactate intravenous infusion (also called Hartmann’s solution for injection or Ringer-lactate solution for injection).</td>
<td>Blood and fluid loss, to correct hypovolaemia and improve tissue perfusion. Dehydration.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACTIONS</th>
<th>CONTRA-INDICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compound sodium lactate intravenous infusion is an isotonic electrolyte solution, suitable for fluid replacement.</td>
<td>Should NOT be used as fluid replacement in diabetic hyperglycaemic ketoacidotic coma and pre-coma, use sodium chloride intravenous infusion 0.9% instead.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTIONS</th>
<th>SIDE EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compound sodium lactate intravenous infusion should not be given except to keep vein open in ISOLATED head injuries because large-volume infusions may increase intra-cranial pressure. HOWEVER, in head injured patients with other significant trauma, infuse as normal to correct volume loss. Inadequate infusion decreases cerebral blood flow and increases hypoxia.</td>
<td>Infusion of an excessive volume may overload the circulation and precipitate heart failure (increased breathlessness, wheezing and distended neck veins). Volume overload is unlikely if the patient is correctly assessed initially and it is very unlikely indeed if patient response is assessed after initial 250ml infusion and then after each 250ml of infusion. If there is evidence of this complication, the patient should be transported rapidly to nearest suitable receiving hospital whilst administering high-flow oxygen.</td>
</tr>
</tbody>
</table>
## DOSAGE AND ADMINISTRATION

### ADULTS

**Hypovolaemia**
Administer 250ml rapid IV.

Reassess perfusion, pulse, respiratory rate and blood pressure wherever possible.

If no improvement in hypovolaemia, give a further 250ml and reassess. Repeat as required to 2 litres maximum.

If still hypotensive after 2 litres have been infused and patient still trapped on scene, if medical support is not imminent, request on-line medical support.

Excessive rise of blood pressure may cause further haemorrhage. Aim to maintain a systolic blood pressure of 90mmHg, measured accurately where possible or estimated by the presence of a radial pulse where time is critical.

If improved, slow infusion rate down.

If infusion is established as a precaution administer slowly to keep vein open.

**Medical Emergencies** (e.g. anaphylaxis, GI bleeding, heat exhaustion)

Give 250ml.

Reassess as above.

If no improvement give further fluids in 250ml aliquots to maintain a radial pulse up to 2 litres maximum.

### CHILDREN

20mg/kg IV bolus should be drawn up. This dose should be administered whilst constantly reassessing the child's physiological signs. Stop when the desired effect has been achieved.

If necessary a further dose of up to 20mg/kg may be administered as above.

## ADDITIONAL INFORMATION

Compound sodium lactate intravenous infusion contains mainly sodium, but also small amounts of potassium and lactate. It is useful for initial fluid replacement in cases of blood loss.

Sodium lactate diffuses rapidly into extra-cellular space (around 75%), so it is useful for initial resuscitation of major fluid loss, followed by blood or colloid. It is also useful as sole volume replacement in small volume losses.

The volume of compound sodium lactate intravenous infusion needed is three times as great as the volume of blood loss. Sodium lactate has **NO** oxygen carrying capacity.
## PRESENTATION
Ampoule containing ergometrine 500 micrograms and oxytocin 5 units in 1ml.

## ACTIONS
Stimulates contraction of the uterus within seven minutes of IM injection.

## INDICATIONS
Postpartum haemorrhage within 24 hours of delivery of the baby where bleeding from the uterus is uncontrollable by uterine massage. Syntometrine may be administered before or after the delivery of the placenta.

## CONTRA-INDICATIONS
- Known hypersensitivity.
- Active labour.
- Severe cardiac, liver or kidney disease.
- Hypertension and severe pre-eclampsia.
- Possible multiple pregnancy/Known or suspected foetus in utero.

## DOSAGE AND ADMINISTRATION
1ml IM (equivalent to ergometrine 500 micrograms and oxytocin 5 units).

## SIDE EFFECTS
- Nausea and vomiting.
- Abdominal pain.
- Headache.
- Hypertension and bradycardia.
- Chest pain and rarely anaphylactic reactions.
### PRESENTATION

Vials of **streptokinase** 1.5 million units for reconstitution with 50-200ml sodium chloride intravenous infusion 0.9%.

Vials of **reteplase** 10 units for reconstitution with 10ml water for injection.

Vials of **tenecteplase** 10,000 units for reconstitution with 10ml water for injection or 8,000 units for reconstitution with 8ml water for injection.

N.B. Whilst the strength of thrombolytics is traditionally expressed in ‘units’ these units are unique to each particular drug and are **NOT** interchangeable.

### ACTIONS

Activates the fibrinolytic system, inducing the breaking up of intravascular thrombi and emboli.

### INDICATIONS

Acute myocardial infarction, where pain has been present continuously for at least 15 minutes, and no more than six hours.

Ensure patient fulfils ALL the criteria for drug administration in the primary and secondary patient assessment sections of the **Thrombolytic Therapy Guideline**.

### CHECK LIST OF QUESTIONS

#### PRIMARY ASSESSMENT

1. Can you confirm that the patient is conscious, coherent, and able to understand that clot dissolving drugs will be used?

2. Can you confirm that the patient is aged 75 years or less?

3. Can you confirm that the patient has had symptoms characteristic of a heart attack (i.e. continuous pain in a typical distribution and of 15 minutes duration or longer)?

4. Can you confirm that the symptoms started less than six hours ago?

5. Can you confirm that the pain built up over seconds and minutes rather than starting totally abruptly?

6. Can you confirm that breathing does not influence the severity of pain?

7. Can you confirm that the heart rate is between 50 and 140 beats per minute?

8. Can you confirm that the systolic blood pressure is more than 80mmHg and less than 160 mmHg and that the diastolic blood pressure is below 110mmHg?

9. Can you confirm that the electrocardiogram shows abnormal ST segment elevation of 2 mm or more in at least two standard leads or in at least two adjacent precordial leads, not including V1? (ST elevation can sometimes be normal in V1 and V2).
CHECK LIST OF QUESTIONS (CONTINUED)

10. Can you confirm that the QRS width is 0.16mm or less, and that left bundle branch block is absent from the tracing? (Note – RBBB permitted only with qualifying ST elevation).

11. Can you confirm that there is NO atrio-ventricular block greater than 1st degree? (if necessary after treatment with IV atropine).

SECONDARY ASSESSMENT (CONTRA-INDICATIONS)

12. Can you confirm that the patient is not likely to be pregnant, nor has delivered within the last two weeks?

13. Can you confirm that the patient has not had a peptic ulcer within the last six months?

14. Can you confirm that the patient has not had a stroke of any sort within the last 12 months and does not have permanent disability from a previous stroke?

15. Can you confirm the patient has no diagnosed bleeding tendency, has had no recent blood loss (except for normal menstruation) and is not taking warfarin (anticoagulant) therapy?

16. Can you confirm the patient has not had any surgical operation, tooth extractions, significant trauma, or head injury within the last four weeks?

17. Can you confirm that the patient has not been treated recently for any other serious head or brain condition? (This is intended to exclude patients with cerebral tumours)

18. Can you confirm that the patient is not being treated for liver failure, renal failure, or any other sever systemic illness?

Remember that previous streptalanase treatment is a contra-indication to the later use of streptokinase – which may be important for hospital treatment. Whilst this is not relevant to the use of tenecteplase or reteplase, it is always worth nothing that thrombolytic treatment has been used in the past.

CONSENT

The suggested information for a patient to receive pre-hospital thrombolysis is as follows:-

'It is likely that you have suffered a heart attack, and the best treatment is a clot dissolving drug called xxx. The quicker you receive this drug, the lower the risk from the heart attack – which is why doctors recommend the treatment is started as soon as possible. These drugs can cause serious side effects in a small minority of patients which I can explain to you in more detail if you so wish, but the risks attached to this treatment are very much less than the likely benefit. Would you like me to give you the injection or would you prefer to have more details?'

In the unlikely event that patients do want more information they should be given the following information:-

'Treatment at this stage saves the lives of about four patients for every 100 we treat. But it can sometimes cause serious bleeding. The biggest risk is stroke which affects about one patient in every 200. Some patients also have allergic and other effects that do not usually cause any major problem.'

STREPTOKINASE

The recommended dose of streptokinase in adults is 1.5 million units dissolved in sodium chloride intravenous infusion 0.9% given as a constant rate IV infusion over 60 minutes, continued en route to hospital.

RETEPLASE

Reteplase is given as a 10 unit bolus dissolved in 10ml water for injections. A repeat dose must be given 30 minutes after the first dose. It is therefore important that the time of the first dose is recorded and that the patient is not left at the hospital until a member of staff qualified to give the second bolus is physically present.
**TENECTEPLASE**

Tenecteplase is given in accordance with the table below to a maximum 10,000 unit (50mg) single bolus dissolved in 10ml water for injections

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Imperial equivalents (approx)</th>
<th>Dose (units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;60</td>
<td>less than 9st 6lbs</td>
<td>6000</td>
</tr>
<tr>
<td>60-69</td>
<td>9st 6lbs to 10st 12lbs</td>
<td>7000</td>
</tr>
<tr>
<td>70-79</td>
<td>11st to 12st 6lbs</td>
<td>8000</td>
</tr>
<tr>
<td>80-89</td>
<td>12st 8lbs to 14st</td>
<td>9000</td>
</tr>
<tr>
<td>&gt;90</td>
<td>more than 14st 2lbs</td>
<td>10000</td>
</tr>
</tbody>
</table>

**IN ALL CASES:**
Monitor pulse, blood pressure and cardiac rhythm during and following infusion.

Manage hypotension by patient positioning or administering IV fluid “push”, and treat reperfusion arrhythmias as required. In case of either complication, stop streptokinase infusion immediately (not possible if bolus thrombolytics used)

Ensure a defibrillator is at hand at all times.

**N.B. Store thrombolytics below 25 degrees C**

**HEPARIN**

Heparin is required as adjunctive therapy with current thrombolytic agents, except for streptokinase. Previously it was believed that it was important in achieving good fibrin binding for the agent to act effectively but this belief seems now to have been discounted. The principal reason is to prevent re-thrombosis, particularly as all thrombolytics are – paradoxically – potent activators of platelets.

Only unfractionated heparin has a licence for this indication at present, but in the future one or more of the low molecular weight (LMW) heparins will be approved – and will be easier to use.

Ambulance paramedics are not permitted to use heparin under the POMs legislation apart from the low dose needed to keep open venous lines but they may legally, of course, use heparin or even a low molecular weight derivative under a PGD.

**DOSAGE AND ADMINISTRATION**

Administer a thrombolytic ONLY if the answer to ALL the questions is YES.

Thrombolytics must only be given by staff who have undergone and assessed competent in specific additional training on the use and administration of thrombolytic drugs and any associated requirements (e.g. heparin etc).

Local guidelines will dictate the decision-making process e.g. paramedic decision according to guidelines or physician-led decision after transmission of patient details and 12 lead ECG.

**SIDE EFFECTS**

There is a 1% mortality associated with the administration of thrombolytics.

Elevation of body temperature.

Nausea and vomiting.

Bleeding, including:

Major haemorrhage – seek online medical advice and transport to hospital rapidly.

Minor haemorrhage at injection sites – use local pressure.

Reperfusion arrhythmias–these are usually benign in the form of transient idioventricular rhythms and usually require no special treatment.

Anaphylaxis – rare.

Lesser allergic responses including low back pain and urticarial rash.

**CONTRA – INDICATIONS, WARNINGS**

Thrombolytics should NOT be administered intramuscularly or subcutaneously, as it increases the risk of local bleeding.
JRCALC and the Joint Thrombolytic Committee (representing JRCALC, ASA, British Cardiac Society, and the Department of Health) do have some concerns about the use of a drug “off label” on a PGD, especially when inevitably some patients will develop cerebral haemorrhage as a result of the treatment. There would be medico-legal implications even if the use were appropriate from a medical viewpoint – but there remain some unresolved dose issues with the LMW fractions especially for older patients.

For these reasons, JRCLAC considers that the use of heparin can be deferred until hospital admission if treatment can be given within 30 minutes of an IV dose of tenecteplase or within 20 minutes of the first dose of reteplase. The half life of these agents should ensure that re-thrombosis is not a serious concern over this period.

But if the journey times are of such a duration that longer delays are possible, heparin should be used within the dose range recommended in the SPCs. For tenecteplase, this depends on body weight, “not exceeding” 4000 units or 5000 units depending on weight being above or below 67Kg – to be followed by an infusion. **JRCALC believes that over-dosage of heparin in the pre-hospital environment (or any perception of it) must be avoided** – given that heparin is an important cause of cerebral haemorrhage after thrombolysis. As a compromise solution, JRCLAC recommends that the pre-hospital dose should be restricted to 4000 units (still compatible with the words ‘not exceeding’ in the SPC even for heavier patients). Those services using reteplase may wish to use 5000 units since no dose variation for body weight is recommended.

In preliminary discussions, the MRHA have not expressed any concern with these compromise suggestions, although formal approval for the use of the bolus agents under the POMs legislation is still awaited.

**ADDITIONAL INFORMATION**

Do not delay transportation to hospital if difficulties arise whilst setting up the equipment or establishing IV access.

**Members of Thrombolytic Steering Group**

Professor D A Chamberlain  
(Cardiologist, Chairman). Retired July 2003.
Dr Liam Penny (Cardiologist, JRCALC)
Dr Tom Evans (Cardiologist, JRCALC)
Dr Jason Kendall (JRCALC)
Dr Simon Brown (JRCALC)
Dr Tom Clarke (JRCALC)
Dr Howard Swanton (Cardiologist, BCS)
Prof Stuart Cobbe (Cardiologist, BCS)
Dr Alan Mackintosh (Cardiologist, BCS)
Professor Richard Vincent (Cardiologist, BCS)
Mr Mark Cooke (ASA)
Mr Gron Roberts (ASA)
Dr Roger Boyle (Dept Health)
Mr Tom Quinn (Coopted)
Mrs Lucy Evans (Coopted)
Ms Debbie Hughes (Coopted)
Mr Andrew Marsden  
(co-opted from Scottish Ambulance Service)
These protocols reflect the current European Resuscitation Council Guidelines.

INTRODUCTION

Basic Life Support is literally maintaining an airway and supporting breathing and circulation in a patient without formal resuscitation equipment. In an ambulance service setting this implies basic CPR using airway devices which do not pass through the oro-pharynx, the pocket mask and/or the bag, valve mask (BVM).

Survival from Cardiac Arrest is more likely if the arrest is witnessed, and survival rates are improved where the time from collapse to commencing BLS is short. It must be performed up to the commencement of ALS skills, if survival is to be optimised.

ASSESSMENT

Follow the S A F E approach:

S Shout for help (if appropriate)
A Approach with care
F Free from danger
E Evaluate ABCs

Check for responsiveness and check ABCs:

Airway
- head tilt, chin lift (chin lift, jaw thrust in trauma if C-spine injury possible)
- remove any obvious obstructions immediately.

Breathing
- look, listen and feel for breathing for no more than 10 seconds
- if not breathing take up to five attempts to give two effective ventilations (remembering to deliver the ventilations via the stoma in laryngectomee and other neck breathing patients).

Circulation
- check carotid pulse for no more than 10 seconds
- consider other signs which may indicate circulation.

MANAGEMENT OF BASIC LIFE SUPPORT

- if there are no signs of a circulation, or you are unsure, start chest compressions
- perform 15 chest compressions
- give two further effective breaths and give 15 further compressions, continuing compressions and breaths in a ratio of 15 : 2
- attach defibrillator to establish the mechanism of arrest and enable defibrillation at the earliest possible moment should VF be present
- follow ALS guideline.

ADDITIONAL INFORMATION

Basic Life Support is intended to provide sufficient circulation until definitive treatment is available, e.g. defibrillation. It is rare that BLS alone will result in the return of spontaneous circulation. It is therefore, not necessary to check for a pulse once compressions are started unless the victim makes a movement or takes a breath; otherwise resuscitation should not be interrupted.

If patient is not breathing with a pulse (respiratory arrest)

- clear airway
- commence respirations (rescue breath) at a rate of about ten breaths per minute (using a pocket mask or other adjunct if possible). Recheck for signs of circulation about every minute
- continue as required.

If patient is breathing with a pulse but unconscious

- maintain airway
- place into the recovery position when appropriate and observe closely, checking for continued breathing (beware of C-Spine injury if any evidence of trauma).
ADULT BASIC LIFE SUPPORT

CHECK RESPONSIVENESS

Shake and Shout

OPEN AIRWAY

Head tilt/Chin lift

If breathing recovery position

CHECK BREATHING

Look, listen and feel, 10 seconds only

BREATHE

Five attempts to achieve two effective breaths

CHECK PULSE

Signs of circulation 10 seconds only (check carotid pulse)

CIRCULATION PRESENT, CONTINUE RESCUE BREATHING

Check circulation every minute

NO CIRCULATION COMPRESS CHEST

100 per minute
15 : 2 ratio

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These guidelines reflect the current European Resuscitation Council Guidelines.

INTRODUCTION

These guidelines are suited to Adult Cardiac Arrest patients with a presumed primary cardiac cause for their arrest. They are not, therefore, totally suitable or applicable to children and trauma victims who may have a primarily non-cardiac cause to their arrest.

In the adult patient, cardiac arrest presents as two main groups:

- **Shockable** rhythms such as Ventricular Fibrillation (VF) and Pulseless Ventricular Tachycardia (VT)
- **Non-shockable** rhythms such as Pulseless Electrical Activity – PEA (previously known as Electro Mechanical Dissociation – EMD) and Asystole.

Some 85% of sudden cardiac arrest victims (with underlying coronary disease) are in VF when they collapse. Over the ensuing 8 – 10 minutes this degenerates to asystole. If BLS is applied early, the period of VF may be prolonged, allowing time to reach the patient with a defibrillator.

VF has a survival of up to 40% in communities where BLS is rapidly applied (within four minutes) and a defibrillation occurs early (within eight minutes).

The condition PEA (pulseless electrical activity) comprises the clinical signs of a cardiac arrest with an ECG rhythm compatible with a cardiac output.

There are a number of causes of PEA treatable pre-hospital, especially in the trauma patient, such as hypovolaemia, hypoxia and tension pneumothorax. These are remediable, but only if the patient is rapidly transported with ongoing resuscitation to the Nearest Suitable Receiving Hospital, who are on alert to receive.

**Consider fluid challenge EARLY in PEA**

Asystole is therefore the terminal event in most cardiac arrest, and has a survivability of <1% in the community.

In all guidelines that include defibrillation the accepted monophasic energy levels are listed. A suitable equivalent biphasic energy level should be substituted where appropriate locally.
SHOCKABLE RHYTHMS
Ventricular Fibrillation / Pulseless Ventricular Tachycardia (VF/VT)

Diagnose Cardiac Arrest

Commence BLS and attach monitor (including monitoring leads)

Monitor shows VF / VT

Precordial Thump (non-traumatic witnessed arrest)
then
Defibrillate 200 J (1)
Defibrillate 200 J (2)
Defibrillate 360 J (3)

1 minute CPR (4 cycles at 15 : 2) during which time:

Ventilate / IV Access
After ventilation continue chest compressions at 100 per minute,
(with NO pause during ventilations if intubated)

Adrenaline (1:10,000) 1 mg IV / 2 mg ET*.
Consider lidocaine (100mg once only) after third shock provided it does not delay the fourth shock.

Defibrillate 360 J (4)
Defibrillate 360 J (5)
Defibrillate 360 J (6)

IF NOT ALREADY:
Ventilate / IV Access
Adrenaline (1:10,000) 1 mg IV / 2 mg ET* every 3 minutes

For third loop, defibrillate at 3 times 360 J

If still in VF, after third loop, consider changing electrode position, potential reversible causes and drug therapy e.g. Lidocaine 100 mg IV (once only, if not already administered)

OR

Transport to nearest suitable receiving hospital with a hospital alert message

Continue defibrillation loops with Adrenaline (1:10,000) 1 mg IV / 2mg ET* every 3 minutes en route

If VF converts follow specific guidelines for any new presenting rhythm

*The ET route is known to be significantly less effective than the IV route and should not be used routinely.
NOTES

Defibrillation through a gel pad/paddle combination has been shown to cause significant delays in the return of the ECG trace, which can mimic asystole and last for up to 3-4 minutes. After the first three shocks have been delivered (or if the patient goes into apparent asystole between shocks) the monitoring leads should be attached to the patient and further monitoring through the paddles should not occur.

The time elapsed between shocks three and four must not exceed 1 minute.

After delivering a shock there is often a delay of a few seconds before an ECG display of diagnostic quality is obtained. Successful defibrillation is followed usually by at least a few seconds of true asystole (electrical stunning). Furthermore, even when a rhythm normally compatible with a cardiac output is obtained, there is often a period of temporary impairment in myocardial contractility (myocardial stunning), resulting in a pulse that is weak and difficult to palpate. It is therefore important not to make a diagnosis of PEA automatically after successful defibrillation. For this reason the algorithm indicates only one minute of CPR before reassessing the rhythm and making a further pulse check. During this one minute adrenaline should not be administered, as this may be detrimental if a perfusing rhythm has been established.

ADDITIONAL INFORMATION

The ERC guidelines were primarily designed for use by hospital resuscitation teams. In this environment multiple tasks can be undertaken simultaneously and lapses between critical defibrillation cycles are therefore minimal. This is NOT the case in the pre-hospital environment where, with two operators, tasks such as cannulation, drug administration and intubation take considerably longer, potentially delaying life saving shocks.

The resuscitation techniques of proven benefit are DEFIBRILLATION AND BLS, and other ALS techniques (including attempted intubation and cannulation) must not stand in the way of these being performed.

Defibrillation must be carried out at the earliest moment after reaching the patient in VF. BLS procedures must be initiated whilst the defibrillator is prepared. In VF the monitor must be checked briefly between shocks (because VF is a non-sustainable rhythm). In VT pulse checks between shocks are required.

Once the patient has been intubated, chest compressions, at a rate of 100/min, should continue uninterrupted (except for defibrillation or pulse checks when indicated), and ventilation continued at approximately 12 breaths/min. A pause in the chest compressions allows the coronary perfusion pressure to fall substantially. On resuming compressions there is some delay before the original coronary perfusion pressure is restored. Thus, chest compressions uninterrupted for ventilation result in a substantially higher mean coronary perfusion pressure.

VF is a rhythm treatable by a single therapy – DEFIBRILLATION. Correction of hypoxia and consequent acidosis by adequate ventilation and CPR will enhance the chances of successful defibrillation. Adrenaline will pharmacologically improve the efficacy of CPR by raising the peripheral resistance and preferentially shunting blood flow to the coronary vessels and the cerebral circulation. It has a short half-life in the circulation, and MUST be given every three minutes.

Hypothermic patients may not respond to defibrillation or ALS techniques. If one loop of defibrillation and ALS therapy fails to have effect immediate transport should be initiated using BLS skills only.

IV access should be in the antecubital fossa, or external jugular vein. If IV access cannot be obtained the dose of adrenaline increased to 2mg when given via the endotracheal tube. The IV route is vastly superior in terms of speed of the drug reaching the heart compared with the ET route largely because in adult cardiac arrest the lungs are congested and drug absorption is often poor.

If, despite three loops of the above protocol, the patient remains in VF, further measures such as change in paddle location or drug therapy can be applied.

Early experience with amiodarone had proved promising and a number of services are currently using this drug under PGD. Audit data is awaited and an operational review will continue to monitor the role of amiodarone in the pre-hospital environment.
Cardiac Arrest

Precordial thump if appropriate

BLS algorithm If appropriate

Attach defibrillator/monitor

Assess rhythm

VF/VT

Defibrillate x 3 as necessary

CPR 1 min

During CPR
Correct reversible causes
If not already:
- Check electrodes, paddle position and contacts
- Attempt/verify airway, O2 and IV access
- Give adrenaline every 3 mins
- Consider antiarrhythmics atropine, pacing or buffers

NON VF/VT

CPR 3 min*
*1 min if immediately after defibrillation

Potential reversible causes:
- Hypoxia
- Hypovolaemia
- Hyper/hypokalaemia & metabolic disorders
- Hypothermia
- Tension pneumothorax
- Tamponade
- Toxic/therapeutic disorders
- Thromboembolic and mechanical obstruction

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NON-SHOCKABLE RHYTHMS
Pulseless Electrical Activity (PEA)

Diagnose Cardiac Arrest

Commence BLS and attach monitor

Monitor shows rhythm compatible with circulation but with no major pulses or other signs of circulation present (PEA)

Can VF be excluded?

YES – this is a non-shockable rhythm

Consider Causes:

<table>
<thead>
<tr>
<th>Toxic/therapeutic disorders</th>
<th>Hypovolaemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamponade</td>
<td>Hypoxia</td>
</tr>
<tr>
<td>Tension pneumothorax</td>
<td>Hypothermia</td>
</tr>
<tr>
<td>Thromboembolic (PE)</td>
<td>Hypo / hyperkalaemia / and Metabolic disorders</td>
</tr>
</tbody>
</table>

Treat cause whilst continuing with cardiac arrest protocol

Intubate / ventilate / IV access
While maintaining BLS for 3 minutes

NO – treat as a shockable rhythm
Adrenaline (1:10,000)  
1mg IV / 2mg ET

If PEA is associated with a bradycardia < 60  
Atropine 3mg IV / 6mg ET (once only)

If traumatic PEA  
LOAD AND GO to nearest suitable receiving hospital

Provide hospital alert message specifying “Traumatic PEA”.

Continue BLS with adrenaline 1:10,000  
1mg IV every 3 minutes en route

Consider crystalloids 1,000 – 2,000ml IV

If medical PEA  
LOAD AND GO to nearest suitable receiving hospital

Provide hospital alert message specifying “Medical PEA”.

Continue BLS with adrenaline 1:10,000  
1mg IV every 3 minutes en route
NON-SHOCKABLE RHYTHMS
Asystole

Diagnose Cardiac Arrest

Commence BLS and attach monitor

Monitor shows Asystole

Can VF be excluded?

NO – treat as a shockable rhythm

YES – this is a non-shockable rhythm

Consider Causes:

<table>
<thead>
<tr>
<th>Toxic / Therapeutic disorders</th>
<th>Hypovolaemia</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

Intubate / ventilate / IV access While maintaining BLS for 3 minutes
Cardiac Arrest

**Adrenaline (1:10,000)** 1mg IV / 2mg ET
Atropine 3mg IV / 6mg ET (Once only)

3 minutes CPR then repeat loops of CPR with adrenaline etc

If any response, OR patient is in Exceptions Group (see below)

Pregnant females
Electrocution
Drowning
Trauma
Suspected hypothermia
Overdose

LOAD AND GO to nearest suitable receiving hospital after one loop

Provide hospital alert message

En route
Continue BLS and adrenaline 1mg IV every 3 minutes

If no response after 20 minutes and patient is NOT in the Exceptions Group

No respiration
No central pulse
No heart sounds

30 second ECG strip for PRF to confirm asystole

Cease resuscitation

Sit Rep to control confirming “Recognition of Death”

Inform GP / Police as appropriate

Additional Information

Ensure leads are well attached and “gain” is not turned down before accepting a “flat line” as asystole.

If in the slightest doubt about presence of even very fine VF in ‘asystole’ defibrillate as described. Pause only to check monitor and pulse, between shocks.

**IT IS ABSOLUTELY ESSENTIAL TO INCLUDE A COPY OF THE PATIENTS FINAL RHYTHM STRIP IN THE CLINICAL RECORD.**
Bradycardia


INTRODUCTION

Bradycardia is defined strictly as a heart rate of less than 60 beats per minute. However, it is more helpful to classify bradycardia as absolute (<40 bpm) or relative, when the heart rate is inappropriately slow for the haemodynamic state of the patient. Athletes and patients on beta-blocker drugs (atenolol, propranolol, sotalol) for high blood pressure, have a bradycardia induced by their level of fitness or medication, which is quite normal. Simple fints may be caused by a marked transient bradycardia. Raised inter-cranial pressures and hypothermia are also associated with bradycardia.

There are a number of situations where a bradycardia will significantly reduce cardiac output to the detriment of the patient, these are known as symptomatic bradycardia, which may require supportive treatment.

Myocardial infarction may induce a bradycardia, or complete (third degree) heart block, with a slow ventricular rate. Complete heart block may occur in the elderly with no warning and this is a cause of collapse in some elderly patients.

Cervical spinal cord injury may damage sympathetic nerve pathways and simple airway manoeuvres in these patients may induce a profound bradycardia from unopposed vagal nerve stimulation.

MANAGEMENT OF BRADYCARDIA

● follow Medical Emergencies Guideline

● specifically consider patient positioning – patient may need to be supine with legs elevated. Do not use this position if patient is in cardiac failure, as breathlessness will be aggravated

● if patient is BRADYCARDIC and some or all of the following symptoms are present and unrelieved by O₂ therapy:
  - hypotension (Systolic BP <90mmHg)
  - paroxysmal ventricular arrhythmias requiring suppression
  - ventricular pauses >3 seconds
  - risk of asystole (recent asystole, Mobitz II AV block, Complete heart block with wide QRS complexes)

  - cold, pale, sweaty, light-headed
  - dyspnoea
  - confusion

  ● administer atropine 500mcg (0.5mg) IV
  
  ● evaluate patient over next 2 – 3 minutes for effect. If no effect, then administer further atropine 500 mcg IV (0.5mg) and reassess

  ● LOAD AND GO to nearest suitable receiving hospital

  ● provide a hospital alert message / information call

  ● atropine 500mcg IV may be repeated at 2 – 3 minute intervals en route where indicated

  ● maximum cumulative dose = 3mg.

ADDITIONAL INFORMATION

External emergency pacing or insertion of a pacing wire may be urgently required in hospital.

In those services that permit it, transcutaneous pacing should be considered for patients who have a bradycardia which is at risk of causing asystole (Mobitz II AV block, complete heart block with wide QRS complexes, any ventricular pauses >3s) and where atropine has been unsuccessful, in accordance with local policy.

INTRODUCTION
The normal AV node has a very slow conduction velocity. This allows contraction of the atria followed by the ventricles. It also has a long recovery phase (refractory period) which prevents a fast rate originating in the atria being conducted to the ventricles. This permits the ventricles adequate time to fill with blood in diastole.

Some people have a dual pathway between the atria and ventricles. This pathway may allow rapid conduction between the atria and the ventricles, as impulses may cycle down one AV path and back up the accessory path very rapidly. This may cause a very rapid ventricular rate with normal width QRS complexes, and the rate may get so fast that cardiac output falls and the patient may collapse.

The patient normally is aware of palpitations and is rather breathless. Attacks of SVT are often recurrent.

MANAGEMENT
Follow Medical Emergencies Guideline, remembering to:

● ensure ABC’s

● specifically consider:
  - providing high flow oxygen therapy
  - securing IV access
  - ensuring a comfortable position for patient
  - if not already tried, vagal manoeuvres e.g. valsalva or carotid sinus massage (see Additional Information)

● LOAD AND GO to nearest suitable receiving hospital

● provide a hospital alert message / information call.

ADDITIONAL INFORMATION

Valsalva manoeuvre
This is the least dangerous method and should be used before others are attempted. The patient is instructed to take a deep breath and bear down, trying to turn their face red. The breath and pressure should be held as long as possible. This procedure may be repeated.

Carotid sinus massage
This procedure has the greatest risk and should only be used if the other methods have failed. Turn the patient’s head to one side and apply firm pressure, lasting no more than 5 seconds, to the carotid artery just below the angle of the jaw. This may be repeated using alternating sides.

Never apply pressure to both carotid arteries simultaneously.

Carotid sinus massage is safe in younger patients but should not be applied in older patients who may have atheroma in their carotid arteries.

Further treatments
The next line of treatment for patients with SVT is either intravenous adenosine or synchronised cardioversion.

Both of these are currently beyond the scope of paramedical practice and require the hospital setting.

**INTRODUCTION**

- patients in ventricular tachycardia (VT) may present a variety of clinical conditions. Once the abnormal rhythm has been recognised, the immediate management of VT is governed by the clinical state of the patient.

![Flowchart diagram]

- Is a pulse present? 
  - If yes, follow VT Guideline
  - If no pulse, follow VF Guideline

- Does the patient have:
  - Breathlessness
  - Chest pain
  - Hypotension

  - If no, but clinically stable
  - If yes, administer lidocaine 50mg over 2 mins by slow IV injection

- Follow Medical Emergencies Guideline
  - Regular Observations
  - LOAD AND GO to nearest suitable receiving hospital
  - Provide a hospital alert message

- Repeat lidocaine 50mg IV over 2 mins every 5 minutes as required maximum dose 200mg
ADDITIONAL INFORMATION

VT may well be present in a patient who appears surprisingly well and stable. In this setting, full supportive treatment should be given and the patient removed and monitored carefully en route to hospital. Patients who are in cardiac arrest with VT as their presenting rhythm should be treated using the VF Shockable Rhythm Guideline.

The difficult group are those with VT who are symptomatic – e.g. breathless, have chest pain, or are hypotensive but remain conscious. If their condition is clearly deteriorating, then lidocaine may be used as described above, but should not delay removal to hospital. In hospital they may be cardioverted under sedation as the quickest method of resolving the arrhythmia.
INTRODUCTION
Cardiac arrest in the trauma patient usually has a very different cause than normal cardiac arrest in the patient with ischaemic heart disease. Most patients who suffer cardiac arrest as a result of trauma, will have sustained this as a result of hypoxia secondary to:

- airway obstruction or ventilatory failure
- hypovolaemia as a result of massive blood loss
- a major visceral injury, which may include damage to the heart
- a major head or spinal injury which may induce cardiac arrest, as a result of CNS depression or disruption.

Clearly, the last two causes are unlikely to be remediable by intervention at the accident scene, as the level of injury is unlikely to be compatible with life.

In the case of airway and respiratory causes and hypovolaemia, immediate intervention and removal to hospital, with reception by an experienced trauma team, may provide a chance of survival for these patients.

HISTORY
The patient will normally have suffered severe trauma and may be found in impending or actual cardio-respiratory arrest.

Patients may have inadequate or completely obstructed airways with impaired or absent ventilation. They may well be in a state of circulatory collapse, with evidence of major injuries and external blood loss.

Cardiac rhythm may be hugely variable, but may include profound bradycardia, PEA or asystole. Occasionally patients may be found in ventricular fibrillation.

MANAGEMENT OF TRAUMATIC CARDIAC ARREST
Follow Trauma Emergencies Guideline – treat as TIME CRITICAL

Specifically consider:

- maintain ABC’s (whilst immobilising C-spine)
- evacuate on long spinal board with continuing BLS/ALS
- establish IV access if possible EN ROUTE – DO NOT DELAY ON SCENE
- follow VF/VT protocol if presenting rhythm dictates
- administer **adrenaline** 1 mg (1:10,000) immediately and every 3 mins. (**adrenaline** 2mg ET if no IV available)
- consider atropine 3mg IV / 6mg ET if asystole or PEA <60bpm
- administer **CRYSTALLOID** 1,000 – 2,000ml IV rapidly early
- continue BLS/ALS en route
- provide a hospital alert message requesting a trauma team standby. Specifically state that the cardiac arrest is due to trauma.
PREAMBLE

1. JRCALC published the paper ‘Recognition of Death by Ambulance Personnel’ in 1996, authored by Drs P Baskett, J Fisher and A Marsden based upon earlier work by Marsden et al.

2. Since then a number of modifications to the use of the guidelines in that paper have been introduced on a local basis, and a number of questions raised about these and other changes. Currently there is no national consensus on the application of the guidelines and evidence that practice differs considerably in different parts of the country.

3. A new set of guidelines was proposed by The Clinical Guidelines Committee of JRCALC and published electronically in the 2001 version of the National Guidelines, however, these proposals have not found widespread acceptance.

4. This document is the product of a new subcommittee set up by JRCALC in 2002 to revisit the existing guidance and the queries that have been raised about them. This discussion document is intended to form the basis of a new set of nationally accepted guidelines which will be published after their widespread discussion and consultation. We have attempted to answer the queries raised since publication of the original guidelines in 1996 and also to go further in defining the circumstances under which resuscitation is undertaken by ambulance personnel in the patient suffering from cardiopulmonary arrest, as well as addressing the care provided for their relatives and close friends who may be present.

5. The members of the Subcommittee were:

   Dr Michael Ward, Consultant Anaesthetist, Medical Director Oxfordshire Ambulance NHS Trust

   Dr Michael Colquhoun, Senior Lecturer UWCM, Cardiff, Medical Director Welsh Ambulance Service

   Mr Andrew Marsden, Medical Director Scottish Ambulance Service

   Mrs Eve Knight, Lay Member, British Cardiac Society.

6. Consultation on this document has included taking the views of members of the lay public, the Association of Police Surgeons, the Coroners Committee in addition to wide discussion with Ambulance Services, their staff and Medical Advisors. It is recognised by the subcommittee that the introduction of these new guidelines will require a training commitment on the part of ambulance services, but we do not believe that the knowledge base or skills required is beyond the abilities of current ambulance personnel.

7. This document will address the following subjects:

   a. when NOT to start resuscitation
   b. when to discontinue attempted resuscitation
   c. what to do after death has been diagnosed

8. It is recognised that no guidelines can cover every situation that might arise, but it is intended that they should provide adequate guidance for the great majority of circumstances. It has been our concern to express the principles of treatment in as clear a way as possible. It is recognised that the details of their application by individual Ambulance Services may require definition in the light of local circumstances, geography and resources.

9. These guidelines are applicable to all age groups. Our original remit was to consider only recognition of death in adults, the assumption being that, with the exception of those cases on which death is obvious, ambulance staff would always make vigorous resuscitation attempts in children. On reflection however, after considered discussion, that view has been modified as nothing in the guidelines cannot be applied equally to children and young people.

INTRODUCTION

10. We would reiterate the introductory statements of the original paper which stated:

   a. In patients with cardio-pulmonary arrest, vigorous resuscitation attempts must be undertaken whenever there is a chance of survival, however remote.

   b. Nevertheless, it is possible to identify patients in whom there is absolutely no chance of survival, and where resuscitation would be both futile and distressing for relatives, friends and healthcare personnel and where time and resources would be wasted in undertaking such measures.

11. Additionally we wish to add that if a Family Practitioner or third party (relative or close friend) insists on resuscitation, then resuscitation should be attempted.
CONDITIONS UNEQUIVOCALLY ASSOCIATED WITH DEATH

12. All the conditions, listed below, are unequivocally associated with death in all age groups

- Decapitation
- Massive cranial and cerebral destruction
- Hemiperecetomy (or similar massive injury)
- Decomposition/Putrefaction
- Incineration
- Hypostasis
- Rigor Mortis

In the newborn fetal maceration is a contraindication to attempted resuscitation.

13. Details

a. **Decapitation**: self evidently incompatible with life

b. **Massive cranial and cerebral destruction**: where the injuries are considered by the crew member to be incompatible with life

c. **Hemicorporectomy (or similar massive injury)**: where the injuries are considered by the attendant to be incompatible with life

d. **Decomposition/Putrefaction**: where tissue damage indicates that the subject has been dead for some hours, days or longer

e. **Incineration**: the presence of full thickness burns with charring of greater than 95% of the body surface

f. **Hypostasis**: is the pooling of blood in congested vessels in the dependant part of the body in the position in which it lies after death.²

g. **Rigor Mortis**: the stiffness occurring after death from the post mortem breakdown of enzymes in the muscle fibres.³

WHERE RESUSCITATION SHOULD NOT BE CONTINUED ONCE THE FACTS OF THE ARREST ARE KNOWN

14. Following arrival and the recognition of pulselessness and apnoea, the airway should be opened, ventilation and chest compression commenced whilst the facts of the collapse are ascertained.

15. In the following conditions resuscitation can be discontinued:

- Submersion for longer than 1 hour (Note, submersion NOT immersion)⁴ See guidance Note 3 at end

- The presence of a DNAR (Do Not Attempt Resuscitation) order or a Living Will that states the wish of the subject not to undergo attempted resuscitation (See #19 Below)

- In situations when ALL the following exist together:
  - >15 minutes since the onset of collapse
  - non-shockable Rhythm on an AED
  - no bystander CPR prior to arrival of the Ambulance
  - the absence of any of the exclusion factors on the flowchart
  - asystole (flat line) for >30 seconds on the ECG monitor screen

16. The use of the flow chart shown as Appendix A is recommended.

When to terminate resuscitation attempts

17. Where the patient remains in asystole despite full ALS procedures for >20 minutes the resuscitation attempt may be discontinued

18. Removal of endotracheal tubes and/or indwelling cannulae should be in accordance with local protocol.

Do Not Attempt Resuscitation (DNAR)/ Living Wills

19. Ambulance staff should initiate resuscitation unless:

a. A formal DNAR⁵ order is in place, either written and handed to the ambulance crew or verbally received and recorded by Control from the patient’s attendant requesting the ambulance providing that

  - the order is seen and corroborated by the ambulance crew at pick up
  - the decision to resuscitate relates to the condition for which the DNAR order is in force
  - resuscitation should not be withheld for coincidental conditions.
b. A known terminally ill patient is being transferred to a palliative or terminal care facility (unless contrary instructions have been issued or the patient and/or carers express a specific wish for resuscitation to be attempted). Such information may be passed to and recorded by Ambulance Control as above.

c. A living will has been accepted by the medical attendants to signify a DNAR order.

d. Patients may have a “living will” or “advance directive” although it is not legally necessary for the refusal to be made in writing or formally witnessed. This specifies how they would like to be treated in the case of future incapacity. Case law is now clear that an advance refusal of treatment that is valid, and applicable to subsequent circumstances in which the patient lacks capacity, is legally binding. An advance refusal is valid if made voluntarily by an appropriately informed person with capacity. Staff should respect the wishes stated in such a document.

20. In a pre-hospital emergency environment, there may be situations where there is doubt about the validity of an advance refusal. If staff are not satisfied that the patient had made a prior and specific request to refuse treatment, they should continue to provide all clinical care in the normal way.

ACTION TO BE TAKEN AFTER DEATH HAS BEEN ESTABLISHED

21. In the light of the fact that the earlier guidelines have been in use by a number of Services for almost ten years, we no longer believe that it is necessary for a medical practitioner to attend to confirm the fact of death. Moreover, there is no obligation for a GP to do so when requested to attend by ambulance control.

22. Services should be encouraged, in conjunction with their coroner’s service (or Procurator in Scotland), to develop a local procedure for the handling of the body once death has been diagnosed by Ambulance personnel.

23. As a guide the attached procedure (Appendix B) and record form (Appendix C) are suggested:

24. We further propose the adoption of a locally approved Leaflet for handing to bereaved relatives. A suggested format is given as Appendix D.

GUIDANCE NOTE 1

Initially hypostatic staining may appear as small round patches looking rather like bruises but later these coalesce to merge as the familiar pattern. Above the hypostatic engorgement there is obvious pallor of the skin.

The presence of hypostasis is diagnostic of death – the appearance is not present in a live subject.

In extremely cold conditions hypostasis may be bright red in colour, and in carbon monoxide poisoning it is characteristically ‘cherry red’ in appearance.

GUIDANCE NOTE 2

Rigor mortis occurs first in the small muscles of the face, next in the arms, then in the legs (30 minutes to 3 hours).

Children will show a more rapid onset of rigor because of their large surface area/body mass ratio.

The recognition of rigor mortis can be made difficult where, rarely, death has occurred from tetanus or strychnine poisoning.

It is stated that the diagnosis of rigor mortis can be confirmed by firmly pressing on a joint such as the knee, when the rigor mortis will be abolished and the joint becomes flaccid.

In some the rigidity never develops (infants, cachectic and the aged) and in some it may become apparent more rapidly (in conditions in which muscle glycogen is depleted); exertion (that includes struggling), strychnine poisoning, local heat (from a fire, hot room or direct sunlight)).

Rigor should not be confused with cadaveric spasm (sometimes referred to as instant rigor mortis) which develops immediately after death without preceding flaccidity following intense physical and/or emotional activity.

Examples are:
- following death by drowning
- falls from heights.

In contrast with true rigor mortis only one group of muscles is affected and NOT the whole body. Rigor mortis will develop subsequently.
GUIDANCE NOTE 3

Submersion victims

With thanks to Dr F StC Golden for his advice in this specialist area

Attempting to predict criteria for commencing resuscitative efforts on victims found in water is fraught with danger because of many interacting factors that may contribute to extending accepted anoxic survival times. Chief among these is the heat exchange that occurs in the lungs following aspiration of water.

Should the water temperature be very cold, it will rapidly cool the blood in the pulmonary circulation, which in turn selectively cools the brain for as long as a viable cardiac output continues.

Should brain temperature be rapidly cooled to a degree where protection from hypoxia/anoxia is possible (circa 20°C) in the 70 seconds or thereabouts before cardiac failure occurs, then the chances of successful resuscitation are considerably enhanced even if cardio respiratory arrest has been present for an hour or more.

For this outcome to be likely, the water temperature has to be near freezing, and usually, but not necessarily, the body mass relatively small. Hence the majority of the accounts of successful resuscitation after submersion pertain to small children being rescued from ‘ice water’.

It would seem prudent that resuscitative efforts should be made on:

1. Those with a witnessed submersion time of 10 – 15 minutes or less, even though they appear to be dead on rescue.

2. All those where there is a possibility of their being able to breathe from a pocket of air while underwater.

3. All those submerged for up to an hour in ice water and for longer (1 hour) in small children.

4. Everyone who is showing any signs of life initially on rescue.

5. Those whose airway has been only intermittently submerged for the duration of their immersion, e.g. those wearing lifejackets but in whom the airway is being intermittently submerged, provided the body still has a reasonably fresh appearance.

Resuscitative efforts are unlikely to be successful in those submerged for periods exceeding 15 minutes with the exception of those in categories 2 – 5 above.
APPENDIX A (Where resuscitation should not be continued once the facts of the arrest are known)

Cardio-pulmonary arrest

Pulseless/Apnoeic

Open Airway, Start Ventilations and Chest Compressions

Attach defibrillator

Analyse rhythm shock advised?

Evidence of cardiopulmonary resuscitation in past 15 minutes

Any suspicion of:
- Drowning?
- Hypothermia?
- Poisoning and Overdose
- Pregnancy? See below

Yes

No

Yes, or don’t know

Asystole (flat line) >30 seconds?

Yes

No further attempts at resuscitation

No

Continue full resuscitation protocol

Pregnancy is an indication for rapid transfer to hospital to deliver the infant, if necessary by emergency caesarean section, in order to resuscitate the infant.
APPENDIX B Actions to be taken after diagnosis of death

Ambulance crew diagnose death

Are there any suspicious circumstances

Yes

Death in public place

Take steps to preserve scene.
Ask Control to contact Police and advise them of a suspicious death.
Remain on scene
Complete documentation †

No

Death in home or place of normal residence

Are relatives present?

Yes

Offer Condolences.
Leave leaflet ‡ with relatives.
Notify Control who inform GP.
Complete documentation †

No

Seek contact details.
(Control may have some)
Where NONE ask control to inform Police.
Remain on scene until police or other responsible person arrives.
Complete documentation †

Remain on scene
Complete documentation †

Remove patient * to a destination according to agreed local policy.
Request Ambulance Control to inform Police of details of case and destination.
Leave patient documentation † with patient

* The Ambulance Service has a responsibility to remove the patient from public gaze. Operational policy will be agreed locally with Police and Coroner’s services.

† A suggested example of documentation is attached as Appendix C.

‡ A suggested example is attached as Appendix D.
APPENDIX C Diagnosis of the Fact of Death

CONFIDENTIAL

Date and Time..................................................................................................................................................
PRF Number....................................................................................................................................................
Patient's Name................................................................................................................................................
Age or DOB.....................................................................................................................................................
Patient's Address ..........................................................................................................................................
GP Name and Address ...................................................................................................................................

● Patient in collapsed state with no signs of life............................................................................... .........
● Condition incompatible with life (state) ................................................................................................. ....
OR
● DNAR or Living Will Validated ................................................................................................................. ....
OR
● No evidence of CPR in past 15 minutes ................................................................................................. ....
AND
● No signs of
  DROWNING □
  HYPOTHERMIA □
  POISONING OR OVERDOSE □
  PREGNANCY □
AND
● Flat line (asystole on ECG for 30 seconds .........................................................................................

CONTROL NOTIFIED requesting contact POLICE □ &/OR GP □ at .........................hrs
RELATIVES/NEIGHBOURS CONTACTED □ at .........................hrs
MINISTER of RELIGION CONTACTED □ at .........................hrs
BYSTANDER PRESENT yes/no contact info ................................................................................................

DIAGNOSED BY .................................................................Call Sign..........................................................
WITNESSED BY .................................................................Call Sign..........................................................
STATION ..................................................................................
APPENDIX D

Anywhere Ambulance Service

From the Chief Ambulance Officer

May we offer you our deepest sympathies

Sadly someone you were close to has died. The ambulance service offers you our sincere condolences.

Be assured that if there had been any chance that life could have been saved our staff would have taken appropriate action.

If you have any questions or need help please ask the paramedics to assist you.

This leaflet is an attempt to address some of the issues that you will be facing at the present time. On the back of the leaflet are some local telephone numbers which may be of use to you.

The ambulance staff will soon be leaving. Your deceased relative/friend will remain in your care until other support e.g. doctor, police or undertaker, arrives. May we suggest that, if you wish, you contact someone for support. Members of your family, close friends or a minister of religion may be of assistance to you.

Please remember that there are people to help. They will understand that this is a difficult and stressful time for you and that you are not likely to know everything that has to be done and will need some help. We are sure you will find everyone you deal with anxious to ease your way. We have included some information which you may find useful and you can obtain further information from your telephone directory, or by contacting your GP, local post office or council offices. You may also (if you have not done so already, above) wish to contact your own minister of religion.

Once you have appointed a funeral director, you will find that they can take care of many of the potentially distressing details for you.

The ambulance crew has now pronounced death. However, it is a legal requirement for a doctor (normally it is the patient’s GP) to issue a medical certificate indicating the cause of death. We will attempt to contact your GP but if this is not possible or the GP is not in a position to issue this certificate, perhaps because he/she is unsure of the precise cause, there will be a duty on Her Majesty’s Coroner (Procurator Fiscal) to investigate the death and issue the appropriate certificate. Under these circumstances the police, who act as agents of the coroner/procurator fiscal will be contacted.

In the event of a sudden death

In certain circumstances it may not be possible to establish the cause of death immediately so a doctor may not be able to sign a medical certificate. In some instances the body will have been moved to a mortuary. It may be necessary to hold an inquest or fatal accident enquiry. In all these circumstances, the procedures will be clearly explained to you by the police who are acting as agents of the coroner/procurator fiscal. It is still advisable at this stage to contact a funeral director and start to make the arrangements.

The Medical Certificate

When the doctor or coroner is satisfied as to the cause of death he will issue the medical certificate. This must be taken to the registrar who will register the death and issue the actual death certificate; he will also give you formal notice that he has done so.
The Registrar

You must take the medical certificate to register the death with the Registrar of Births and Deaths in the district where the death occurred. You are legally obliged to do this within five working days and this duty is best done, if possible, by the next of kin or someone with detailed family knowledge. You may take a friend or relative with you and, if possible the deceased birth certificate, marriage certificate (where appropriate) and medical card. You will find a list of addresses for registrars over leaf – they are also listed under registration of births and deaths in your telephone directory.

The Death Certificate

The death certificate is issued by the registrar. You will be given two copies, a green form for burial or cremation which must be given to your funeral director and a white copy for the department of social security and other purposes. It is worth checking as you may need additional copies of the white form – these are required for insurance and pension claims, for processing the will and any bank account. Additional copies can always be obtained later.

The registrar also has application forms for a funeral payment from the social fund, see opposite.

Funeral Directors

You will find the funeral director invaluable during the early stages of your bereavement and there is a list of funeral directors in The Yellow Pages or in your local paper. Reputable directors are committed to the highest professional standards and will explain clearly all options available and will provide a clear estimate of possible charges. In circumstances of hardship it may be possible to apply for a funeral payment towards the expenses of a simple ceremony. Once you have appointed a director you will find that they can take charge of many details for you and if required put you in touch with a minister of the appropriate religion. They will also, if you wish, remove the body to their own chapel of rest prior to the funeral.

Cremation or Burial?

If it is your wish or was that of the deceased to have a cremation the signature of two doctors are required. The funeral director will arrange this.

Ministers of Religion

A minister of the deceased's religion may already have been in attendance and may be of support to family and friends at this time. They will discuss your preferences and advise on the details of the funeral service. If there has been no recent contact with a religious group, your GP or the funeral director can advise on someone of the appropriate faith in your area who will be more than happy to carry out the required duties.

Support Agencies

There are many other organisations that may be available to provide you with help and support, for example CRUISE or the Samaritans (numbers are overleaf, a complete list can be found in the useful telephone numbers section of your local telephone book).
**Pensions and Benefits**

**FUNERAL PAYMENTS FROM THE SOCIAL FUND**

Any pension or benefit books payable to the deceased must be returned to the DSS office. Death grant is no longer available and in some cases of hardship it may be possible to apply for funeral payments from the social fund to help with the expenses of a simple but dignified funeral – your local DSS office will advise and has the appropriate forms. This is also available from the registrar. In the days to follow there will be many other matters requiring attention, for example

- Bank and savings account
- Insurance policies
- Rent and household bills
- Solicitors
- Notice in local newspaper (the funeral director will arrange this).

**Organ donations**

The deceased may have expressed a desire to donate tissue or organs. Under the present circumstances only corneal (eye) donations can be contemplated as they can be removed up to 36 hours after death. This simple procedure can be carried out in the chapel of rest and is not in any way disfiguring. If this is something you wish to consider you should either contact your funeral director who will involve the appropriate agencies or the local accident and emergency department whose number is overleaf.

We are sure you will find that people will help as much as they can and you will find the funeral director’s advice invaluable. This brief guide cannot cover every eventuality but we trust it has been of some help to you.
References

1 The term ‘rigorous’ was used in 1996. We feel that vigorous is now a better adjective.

2 See Guidance Note 1

3 See Guidance Note 2

i Baskett P, Fisher J, Marsden A. Recognition of death by ambulance personnel. *Joint Colleges Ambulance Liaison Committee Newsletter* 1996; 1

ii Marsden AK, Ng GA, Dalziel K et al. When is it futile for ambulance crews to initiate cardiopulmonary Resuscitation? *BMJ* 1995; 311 : 49 – 51


vi Decisions Relating to Cardiopulmonary Resuscitation. A Joint statement from the RCN, Resuscitation Council (UK), and the BMA.
INTRODUCTION
Choking is the interruption of respiration by internal obstruction of the airway.

Foreign body obstructions of the respiratory tract include hard items such as toys, sweets, nuts, and coins as well as soft items such as foodstuffs-meat, (known as a café coronary) and a wide variety of other substances.

Choking can lead to serious morbidity and is the leading cause of accidental deaths in infants less than one year old and the fourth commonest in 1 – 9 year old children in the USA.

The majority of airway foreign bodies are cleared before EMS arrival, especially in older children, however those that are not removed constitute a serious medical emergency, leading to asphyxia or even death.

HISTORY
The choking event is rarely witnessed and diagnosis is often difficult to establish.

Clues in the history include, evidence of missing objects, the environment (café, toy room,) or the pre-existence of a condition which limits swallowing (CVA, tracheotomy).

An obstruction that is not compromising ventilation should be left in place and the patient transferred to hospital.

If blockage of the airway is only partial, the patient will usually be able to clear it by coughing, but if the obstruction is complete urgent intervention is required to prevent asphyxia.

A choking event which has occurred and has no evidence needs to be further investigated

ASSESSMENT
Assess ABCD.

Assess the evidence.

General signs include coughing, cyanosis, agitation, blood streaked sputum, decreased air entry, abnormal breath sounds, sternal indrawing, and tachypnoea.

In acute upper airway obstruction there may also be,

- stridor
- dysphonia
- dysphagia
- retrosternal chest pain
- audible slap and palpable thud in expiration when the foreign body hits the subglottic level
- abnormal posture.

Conditions such as croup, epiglottitis, and other upper airway infections may present similar signs and symptoms, especially in children.

MANAGEMENT
Victim is conscious and breathing, despite evidence of obstruction:

- encourage the patient to continue coughing and provide supportive care with minimal invasive procedures provided adequate ventilation is maintained
- reassess in case the situation deteriorates
- provide rapid transportation to hospital (load and go).

Obstruction is complete or the victim shows signs of exhaustion or becomes cyanosed:

If the victim is conscious:

Carry out back blows;

- remove any obvious debris or loose teeth/dentures from the mouth
- stand to the side and slightly behind him/her
- support the chest with one hand and lean the patient well forwards so that when the obstruction is removed it comes out of the mouth rather than further down the airway
- give up to five sharp blows between the scapulae (shoulder blades) with the heel of your hand; each blow should be aimed at removing the obstruction, so all five need not necessarily be given if the back blows fail –
  - carry out abdominal thrusts
  - stand behind the patient and put both arms around the upper part of the abdomen
  - make sure the victim is bending well forwards so that when the obstructing object is dislodged it comes out of the mouth rather than goes down the airway
  - clench your fist and place it between the umbilicus (navel) and xiphisternum.
Cardiac Arrest

To avoid complications when using abdominal thrusts it is imperative the correct hand position is used. Potentially life threatening conditions could occur such as laceration of abdominal or thoracic viscera, surgical emphysema, pneumomediastinum, and/or pneumopericardium.

If the victim at any time becomes unconscious:

This may result in the relaxation of the muscles around the larynx (voicebox) and allow air to pass down into the lungs.

- tilt the victims head and remove any visible obstruction from the mouth (a view assisted by laryngoscopy may help, but care must be taken not to further impact any obstruction)
- at this point consider aspirating small soft items/hard items which may be suctioned upwards, taking care not to push the item further down the airway.
- if the obstruction cannot be removed, use Magills forceps whilst under the direct vision of laryngoscopy (the smallest diameter of a child’s airway is located below the vocal-cords at the cricoid cartilage level; when a foreign body is lodged or impacted in this place, attempts to clear the airway with manoeuvres to relieve it can be unsuccessful) be aware of laryngeal spasm.

If the advanced techniques are unsuccessful

- open the airway further by lifting his/her chin
- assess any breathing
- attempt two effective ventilations with BVM
- if effective ventilation can be achieved within five attempts
  - check for signs of circulation
  - start chest compressions and/or ventilate with BVM
- if effective ventilation cannot be achieved within five attempts
  - start chest compressions immediately and/or other advanced techniques used previously to remove the obstruction
  - do not check for signs of circulation
- after 15 compressions, check the mouth for any obstruction then attempt ventilation
  - continue to give cycles of 15 compressions followed by attempts at ventilating
- if at any time effective ventilation can be achieved;
  - check for signs of circulation
  - continue chest compressions and/or ventilation as appropriate.

The use of needle cricothyroidotomy and transtracheal jet ventilation should be considered by a competent clinician where the situation is desperate, and all methods to obtain an airway have failed.

ADDITIONAL INFORMATION

- finger sweep must not be used without evaluating and visualising the back of the pharynx. This will avoid increasing the severity of the obstruction or causing marked tissue injury
- the back blow with the head down is suggested as the initial treatment, this uses the force of gravity and compression of the chest to expel the foreign body
- the use of Magills forceps should only be used by a competent clinician
- when aspirating always remember to re-oxygenate after a period 15 seconds.

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ADDITIONAL INFORMATION
References


Marsden AK, Ng GA, Dalziel K et al. When is it futile for ambulance personnel to initiate cardiopulmonary resuscitation? *BMJ*. 1995 Jul 1;311(6996):49-51


Fitzpatrick PC, Guarisco JL. Paediatric airway foreign bodies *J La State Med Soc* 1998 Apr;150(4):138-41


Pharyngeal Trauma as a result of blind finger sweeps in the choking child *Emerg Med J* 1995;12:52-54


INTRODUCTION
Although the care of a wide range of medical conditions will be quite specific to the presenting complaint, there are general principles of care that apply to most medical cases, regardless of origin.

HISTORY
The accepted format of history taking is as follows:

- presenting complaint
- history of presenting complaint
- direct questioning about associated symptoms
- past medical history
- family history
- social history.

Combined with a good physical examination this format of history taking should ensure that you correctly identify those patients who are time critical, urgent or routine.

PATIENT ASSESSMENT
Primary survey
The Primary Survey is an invaluable tool to initially assess any ill patient, and detect any TIME CRITICAL problems.

Assess and correct deficits with:

A  airway
B  breathing
C  circulation
D  disability (Mini neuro exam)

Assess and document vital signs from the above survey.

STEPWISE PATIENT ASSESSMENT AND MANAGEMENT
In ABCD management, manage deficits as they are encountered: i.e. do not move on to rectification of Breathing or Circulation until Airway is secured.

AIRWAY ASSESSMENT
Observe mouth and upper airway for air movement, and open airway as required.

Exclude and be prepared to manage airway obstruction resulting from vomit, or other debris.

STEPWISE AIRWAY MANAGEMENT
Correct any AIRWAY deficits immediately by:

- positioning, head tilt / chin lift / jaw thrust
- aspiration
- oropharyngeal airway
- nasopharyngeal airway
- laryngeal mask airway (LMA)
- endotracheal Intubation
- needle cricothyroidotomy.

BREATHING ASSESSMENT
Assess for skin colour and for any evidence of cyanosis.

Expose the chest to observe chest wall movement. If breathing is absent proceed to resuscitation procedures.

OTHERWISE
Assess respiratory rate and effort, along with any inequality of either side of the chest's movement. Note any wheezing, noisy respiration, either on inspiration or expiration. Listen for stridor (higher pitched noise on inspiration), suggestive of upper respiratory obstruction.

Check position of trachea in suprasternal notch.

Listen to the chest with a stethoscope. Ask the patient to breathe in and out briskly through their mouth. Listen on both sides of the chest:

- above the nipples in the mid-clavicular line
- in the mid-axilla under the armpit
- at the rear of the chest, below the shoulder blade.

Listen for:

- normal or reduced air entry
- equal air entry on each side
- wheezing (on expiration)
- crepitations at the rear of the chest (crackles, heard low down in the lung fields at the rear – indicates fluid in the lung in heart failure)
- additional crackles and wheeze on inspiration that may be associated with inhalation of blood or vomit.

STEPWISE BREATHING MANAGEMENT
Correct any BREATHING deficits immediately by:

- All medical emergencies should receive supplemental O₂ at high flow rate. Specific advice is available for patients with COPD.
Be prepared to assist ventilation or provide IPPV if ventilation is inadequate (i.e. rate <12 or >30 bpm, or inadequate depth (see Assisted Ventilation Procedure).

Assist or provide IPPV with bag, mask and reservoir or mechanical ventilation (Assisted or IPPV).

CIRCULATORY ASSESSMENT
Assess for evidence of haemorrhage externally (epistaxis, haemoptysis, haematemesis, melaena).

Assess skin colour and temperature.

Palpate a radial pulse – if present this implies a systolic BP (SBP) of >90 mmHg. If absent, assess for a carotid pulse, which if present implies an SBP of >60 mmHg.

Assess for pulse rate, volume, and regularity.

Check capillary refill time in fingertips, (normal <2 seconds).

STEPWISE CIRCULATORY MANAGEMENT
Correct any circulation deficits immediately:

Arrest external haemorrhage.

Where appropriate, consider cannulation for drug administration.

In patients with large volume blood or circulating fluid loss, (e.g. GI bleeding, diabetic hyperglycaemia, anaphylaxis), commence IV infusion with crystalloid 250ml through the largest bore cannula which can confidently be placed.

Reassess pulse and BP. If required give additional fluid to maintain a radial pulse (SBP) of 90-100 mmHg during transport.

DISABILITY ASSESSMENT
Note initial level of responsiveness on AVPU scale, and time of assessment.

A Alert
V Responds to voice
P Responds to painful stimulus
U Unresponsive

Assess and note pupil size, equality and response to light.

Observe and note any spontaneous limb movement.

Continually reassess ABCD and initiate appropriate treatments en route in case of deterioration.

EVALUATE
If any of the following features are identified within the Primary Survey then the patient should be considered TIME CRITICAL. The priority is to get the patient to definitive care in hospital, other than correcting immediately life-threatening A and B conditions further assessment and treatment should continue en route. (This list is not inclusive, patients with other signs may also be time critical, this is where the clinical judgement of the Paramedic is important).

- airway impairment
- severe breathlessness
- failing ventilation
- severe haemorrhage
- circulatory collapse and shock due to infection
- cardiac chest pain
- cardiogenic shock
- severe hypotension due to bradycardia or extreme tachycardia
- anaphylaxis
- unconsciousness
- status epilepticus.

CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT to NEAREST SUITABLE RECEIVING HOSPITAL

- Provide a hospital alert message.
- En route – continue patient MANAGEMENT (see below).

Secondary Survey
In non-TIME CRITICAL conditions, perform a more thorough patient assessment with a brief Secondary Survey. It may be easier and more appropriate to perform this in the Ambulance, and in many instances en route to hospital even when the patient is not time critical.

HEAD
- reassess AIRWAY
- reassess levels of consciousness (avpu), pupil size and activity
- establish Glasgow coma scale – see appendix 1.
CHEST
● reassess respiratory rate and depth
● re-listen for breath sounds in all lung fields
● assess for pneumothorax – in small pneumothorax – no clinical signs may be present. A pneumothorax causes breathlessness, reduced air entry and chest movement on the affected side. If this is a tension pneumothorax, distended neck veins, and tracheal deviation away from affected side may also be present
● assess skin colour and temperature
● assess heart sounds, assess and confirm heart rate
● obtain a blood pressure reading using a sphygmomanometer. Document and record results
● re-assess as needed en route to hospital.

ABDOMEN
● feel for tenderness and guarding in all four quadrants.

LOWER AND UPPER LIMBS
Check for MSC x 4:
M = MOTOR – test for movement
S = SENSATION – apply light touch to evaluate sensation
C = CIRCULATION – assess pulse and skin temperature
x 4 = ALL FOUR LIMBS

MANAGEMENT OF MEDICAL EMERGENCIES
● ensure ABC’s
● ENSURE ADEQUATE O₂ THERAPY
● obtain IV access/infusion, if required
● apply ECG and pulse oximetry monitoring, as required
● consider patient positioning, e.g. sitting upright for respiratory problems
● check blood glucose levels in all patients with history of diabetes, impaired consciousness, fits in non-epileptic patients, collapses involving heat exhaustion or alcohol
● provide drug therapy as required, e.g. 10% glucose IV in cases of hypoglycaemia
● if the level of consciousness deteriorates or respiratory depression develops in cases where an overdose with opiate type drugs may be a possibility, consider naloxone. (See Naloxone Guideline)
● follow ADDITIONAL MEDICAL guidelines as indicated by the patient’s condition, e.g. Bradycardia procedure
● correct A and B problems on scene then commence transport to nearest suitable receiving hospital
● provide a hospital alert message / information call, if required. (see Hospital Alert Message Guideline)
● at the hospital, provide a comprehensive verbal handover, and a completed Patient Report Form to the receiving hospital staff.

ADDITIONAL INFORMATION
Remember that the patient history may give you valuable insight into the cause of the current condition. The following may be of great help in your diagnosis:

● relatives, carers or friends with knowledge of the patient’s history
● packets or containers of medication (including domiciliary oxygen) or evidence of administration devices e.g. nebuliser machines
● medicalert jewellery (bracelets or necklets) which detail the patient’s primary health risk (eg diabetes, anaphylaxis etc) but also list a 24 hour telephone number to obtain a more detailed patient history
● warning stickers, often placed by the front door or the telephone directing the health professional to a source of detailed information (one current scheme involves storing the patient details in a container in the fridge as this is relatively easy to find in the house)
● patient held warning cards denoting previous thrombolysis, at risk COPD patients or those taking MAOI medication.
### APPENDIX 1 – GLASGOW COMA SCALE

<table>
<thead>
<tr>
<th>GLASGOW COMA SCALE</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eyes Open:</strong></td>
<td></td>
</tr>
<tr>
<td>Spontaneously</td>
<td>4</td>
</tr>
<tr>
<td>To speech</td>
<td>3</td>
</tr>
<tr>
<td>To pain</td>
<td>2</td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
</tr>
<tr>
<td><strong>Best motor response:</strong></td>
<td></td>
</tr>
<tr>
<td>Obey commands</td>
<td>6</td>
</tr>
<tr>
<td>Localises pain</td>
<td>5</td>
</tr>
<tr>
<td>Flexion withdrawal</td>
<td>4</td>
</tr>
<tr>
<td>Decerebrate flexion</td>
<td>3</td>
</tr>
<tr>
<td>Decerebrate extension</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td><strong>Best verbal response:</strong></td>
<td></td>
</tr>
<tr>
<td>Orientated</td>
<td>5</td>
</tr>
<tr>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td>Silent</td>
<td>1</td>
</tr>
</tbody>
</table>

### MODIFICATION OF GLASGOW COMA SCALE FOR CHILDREN UNDER 4

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best verbal response:</strong></td>
<td></td>
</tr>
<tr>
<td>Appropriate words or social smiles, fixes on and follows objects</td>
<td>5</td>
</tr>
<tr>
<td>Cries, but is consolable</td>
<td>4</td>
</tr>
<tr>
<td>Persistent irritable</td>
<td>3</td>
</tr>
<tr>
<td>Restless, agitated</td>
<td>2</td>
</tr>
<tr>
<td>Silent</td>
<td>1</td>
</tr>
<tr>
<td><strong>Eyes open:</strong></td>
<td>As per Adult Scale</td>
</tr>
<tr>
<td><strong>Motor response:</strong></td>
<td>As per Adult Scale</td>
</tr>
</tbody>
</table>

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Medical Emergencies
INTRODUCTION
A variety of medical conditions such as gastroenteritis, ulcerative colitis, and gastritis may be present with abdominal pain. Abdominal pain may also arise from a variety of intra-abdominal surgical events, such as acute appendicitis, cholecystitis, and perforation of a gastric ulcer. These may require direct surgical intervention to rectify.

The specific anatomical cause of abdominal pain can rarely be determined in the field, but the most important diagnoses to consider are those that threaten life, mainly as a result of MAJOR INTERNAL HAEMORRHAGE. Ruptured aortic aneurysm, ruptured ectopic pregnancy and traumatic disruption of the liver or spleen, are common examples of these conditions and require Airway, Breathing and Circulatory assessment and resuscitation. The nature, location and pattern of the pain and associated accompanying symptoms often point to the probable cause.

Abdominal pain secondary to trauma may well be related to specific organ injury, such as splenic rupture. Abdominal trauma is often initially silent, i.e. little or no pain at first, with pain and other symptoms developing later. Abdominal injury may well be masked in cases where patients have other distracting painful injuries e.g. fractures or chest trauma.

Occasionally the pain of myocardial infarction may present as upper abdominal rather than chest pain.

In the case of SUSPECTED AORTIC ANEURYSM RUPTURE, it is important to remember that IV fluid administration should not raise blood pressure in excess of 90mmHg, as re-bleeding may occur.

Ambulance crews may often attend a variety of acute medical conditions such as appendicitis, renal colic, acute duodenal ulcer perforation, acute pancreatitis, abdominal angina and peritonitis (as before etc.) plus chronic conditions such as IBS, gastric and duodenal ulcers and various abdominal organ cancers (Blendis, 1994).

20-25% of patient’s with abdominal pain calling 999 may have serious conditions (Graff & Robinson). Both ends of the age spectrum present atypically and therefore require a more refined history to assess (Graff & Robinson).

The elderly patient suffering internal bleeding has a higher mortality than most.

Women of childbearing age require particular vigilance (Graff & Robinson).

It is important to adopt a high level of suspicion and obtain an ECG as standard for all elderly patient’s and those with only cardiac risk and upper abdominal pain (ACEP 2000).

Suspect ruptured AAA in anyone over 50 years of age who presents with sudden severe abdominal or back pain, hypotension with bi lateral lower extremity ischemia (or mottling a late sign) especially if there is a history of smoking, hypertension and hypercholesterolemia (Coselli et al, 1999). New renal colic type symptoms in older people may also represent AAA.

IV fluid replacement should follow the current hypotensive resuscitation guidelines (Revell, Porter & Greaves, 2002). This requires a titrated administration of IV fluids in 250ml aliquots so that systolic blood pressure does not rise above 90mm Hg. However, it is thought that certain subgroups of patients tolerate hypotension differently (Revell, porter & Greaves, 2002). For instance; head injuries require higher pressures to maintain cerebral blood circulation, whilst penetrating injuries to the torso require particularly low systolic pressures and the elderly tolerate hypotension badly (Revell, Porter & Greeves, 2002).

Early pain relief is advised as it minimises patient suffering, is humane and scientifically appropriate (Ducharme, 2000 and Thomas & Silen, 2003). It does not affect diagnostic accuracy (Mackway-Jones, 2003) and may help the patient to make a calmer more informed decision.

HISTORY
It is important to gain a thorough history of the pain, understanding the mechanism of pain can help assist in assessing the patient (Graff & Robinson)


Associated symptoms (diarrhoea, nausea, vomiting, constipation, blood in vomit, urinary burning, missed periods in females).

Past Medical History including, recent viruses, kidney stones, diabetes, (Blendis in Wall & Melzack, 1994).
ASSESSMENT
Assess ABCD’s.

Assess for pallor, seating restlessness.

Evaluate any time critical features (see description of time critical signs).

If time critical resuscitate A and B problems then transport to nearest hospital. Early cannulation is desirable but should not delay on scene time, and a limit of only two attempts at cannulation en route (Revell, Porter & Greaves, 2002).

Provide pre alert to A/E dept.

En route continue patient management (see below).

Obtain ECG as standard for all elderly patients and those with cardiac risk and upper abdominal pain (ACEP 2000).

In patients with NO time critical features, perform a thorough assessment including;

Consider pain as the 5th VITAL SIGN by aggressive assessment and treatment of pain. Then re-assess at regular intervals (Quinn in Campbell, 1996 & ICSI 2001).

Use an appropriate pain assessment tool.

Assess for raised temp where possible.

Gently palpate abdomen (all four quadrants) for guarding, tenderness, muscle spasm, distension, pulsating mass.

MANAGEMENT
SAME AS BEFORE EXCEPT:
High flow O₂ Therapy (Revell, Porter & Greaves, 2002).

Fluids should be warmed and given slowly NOT rapidly. Judicious aliquots of 250mls of fluid titrated to maintain presence of radial pulse, which should approximately equate to systolic blood pressure of >90mmHg (Revell, Porter & Greaves, 2002).

Normal Saline is the fluid of choice for IV fluid replacement (Revell, Porter & Greaves, 2002).

SPECIFICALLY CONSIDER:
Ensure position of comfort (Blendis in Wall & Melzack, 1994).

Prompt pain relief does not interfere with later diagnosis (Bohan, ACEP, Thomas & Silen, 2003). It is ethically and clinically inappropriate to hold back on pain relief. Pain can cloud the patient’s ability to concentrate and to understand explanations (Durchame, 2000, Gabbay & Dickinson, 2000 and Thomas & Silen, 2003). Therefore, offer entonox as soon as possible whilst cannulating followed by an approved opiate.

Ensure systolic BP of >90-100mmHg before administering IV Morphine or Nalbuphine.

Tailoring doses to individual patient requirements rather than bolus doses (Ricard Hibbon et al 1999).

ADDITIONAL INFORMATION
Use developmentally appropriate pain scales (New Pain Management Standards, 2000) Children will understand face scales and game type tests more easily.

Elderly and confused do suffer pain (Zimmerman, 2002) and may need help in understanding what is required of them when being asked to describe or to give a “score” to their pain.

Use a pain scale that crosses language barriers (New Pain Management Standards, 2000).

Beware of the blanket statement of “hypotensive” fluid resuscitation in the elderly.

Remember that fewer than half of all patients with ruptured AAA present with the classical clinical triad (sudden abdominal or lower back pain, hypotension and a pulsating abdominal mass) (Coselli et al, 1999).
REFERENCES


Institute of Clinical systems improvement & management of acute pain. Bloomington (MN): Institute for clinical systems Improvement (ICSI); 2001 Nov, 74,133.


INTRODUCTION

Breathing difficulty in the adult is one of the most common causes of emergency calls for ambulance assistance and is the most common reason for Emergency Department (ED) visits. Approximately 25-50% of dyspnoea patients presenting to the ED are admitted to hospital.

Dyspnoea has many causes involving single and multiple organ systems. Asthma, cardiogenic pulmonary oedema, chronic obstructive pulmonary disease (COPD), pneumonia, cardiac ischaemia, and interstitial lung disease account for approximately 85% of all ED cases of shortness of breath.

Less common medical causes of dyspnoea include pulmonary embolus, severe anaemia and hypertensive crisis. In trauma, pneumothorax, flail chest, lung contusion, and severe hypovolaemic shock may also cause severe breathing difficulties. Acidosis following salicylate overdose or ketoacidosis also causes physiological hyperventilation.

The primary question is whether the breathlessness is of respiratory, cardiac, both or other causes. Evaluation and assessment of patients with a chief complaint of dyspnoea should include a thorough history taking and physical exam.

Diagnosis in these cases is difficult even in hospital where chest X-rays are an important aid. Even so, prehospital carers have excellent diagnostic agreement with emergency physician diagnosis by organ system (USA).

HISTORY

A thorough history taking will determine the probable causes of dyspnoea. Ask the patient about a history of:

- Smoker?
- Ischaemic Heart Disease (IHD)?
- Asthma?
- Hypertension?
- Recent surgery or immobilization?
- Recent increase in own inhaler use?
- Acute exacerbation of existing chronic condition?

E.g. COPD with a sudden change due to chest infection.

- Known heart failure (pulmonary oedema, ankle swelling, “on water tablets”).
- History of asthma?
- Any wheezing?
- If there is a history of asthma this may well be an acute attack.

- Older patients with no history of asthma?
- Breathless and wheezy?
- Especially waking at night with these symptoms?
- These are often in acute left ventricular failure (LVF).
- Hysteria with hyperventilation?

- often accompanied by numbness and tingling in the limbs and around the mouth.

- Ensure other more serious conditions are excluded before assuming this diagnosis.
ASSESSMENT


Specifically assess: (inspect, percuss, palpate, auscultate).

- respiratory rate and effort
- degree of dyspnoea’ (see Additional Information)  
  - assess on Vertical Visual Analogue Scale (VAS) where possible or against another locally agreed scale
- raised jugular vein pressure (JVP) and peripheral oedema: LVF
- signs of anaphylaxis – itchy rash, facial swelling, circulatory collapse
- absence of air entry on one side of the chest: pneumothorax  
  - these rarely tension in non-trauma cases, but beware

- productive cough, sputum or bubbling.
- Infection or heart failure  
  - frothy white / pink sputum:- acute LVF  
  - productive cough (yellow / green sputum):- chest infection  
  - haemoptysis:- PE, chest infection, or CA lung.
- chest sounds.  
  - audible wheeze on expiration: asthma or LVF  
  - audible stridor: upper airway narrowing (e.g. anaphylaxis)  
  - on auscultation  
    ❑ rales – fine crackling in lung bases (crepitations): LVF  
    ❑ rhonchi – harsher sound – collections of fluid in larger airways: pneumonia.

<table>
<thead>
<tr>
<th>Most common findings</th>
<th>Pneumonia</th>
<th>Pulmonary Embolism</th>
<th>LVF</th>
<th>Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>Dyspnoea</td>
<td>Dyspnoea pleuritic chest pain cough</td>
<td>Dyspnoea especially on exertion or anaphylaxis</td>
<td>Dyspnoea cough or unable to complete sentences</td>
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<td></td>
<td>Fever</td>
<td>Leg pain</td>
<td>Orthopnoea / nocturnal dyspnea</td>
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<td></td>
<td>Cough</td>
<td>Leg oedema</td>
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<tr>
<td>Physical Signs</td>
<td>Tachycardia</td>
<td>Tachycardia, fever</td>
<td>Peripheral oedema</td>
<td>Wheeze</td>
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<td></td>
<td>ECG: Nonspecific ST-T wave changes</td>
<td>JVD</td>
<td>Tachycardia</td>
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<td>Pulsus paradoxus</td>
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<td>Hyperresonant chest</td>
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<td>Accessory muscle</td>
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<td></td>
<td>PEF&lt;50% normal</td>
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<tr>
<td>Auscultation sounds</td>
<td>Rhonchi</td>
<td>Focal rales</td>
<td>Rales, Heart murmur, rhonchi</td>
<td>Decreased or absent breath sounds if severe</td>
</tr>
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<tr>
<td>History of:</td>
<td>Smoking</td>
<td>Prolonged immobilization</td>
<td>IHD</td>
<td>Previous asthma</td>
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<tr>
<td></td>
<td>IHD</td>
<td>Recent surgery, thrombotic disease</td>
<td>Hypertension</td>
<td>Recent sharp increase in inhaler use</td>
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</tbody>
</table>

N.B. Any condition may present with any number of characteristics.

Table 1: Evidence Based Differential Diagnosis²,³,⁶,³⁰,³¹

- productive cough, sputum or bubbling.
- Infection or heart failure  
  - frothy white / pink sputum:- acute LVF  
  - productive cough (yellow / green sputum):- chest infection  
  - haemoptysis:- PE, chest infection, or CA lung.
- chest sounds.  
  - audible wheeze on expiration: asthma or LVF  
  - audible stridor: upper airway narrowing (e.g. anaphylaxis)  
  - on auscultation  
    ❑ rales – fine crackling in lung bases (crepitations): LVF  
    ❑ rhonchi – harsher sound – collections of fluid in larger airways: pneumonia.
Children or adults with stridor and drooling, consider epiglottitis or foreign body inhalation.

- inspect inside the mouth but NEVER insert anything (e.g. spatula) into the mouth as this may induce gagging and reflex airway obstruction.

Other symptoms to help reach a diagnosis, e.g. constricting pain suggests angina / or possible MI

Evaluate TIME CRITICAL factors:
THESE MAY INCLUDE
- extreme breathing difficulty
- cyanosis
- hypoxia – i.e saturation levels on pulse oximeter (SpO₂) <95% or not responding to high flow O₂ (see additional information)
- features of life threatening asthma
- features of tension pneumothorax, or major chest trauma
- evidence of anaphylaxis
- if any of these features are present, correct A and B problems, give O₂, LOAD AND GO to nearest suitable receiving hospital, applying appropriate individual treatment guideline enroute.
- Provide a hospital alert message / information call.

MANAGEMENT
Follow Medical Emergencies Guideline, Ensure ABC’s.

Provide high flow (10-15 lpm 100%) O₂ via non-rebreath mask.

Position for comfort (usually sitting upright).

Specifically consider:
- anaphylaxis guideline
- asthma guideline
- COPD guideline
- pulmonary oedema guideline
- pulmonary embolism guideline
- tension pneumothorax: consider needle decompression of the affected side, if suitably trained

Reassess degree of dyspnoea after treatment.

ADDITIONAL INFORMATION

SpO₂ level
Defined lower limit of normal/or SpO₂ : 91%-96% 8,9,11,12,13

Validated screening cut-off level of 92% for detection of systemic hypoxia (sensitivity 100%, specificity 86%).14

Pulse oximetry in reasonably perfused patients accurate to +/- 4% (largest errors in highly pigmented skin).1,15

SpO₂ levels 94% or below should be considered as hypoxia.

Pulse oximetry affected by motion artefact16, carboxyhaemoglobin and nail varnish. Remove varnish or mount probe sideways on finger.15

Dyspnoea Visual Analogue Scale (VAS)
Validated Visual Analogue Scales have been used to assess subjective degree of dyspnoea in patients with asthma, COPD, LVF and dyspnoea on exertion.17,18,19,20,21,22,23

The vertical scale was developed in response to difficulty patients were having using the horizontal scale.18,24,25

Continuous VAS scales can identify transient changes brought about by acute episodes of breathlessness, which discrete (0,1,2,3..10) scales cannot.26

The dyspnoea VAS is valid in assessing symptomatic changes and may detect small subjective improvements better than PEFR. In asthma, symptomatic improvement was seen in changes >0.5cm and clinically meaningful improvement seen in changes >2.2cm.27

VAS scales have been utilised in the pre-hospital field, including the UK.28,29 (see over)
REFERENCES


measures of breathlessness. Respiratory Care 47(9), pp. 986-993.


INTRODUCTION
Chest pain is one of the most common symptoms of myocardial infarction (MI).

It is also a common feature in many other non-cardiac conditions such as chest infection with pleuritic pain, pulmonary embolus, reflux, oesophagitis, indigestion, and simple musculoskeletal chest pain.

HISTORY
Taking and assessing a history.

There are a number of specific factors that may help in reaching a reasoned working diagnosis, and applying appropriate management measures to the patient. **There must be a high index of suspicion that any chest pain is cardiac in origin.** AMI cannot be excluded on clinical examination.

The majority of deaths from myocardial infarction occur shortly after the onset of the MI, and are a result of ventricular fibrillation. The sooner a defibrillator arrives by the patient, the better.

**THE NATIONAL SERVICE FRAMEWORK FOR CORONARY HEART DISEASE** requires a defibrillator to be at the patient's side in cases of suspected MI within eight minutes of the call for help. This is a challenging target but requires both rapid response times and taking the defibrillator to all suspected chest pain and breathing difficulty cases.

**THE DEFIBRILLATOR MUST BE TAKEN TO ANY PATIENT COMPLAINING OF CHEST PAIN.**

AMI is more likely as a cause of chest pain in patients with a previous history of angina or MI.

**Nature and location of the pain**
Myocardial infarction and angina pain tends to be central in the chest and constricting in nature. It may, however, be present in the shoulders, or upper abdomen, and be referred to the neck, jaws and arms. Anginal pain tends to last minutes in duration, but should it persist for more than 15-20 minutes, or despite usual treatment, myocardial infarction is more likely.

Using the nature of the pain to exclude MI has been shown unreliable.

Associated signs and symptoms are as important as the pain itself with nausea, vomiting, sweating and radiation of pain to the arm(s) all being strongly indicative of cardiac origin.

The pain of **pulmonary embolus** and **pleuritic pain** associated with chest infection and pneumonia produce a stabbing, generally one-sided pain, worse on breathing in. Patients with pleuritic chest pain, associated with infection, usually have a cough with sputum, and may well have a raised temperature (>37.5ºC). Massive PE may produce pain identical in nature to AMI.

Most pain associated with indigestion is central, related to food and may be associated with belching and burning in nature. However, some patients with myocardial infarction may also get indigestion type pain and belching.

Muscular pain tends to be worse on movement and often has associated tenderness.

**ASSESSMENT**
Assess ABCD’s.

Assess site and nature of the pain.

Assess for accompanying features, e.g. sweating, pallor, breathlessness, temperature and cough.

*Evaluate if any TIME CRITICAL features are present.* These may include:
- cardiopulmonary arrest
- any major ABCD problems
- central, crushing chest pain, especially with radiation to the neck, arms or jaw
- chest pain associated with breathing difficulty
- suspected AMI for any other reason.

If any of these features are present, **CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT to nearest suitable receiving hospital.**

Provide a hospital alert message / information call. This should be routine practice for **ANY** potentially cardiac related chest pain.

En Route – continue patient **MANAGEMENT** (see below).
Management of chest pain

Follow the Acute Medical Emergencies guideline, remembering to:

- ensure ABC’s
- monitor with ECG for arrhythmias, and apply pulse oximetry
- specifically consider:
  Treat as a “Blue Light Emergency”; do not delay at scene. Provide treatment and further assessment en route to hospital. THE NATIONAL SERVICE FRAMEWORK FOR CORONARY HEART DISEASE requires that suspected MI patients receive thrombolysis within 60 minutes of the call for help. A target on scene time of no more than 10 minutes OR paramedic thrombolysis en route is vital to achieve this objective.

REFERENCES

See individual guidelines.
INTRODUCTION
Headache is a common presenting problem met by emergency ambulance crews. Its origins may be simple, and require no more than simple painkillers, or be potentially TIME CRITICAL, caused by meningitis or subarachnoid haemorrhage.

HISTORY
Take a history and determine the most probable causes of the headache (See additional information).

Is the headache severe? Is it the most severe ever experienced by this patient?

Has the patient had this type of headache before?

Was it a sudden onset?

Is there any impairment of consciousness?

Any visual symptoms or associated vomiting?

Is the headache one-sided, (frontal) or at the back of the head (occipital)?

ASSESSMENT
Assess ABCD’s.

Specifically assess:
● levels of consciousness – AVPU
● temperature
● blood pressure
● neck stiffness and photophobia (light sensitivity of eyes)
● any evidence of a rash
● flushed face but cool, pale trunk and extremities.

Evaluate whether any TIME CRITICAL features are present: These may include:
● impaired consciousness, and/or fitting
● respiratory depression
● signs of septic shock – tachycardia, hypotension, impaired consciousness, high temperature – often >39°C
● bruising type skin rash
● suspicion of subarachnoid haemorrhage (SAH)
● suspicion of meningitis
● if any of these features are present, correct A and B problems then transport to nearest suitable receiving hospital
● provide a hospital alert message / information call
● En route –continue patient MANAGEMENT (see below).

MANAGEMENT OF HEADACHE
Follow Medical Emergencies Guideline, remembering to:
● ensure ABC’s.

Specifically consider:
● position for comfort.

HOSPITAL ASSESSMENTS
It is often difficult to differentiate between a simple headache which requires no treatment and a potentially more serious condition. The following list identifies symptoms that require the patient to undergo hospital assessment. (This does not mean that any patient presenting without these symptoms is automatically safe to be left at home).

Finding Concern
Headache of severe, sudden (thunderclap) onset SAH
Headache localised to the vertex Sphenoid sinusitis
Changed visual acuity Temporal arteritis or glaucoma
Meningeal irritation SAH / meningitis
Changed mental state Stroke / SAH
Newly presenting ataxia Cerebellar lesion
Women on the contraceptive pill Higher risk of thrombosis

ADDITIONAL INFORMATION
Neck stiffness
Can be assessed by gently trying to flex the head forwards in the lying position, resistance and pain suggest neck stiffness, however, the absence of neck stiffness does not exclude meningitis (particularly in children under one year of age).

Meningitis and/or septicaemia
Meningitis is caused by either viral or bacterial infection. The most severe forms are usually bacterial and the meningococcal type is particularly dangerous, especially in children. Meningococcal meningitis and meningococcal septicaemia are different illnesses and may occur separately or present together.

The infection may start as a sore throat and temperature, but proceeds to headache, temperature, stiff neck, photophobia (light sensitivity) and impaired consciousness. Fitting and coma may also follow, along with a “bruising” type of skin rash. Bulging of the fontanelle is a sign in small children.
Meningococcal disease may present without the classical signs of septicaemia (rash and photophobia). Be alert and remain suspicious.

**Meningococcal disease in children, especially very young, may present with only drowsiness, high temperature and signs of recent upper respiratory infection (sore throat or even ear infection), and often have no headache or neck stiffness.** The key need in children is to recognise, and react to the seriously ill child see Recognition of the Seriously Ill Child Guideline.

**Subarachnoid haemorrhage (SAH)**

Classically, causes sudden onset blinding headache, commonly described as “like a blow to the back of the head”. This may be associated with vomiting and range in severity from isolated headache to causing unconsciousness.

SAH may also present as a gradually worsening crescendo headache associated with so called ‘trickle’ haemorrhage.

SAH may present as a sudden collapse, with or without a headache, sometimes with apparent full recovery. These patients should not be left at home and require full hospital assessment.

Neck stiffness may also be a sign of SAH, as may ECG abnormalities.

Cerebral haemorrhage (bleeding into the brain itself) often causes a similar acute picture in older patients.

**Migraine**

Commonly causes recurrent one-sided headache, often accompanied by nausea or vomiting and blurring distortion of vision. There is frequently a previous history of migraine or similar pattern of headaches but this does not exclude the possibility of a serious bleed in someone who has previously suffered migraines.

**Sinusitis and common virus infections**

- can all cause quite severe frontal headache.

**Glaucoma (acutely raised pressure in the eye)**

- is a cause of severe one-sided headache, particularly in elderly patients.
**INTRODUCTION**

Mental Illness is common, to the extent that one in four people are likely to suffer some form of mental illness during their lives. This may vary from a mild transient depression, to schizophrenia. The majority of mentally ill patients will have been assessed and diagnosed at the time they were transported. There will be occasions, however, when acutely disturbed patients will be transported, either voluntarily or compulsorily under a Section Order of the Mental Health Act 1983. There may be other situations where one is faced with an emergency call to an acutely disturbed mentally ill patient.

**HISTORY**

The patient may well have a diagnosis of depression, anxiety or other mental disorder and they or their relatives may well be able to give you some background history and details of the condition.

The patient may be suffering from a mood, stress related, and anxiety type disorder, such as depression, where they are disturbed but aware of their state. Alternatively, they may be suffering from a psychotic type illness, such as acute schizophrenia, where they are seriously disturbed and have no awareness of how disturbed they are.

In reality, many acute situations met by ambulance staff are not straightforward. They frequently involve a degree of mental illness combined with alcohol use, drugs use or overdose, and often involve some form of domestic crisis.

**ASSESSMENT**

Accurate assessment of the acutely mentally ill patient takes much training and experience to achieve. However, there are certain basic approaches that may help with managing these patients.

In any acute situation, if the patient is behaving in an irrational manner or in a way that is inappropriate to the circumstances, always consider the possibility of mental illness. Remember, however, that drugs, illegal or prescribed, alcohol, hypoglycaemia and other intoxications, e.g. carbon monoxide poisoning, can make a normal patient behave in a very bizarre fashion, as can generalised systemic illness.

A suicide and self-harm risk assessment form, as per the sample at appendix 2, may be of value in assessing some mental health patients who lack either capacity or rationality.

**MANAGEMENT OF MENTAL ILLNESS**

Your initial approach and communication with the patient will be critical to managing the situation later. Keep your own emotions under control and make an overall evaluation of the patient under their circumstances. Their environment may give important clues, such as the presence of medication or a backdrop of chaotic living conditions.

Do not rush. No-one likes to be hurried, and a disturbed patient may react very badly to rush and hurry. Take time to explain your actions to both the patient and the relatives and always endeavour to be honest about what you are going to do and what is going to happen.

There are few patients who are mentally ill to such an extent that the sufferer will not respond to a calm and reasonable approach. Courtesy and genuine concern will normally win over a patient, and threats and sarcastic comments may aggravate the situation out of all proportion.

Honesty is always the best policy and a consistent approach, both in explanation and actions towards the patient will assist in managing these patients.

Unless the patient is being compulsorily admitted, they have a perfect right to change their minds, and refuse admission. An ambulance crew’s inherent ability to persuade, courteously but firmly, may well be of great help here in persuading a patient to go to hospital. If a patient being admitted voluntarily ultimately refuses however, this refusal must be complied with, and the GP or responsible hospital or social worker MUST be informed.

In the case of patients being compulsorily admitted under one of the Sections of the Mental Health Act 1983 (see Appendix 1), these patients do not have the option to refuse and must be transported to the receiving hospital with assistance from the police, should this be necessary.

When dealing with severely disturbed or violent patients, ambulance crews MUST NOT place themselves at risk and must request Police assistance, both with removal and transport to the hospital, if there is any doubt about the cooperation of the patient. If a patient has been placed under Section, it is up to the applicant (usually an approved Social Worker) for that Section Order to provide you with authority to move the patient.
Restraint should normally be purely within the remit of the Police (who are trained in such techniques) but it is important to recognise that unnecessary restraint or excessive force will often provoke the patient into more violence. Restraint, other than to protect yourself, others or the patient from real and immediate physical harm is unlawful and also increases the risks of serious harm to the patient, usually through asphyxia.

**ADDITIONAL INFORMATION**

Terms and definitions associated with mental illness:

**Mood, Stress Related and Anxiety Disorders.** These are the most common forms of mental illness and often represent the extremes of normal emotion. Depression, anxiety, panic disorder, obsessional behaviour and phobias, tend to fall into this group. The patient may be quite substantially disturbed, but is aware of this and has insight into their condition.

**Psychosis.** This group of patients tends to be more severely disturbed and are often not in touch with reality. Acute schizophrenia is an example of this, where the patient may be behaving under the influence of perceived voices and is in a deluded state.

**Paranoia.** This can be a feature of both depression and schizophrenia and is normally associated with the patient suffering delusions of persecution. They are normally extremely suspicious and can react quite violently in certain situations. Great care should be taken to reassure and not provoke these emotions in these patients.

**Schizophrenia.** This is a common severe mental illness that often affects younger patients. It may present as an acute disturbance with the patient hearing voices and behaving irrationally. A similar sort of reaction may occur as a bad reaction to illicit drugs. These patients are often withdrawn and suffer from auditory hallucinations (voices) and delusions e.g. persecution.

**Mania and Hypomania.** These patients are frequently hyperactive and often have not slept for days. They tend to be obsessional and persistent in their behaviour and they often suffer delusions, mainly delusions of grandeur. On the surface of it, they really seem at a total extreme of excitement. Because they do not sleep and tend to wear out their relatives and anyone else around them, the condition tends to deteriorate quickly and they require medication to “slow them down”.

**Drugs used to treat psychiatric illness**

**HYPNOTIC AND ANXIOLYTICS**

- Hypnotics are used to treat sleep disorders and these include temazepam, nitrazepam and lormetazepam. These are designed for short-term use, to help the patient sleep.

- Anxiolytics. These drugs, including diazepam and oxazepam, are used in the short term to relieve symptoms of anxiety.

**ANTIDEPRESSANTS**

- These drugs are used normally in courses of weeks to months, to relieve depression and many of its associated symptoms, such as sleep disorder and anxiety. They take two to three weeks to become effective and need to be taken for the full course. Examples are amitriptyline, imipramine and dothiepin (tricyclic antidepressants). Newer generation drugs include sertraline (Lustral) and fluoxetine (Prozac).

- It is worth remembering that the tricyclic antidepressants are extremely dangerous when taken in overdose, producing hypotension and cardiac arrhythmias.

- Monoamine oxidase inhibitors (MAOIs) are sometimes used, particularly where tricyclic antidepressants have proved ineffective. They have significant numbers of dietary and drug interactions and, in the ambulance context, contraindicate the use of both morphine and nalbuphine as a dangerous rise in blood pressure may occur.

**ANTIPSYCHOTIC DRUGS**

- These drugs may be taken by mouth, e.g. haloperidol and chlorpromazine, or by regular injection, e.g. Depixol and Modecate. They are powerful tranquillisers and tend to be used for the long-term control of illnesses such as schizophrenia. They are also useful in the acute setting as a powerful tranquilliser for those patients suffering from severe disturbance.

- Some of these drugs can cause significant extra pyramidal side effects that are a common presentation in the accident and emergency department.
APPENDIX 1
Mental Health Act 1983

Application for admission under the Mental Health Act 1983

● A person suffering from a mental illness, who is either at risk from themselves or to the public, may be removed from a public place or their home to a place of safety (usually a Police Station or hospital) by a Police Officer.

● Approved social workers, GPs and specialist-approved doctors are usually involved in assessing the patient for a Section Order. This multi-disciplinary approach to invoking a Section is designed to protect the patient from unnecessary admission and removal of human rights.

● The Mental Health Act was designed to protect the individual from potential abuses to their freedom, whilst protecting the public and the patient from any consequences of their mental illness. There are a variety of Sections within the Act that may be used to secure a patient’s admission.

● Ambulance staff will usually be empowered by the appropriate social worker or applicant (usually a relative) to convey the patient compulsorily under Section Order to hospital, and it is vitally important that these individuals confirm that a bed has been secured for the patient. If there is any threat of violence to the crew, a Police escort MUST be requested.

SECTION 2 – (admission for assessment)
Admission for up to a period of 28 days for:

● a mental disorder which warrants detention in hospital for assessment followed by medical treatment.

OR

● a patient who needs to be detained for their own health or safety, or for the protection of others.

Application for admission is made by:

● the nearest relative.

OR

● an approved social worker, who must interview the patient and be satisfied that detention in hospital is appropriate.

Two doctors make recommendation for admission, one of whom must be approved. The patient is to be examined by both doctors, either together, or separately within five days of each other.

SECTION 3 – (admission for treatment)
Admission for up to a period of six months, renewable for a further six months and then for periods of up to one year at a time, for severe mental illness, severe mental impairment or disorder of a nature or degree which requires medical treatment in an appropriate hospital.

Application for admission is the same as a Section 2 but the approved social worker cannot make an application if the nearest relative objects.

The recommendation for admission is the same as a Section 2.

SECTION 4 – (admission for assessment in an emergency)
Admission for up to a period of 72 hours (the patient can be placed under Sections 2 or 3 after examination) for urgent assessment.

Application is made by:

● the nearest relative.

OR

● an approved social worker

● the applicant must have seen the patient during the 24 hours prior to the application being made

● one doctor makes recommendation for admission, preferably with previous knowledge of the patient.

SECTION 131 – (informal admission)
The patient voluntarily agrees to be admitted, but can change their mind and refuse.

There is no time limit.

SECTION 135 – (Place of Safety Order – private)
Admission for up to a period of 72 hours.

A person suffering from mental illness can be removed from a private dwelling to a place of safety, for a more formal assessment. Commonly a place of safety is a police station. The patient should not be removed directly to hospital under Section 135 unless a social worker or doctor has attended.
SECTION 136 – (Place of Safety Order – public)

Admission for up to a period of 72 hours.

A person suffering from a mental illness can be removed from a public place to a place of safety (usually a police station or possibly a hospital) by a police officer or an approved social worker.

Schedule of legal powers for the compulsory detention of patients

<table>
<thead>
<tr>
<th>1983 Act Section Number</th>
<th>Purpose</th>
<th>Duration</th>
<th>Application for admission</th>
<th>Medical Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Assessment</td>
<td>28 days</td>
<td>Approved social worker or nearest relative</td>
<td>Two doctors, including one approved under S 12 and, if practicable, one with knowledge of patient.</td>
</tr>
<tr>
<td>3</td>
<td>Treatment</td>
<td>6 months (initially)</td>
<td>Approved social worker or nearest relative</td>
<td>Two doctors, including one approved under S 12 and, if practicable, one with knowledge of patient.</td>
</tr>
<tr>
<td>4</td>
<td>Emergency assessment</td>
<td>72 hours</td>
<td>Approved social worker or nearest relative</td>
<td>One doctor, preferably with knowledge of the patient.</td>
</tr>
</tbody>
</table>

APPENDIX 2 Suicide & Self-Harm Risk Assessment Form

This assessment should be used for patients who lack capacity or rationality, and may be suffering from a mental illness episode. It is designed to provide an insight into whether the patient may harm themselves, or others, if they do not seek treatment and attend hospital.

<table>
<thead>
<tr>
<th>Sex (female = 0 Male = 1)</th>
<th>score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (less than 19, greater than 45 = 1, other = 0)</td>
<td></td>
</tr>
<tr>
<td>DEPRESSION / HOPELESSNESS (If patient admits to depression or decreased concentration, appetite, sleep or libido then score 1)</td>
<td></td>
</tr>
<tr>
<td>PREVIOUS ATTEMPTS (If patient has attempted self harm before and / or previous psychiatric care, score 1)</td>
<td></td>
</tr>
<tr>
<td>EXCESSIVE ALCOHOL / DRUG ABUSE (If evidence of these score 1)</td>
<td></td>
</tr>
<tr>
<td>RATIONAL THINKING (If not then score 1)</td>
<td></td>
</tr>
<tr>
<td>SEPARATED, DIVORCED OR WIDOWED (Score 1)</td>
<td></td>
</tr>
<tr>
<td>ORGANISED OR SERIOUS ATTEMPT (If well thought out plan or life threatening presentation score 1)</td>
<td></td>
</tr>
<tr>
<td>NO SOCIAL SUPPORT (If no close / reliable family, job or active religious affiliation, then score 1)</td>
<td></td>
</tr>
<tr>
<td>STATED FUTURE INTENT (If determined to repeat attempt or ambivalent score 1) Total score</td>
<td></td>
</tr>
</tbody>
</table>

<3 low risk 3-6 medium risk >6 high risk
INTRODUCTION

Coma is defined as a Glasgow coma score of 8 or less however any patient presenting with a GCS other than 15 requires urgent assessment and, possibly, treatment.

The unconscious patient provides a major challenge for emergency care staff. The causes may range from diabetic collapse to factitious illness, with often very little information presented. Common causes include:

- head injury
- hypoglycaemia
- stroke
- epilepsy
- sub arachnoid haemorrhage
- overdose etc.

HISTORY

It is important to understand, wherever possible, the cause of unconsciousness in a particular patient.

Is there any history of preceding illness or the onset and progression of the present state? e.g. diabetes, epilepsy.

Any preceding symptoms such as headache, fits, confusion or evidence of trauma?

Any past history of medical or psychiatric problems and any evidence of use or abuse of medication?

Remember an acute condition may be superimposed on an existing problem.

Any evidence of tablets, ampoules, pill boxes, syringes, or alcohol?

Any environmental factors, e.g. extreme cold, possible carbon monoxide sources?

Factitious illness may present to the ambulance service as an unconscious patient

ASSESSMENT

Assess ABCD’s.

Levels of consciousness – AVPU.

Evaluate whether patient has any TIME CRITICAL, features:

These may include:

- any major ABCD problems
- any significant accompanying other injuries (especially to head).

If any of these features are present, correct A and B problems then transport to nearest suitable receiving hospital.

Provide a hospital alert message / information call

En route – continue patient ASSESSMENT and MANAGEMENT (see below).

If non TIME CRITICAL, perform a more thorough assessment and a brief secondary survey. Include observations for:

- any evidence of trauma?
- breath for ketones, alcohol and solvents
- evidence of needle tracks/marks
- medic Alert Bracelets.

MANAGEMENT

Follow Medical Emergencies Guideline, remembering to

Take a defibrillator to the incident – many calls to unconscious patients are in fact cardiac arrests.

Ensure ABC’s.

Ensure high flow O2 therapy.

Apply pulse oximetry and ECG monitoring for detection of hidden hypoxia and arrhythmias.

Specifically consider:

- if any suspicion of trauma, immobilise cervical spine and follow the Trauma Emergencies Guidelines
- establish IV access
- obtain blood glucose level and if hypoglycaemic (<3.0 mmol/l) or hypoglycaemia is clinically suspected, give glucose or glucagon
- in the case of severe respiratory depression/arrest support ventilation. If any suggestion of morphine or other opioid narcotic overdose give naloxone 400mcg IV/IM repeated as necessary.

REFERENCES

Mackay CA. Burke DP. Burke JA. Porter KM. Bowden D. Gorman D. Association between the assessment of conscious level using the AVPU system and the Glasgow coma scale Pre-Hospital Immediate Care. 4(1):17-9, 2000 March. (15 refs)
These guidelines reflect the current Resuscitation Council UK Guidelines.

INTRODUCTION
Anaphylaxis is an extreme allergic response, and may prove rapidly fatal if not managed aggressively and speedily. It is commonly triggered in vulnerable individuals by bee and wasp stings, certain foodstuffs, especially peanuts, and reactions to medication (e.g. penicillin).

HISTORY
Often previous episode of anaphylactic or severe allergic reaction. Possibly known hypersensitivity to wasp/bee stings or drugs, but may produce this response occasionally on first encounter.

The classic signs of anaphylaxis are not always present therefore, in the collapsed patient, history is vitally important as it may point to anaphylaxis that would otherwise be overlooked.

ASSESSMENT
There are two types of reaction:

- allergic reactions (which may range from very minor to severe)
- anaphylaxis.

NB Take care because a life threatening anaphylactic reaction can develop very swiftly but can also develop slowly, a number of hours after exposure to the allergen.

Features of allergic reactions
- itchy rash, swelling around eyes and prickly lips, restlessness.

Features of early anaphylaxis
- chest tightness, tongue and throat swelling
Wheeze and hoarseness.

Features of advancing severe anaphylaxis
- stridor, hypotension, bronchospasm, cyanosis, circulatory collapse, respiratory collapse
- assess ABCD’s paying special attention to the upper airway, respiratory rate, pulse, systolic blood pressure, condition of the skin and chest auscultation where condition allow
- stridor – inspiratory noises from oedema of larynx
- wheezing – due to bronchospasm.

Specifically assess for:
- red blotchy and itchy rash – urticaria
- angio-oedema – gross swelling of lips, mouth and face
- collapse – due to hypotension
- in all cases of major ABCD problems, and/or any features of anaphylaxis (or previous anaphylactic reactions) CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT to nearest suitable receiving hospital
- provide a hospital alert message / information call
- en route – continue patient MANAGEMENT (see below).

MANAGEMENT OF ANAPHYLAXIS/SEVERE ALLERGIC REACTION
Follow Medical Emergencies Guideline, remembering to:
- ensure ABC’s
- initiate rapid transportation as above
- if ANY indication of anaphylactic reaction
- ensure high flow oxygen therapy
- administer adrenaline 1:1000 IM as per the age-related guideline
- apply ECG, and pulse oximetry monitoring.

After initial treatment has been administered as described above, whilst en route to hospital, the patient should be observed very closely for signs of improvement over the next five minutes:
- secure IV access with large bore cannula
- consider nebulised salbutamol to assist with bronchodilation – assess peak flow (where possible), document and nebulise salbutamol with O₂. Repeat peak flow to assess effect, recommence high flow O₂ post nebulisation
- administer chlorphenamine (Piriton) IV (age related)
● administer hydrocortisone IV (age related)

● consider administration of crystalloids IV if SBP is <90mmHg in adults or similarly hypotensive in children

● reassess ABC’s, ECG and BP

● administer a further dose of adrenaline 1:1,000 IM as per the age related guideline, repeating every five minutes where necessary

● administer second bolus of crystalloid if still hypotensive

● in extreme cases where there has been no effect from IM adrenaline, it may very rarely, be necessary to give intravenous (IV) adrenaline. This should only be administered by a suitably experienced doctor with ECG monitoring.

ALLERGIC REACTIONS

In those patients suffering an allergic reaction, which is significant, enough to warrant hospitalisation but is not anaphylactic in nature the use of chlorphenamine alone should be considered where the symptoms are causing the patient pain or distress. Dosages are as given below. The balance between relief and symptoms and having to cannulate the patient should be carefully considered.

DRUG DOSAGES

<table>
<thead>
<tr>
<th></th>
<th>Adult (age &gt;12)</th>
<th>6-11 years</th>
<th>6/12-6 years</th>
<th>&lt;6/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenaline (IM)</td>
<td>0.5mg</td>
<td>0.25mg</td>
<td>0.12mg</td>
<td>0.05mg</td>
</tr>
<tr>
<td>Chlorphenamine (IV)</td>
<td>10mg</td>
<td>5mg</td>
<td>2.5mg (&gt;1yr)</td>
<td>n/a</td>
</tr>
<tr>
<td>Hydrocortisone (IV)</td>
<td>200mg</td>
<td>4mg/kg</td>
<td>4mg/kg</td>
<td>4mg/kg</td>
</tr>
<tr>
<td>Salbutamol (Neb)</td>
<td>5mg</td>
<td>5mg</td>
<td>2.5mg</td>
<td>2.5mg</td>
</tr>
<tr>
<td>Crystalloid (IV)^</td>
<td>500-1000ml</td>
<td>20ml/kg</td>
<td>20ml/kg</td>
<td>20ml/kg</td>
</tr>
</tbody>
</table>

^ Initial dose stated, may be repeated once only if condition does not improve

ADDITIONAL INFORMATION

Genuine anaphylaxis is rare, but may be rapidly fatal over a matter of minutes. Severe allergic reactions may overlap into features of early anaphylaxis and are treated in essentially the same way. In severe allergic reactions steroids (hydrocortisone) and antihistamines can help but in true anaphylaxis, oxygen, IV fluids, and cautious use of small amounts of intramuscular adrenaline are required at the earliest opportunity.

The Resuscitation Council UK has highlighted the continued failure to administer adrenaline in anaphylaxis in reliance upon chlorphenamine and hydrocortisone. Early adrenaline administration is imperative in any reaction showing signs of anaphylaxis and significantly affects outcome.
REFERENCES


Jowett NI. Speed of treatment affects outcome in anaphylaxis. BMJ 2000 Sep 2; 321(7260):571


Brown AF. Intramuscular or intravenous adrenaline in acute, severe anaphylaxis? Emerg Med J 2000 17: 152

Safdar B, Cone DC, Pham KT. Subcutaneous epinephrine in the prehospital setting [review]. Prehosp Emerg Care 2001 Apr-Jun;5(2):200-7

INTRODUCTION
Asthma is one of the commonest of all medical conditions. It is caused by a chronic inflammation of the bronchi, making them narrower. The muscles around the bronchi become irritated and contract, causing sudden worsening of the symptoms. The inflammation can also cause the mucus glands to produce excessive sputum which further blocks the air passages. These guidelines are concerned with the acute asthma attack.

HISTORY
The patient may well have a history of increased wheezy breathlessness, often worse at night or in the early morning, associated either with infection, allergy or exertion as a trigger. They are usually a known asthmatic and may well be on regular inhaler therapy for this. They may well have used their own treatment inhalers and in some cases will have used a home based nebuliser.

If a patient is suffering a first episode of ‘asthma’ always consider an inhaled foreign body as a differential diagnosis

ASSESSMENT
Assess ABCD’s.

Asthma usually presents to the Ambulance Service in one of two forms.

Life Threatening
● exhaustion
● confusion
● coma
● silent chest
● cyanosis
● feeble respiratory effort
● bradycardia
● hypotension
● peak flow <33% of predicted best value
● SpO₂ <92%.

Acute Severe
● unable to complete sentences in one breath
● respiratory rate >25 (adult)
● respiratory rate >50 (child)
● pulse >110Bp. (adult)
● pulse >120 (child >5 yrs)
● pulse >130 (child 2-5 yrs)
● peak flow <50% of predicted best value.

Assess for any LIFE THREATENING features

If any of these features are present, correct A and B problems then transport to nearest suitable receiving hospital commencing O₂ immediately at the patient side.

Provide a hospital alert message / information call.

Those with life threatening asthma may need paralysing and ventilating if they fail to respond to treatment. Rapid transport to hospital on blue lights is therefore extremely important.

En route – continue patient MANAGEMENT, (see below) providing any other necessary interventions, including nebulisation, steroids etc.

If no TIME CRITICAL features are present:
● assess for features of acute severe asthma
● consider the benefits of treatment en route to hospital unless the patient has a history of full recovery and subsequent refusal of transport
● any patient who is transported to hospital requires at least oxygen and nebuliser treatment en route
● remember that the risk of death in the group of asthmatics previously admitted to hospital with an acute attack is significant.

MANAGEMENT OF ASTHMA

Follow Medical Emergencies Guideline, remembering to:
● ensure ABC’s
● ensure high flow O₂ therapy via a non-rebreathing mask
● commence transport.

Specifically consider,
● check peak flow if practicable – note the best of three readings. This is often impractical in many children and adults during an acute attack
● oxygen via a non-rebreathing mask at a rate sufficient to keep the reservoir bag fully inflated, then administer salbutamol via oxygen driven nebuliser, running at 6-8 litres per minutes. In acute severe or life threatening cases ipratropium should be added to the salbutamol
● in cases of hypoventilation in-line nebulisation with a bag, valve, mask (BVM) device and suitable nebuliser attachment should be considered

● monitor using ECG and pulse oximeter

● obtain IV access if possible (do NOT delay)

● continue high flow oxygen after nebulisation

● if no clinical improvement after 5-10 minutes, administer further salbutamol via nebuliser and consideration given to continuous nebulised salbutamol. Ipratropium bromide should be administered if not given earlier

● repeat or continuous nebulised salbutamol may be given until arrival at hospital or side effects become significant (extreme tachycardia >140bpm in adults, tremors etc.)

● assess chest to exclude evidence of pneumothorax – remember the very rare complication in severe asthma of bilateral pneumothoraces

● reassess to evaluate any improvement in peak flow or improvement in air entry on chest assessment

● administer hydrocortisone IV where there is a delay getting to hospital of 30 minutes or more. Although steroids take some time to take effect, the sooner they are administered the better.

LIFE THREATENING ASTHMA
A small minority of cases may not respond to oxygen and nebuliser therapy. In these cases the use of subcutaneous or intramuscular adrenaline should be considered where:

● the patient is suffering from life threatening asthma

● ventilation is failing

● deterioration continues despite oxygen and continuous nebulised salbutamol.

This treatment should be reserved for the most serious cases and is NOT intended to be used as a matter of routine.

Adrenaline should be given as 0.5mg (10micrograms/kg in children) sub-cutaneously or intramuscularly and may be repeated at five minutes if the patient continues to deteriorate.

● salbutamol may be repeated as required, except <1 year where a single dose is indicated

● Ipratropium should usually only be given once every six hours however in children it may be given every two hours initially in severe asthma, especially if there has been a poor response to salbutamol. Given U.K. travelling times this is likely to make ipratropium a single administration drug

● steroid treatment involves a single dose only

● adrenaline may be repeated once after 5 minutes if the patient continues to deteriorate.

Asthmatic patients do not have hypoxic drive and need high flow oxygen therapy and nebulisation AS DESCRIBED EARLIER.

ADDITIONAL INFORMATION
The obstruction and subsequent wheezing are caused by three factors within the bronchial tree.

● increased production of bronchial mucus

● swelling of the bronchial tube mucosal lining cells

● spasm and constriction of bronchial muscles

These three factors conspire to cause blockage and narrowing of the small airways in the lung. Because inspiration is an active process involving the muscles of respiration, this obstruction of the airways is overcome on breathing in. Expiration occurs with muscle relaxation, and is severely delayed by the narrowing of the airways in asthma. This generates the wheezing on expiration that is characteristic of this condition.

INITIAL DRUG DOSAGES

<table>
<thead>
<tr>
<th></th>
<th>Adult</th>
<th>6-11 years</th>
<th>&lt;5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salbutamol (nebulised)</td>
<td>5mg</td>
<td>5mg</td>
<td>2.5mg</td>
</tr>
<tr>
<td>Ipratropium (nebulised)</td>
<td>0.5mg</td>
<td>0.5mg</td>
<td>0.25mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.125mg for &lt;1 year</td>
</tr>
<tr>
<td>Hydrocortisone (IV)</td>
<td>200mg</td>
<td>4mg/kg</td>
<td>4mg/kg</td>
</tr>
<tr>
<td>Adrenaline (SC/IM)</td>
<td>0.5mg</td>
<td>10micrograms/kg</td>
<td>10micrograms/kg</td>
</tr>
</tbody>
</table>
The obstruction in its most severe form can be **TIME CRITICAL** and some **2,000 people a year die as a result of asthma**. In adults, asthma may often be complicated and mixed in with a degree of bronchitis, especially in smokers. This can make the condition much more difficult to treat, both routinely and in emergencies.

The majority of asthmatic patients take regular “preventer” and “reliever” inhalers. Adult asthma is managed with a variety of inhaled and tablet medications. Inhalers are divided in to two broad categories (preventer and reliever). The preventer inhalers are normally anti-inflammatory drugs and these include steroids and other milder anti-inflammatories such as Tilade. The common steroid inhalers are beclomethasone (Becotide), budesonide (Pulmicort) and fluticasone (Flixotide).

These drugs act over a period of time on the lung to reduce the inflammatory reaction that causes the asthma.

Regular use of these inhalers often eradicates all symptoms of asthma, especially in children and allows for a normal lifestyle.

Treatment (reliever) inhalers include salbutamol (Ventolin), terbutaline (Bricanyl) and ipratropium bromide (Atrovent). These inhalers work rapidly on the lung to relax the smooth muscle spasm when the patient feels wheezy or tight chested. They are used in conjunction with preventer inhalers. Inhalers are often used now through large plastic spacer devices, such as the Volumatic. This allows the drug to spread into a larger volume and allows the patient to inhale it more effectively.

In mild and moderate asthma attacks some patients may be treated with high doses of “relievers” through a spacer device. This has been shown to be as effective as giving a salbutamol nebuliser

**Peak Flow Metering.** Peak flow is a rapid measurement of the degree of obstruction in the patient’s lungs. It measures the maximum flow on breathing out, or expiring and therefore can reflect the amount of airway obstruction. Many patients now have their own meter at home and know what their normal peak flow is. Clearly, when control is good, their peak flow will be equivalent to a normal patient’s measurement, but during an attack it may drop markedly.

A copy of a normal adult peak flow chart (see below) is provided and may be used as a reference to the normal range. A peak flow meter reading should be taken prior to, and five minutes after, nebulising the patient, and the results noted. Failure to improve a reduced peak flow after nebulisation is a serious sign in asthmatic patients.

**Taking a peak flow reading** (See Peak Flow Reading Guideline).

**Steroid therapy.** Steroids need to be given early in an acute asthma attack and can be given intravenously as hydrocortisone.

### Peak Expiratory Flow Rate (PEFR) in MALES (l/min)

<table>
<thead>
<tr>
<th>Height</th>
<th>20-25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (ft/ins)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.60 (5'3&quot;)</td>
<td>572</td>
<td>560</td>
<td>548</td>
<td>536</td>
<td>524</td>
<td>512</td>
<td>500</td>
<td>488</td>
<td>476</td>
<td>464</td>
</tr>
<tr>
<td>1.67 (5'6&quot;)</td>
<td>597</td>
<td>584</td>
<td>572</td>
<td>559</td>
<td>547</td>
<td>534</td>
<td>522</td>
<td>509</td>
<td>496</td>
<td>484</td>
</tr>
<tr>
<td>1.75 (5'9&quot;)</td>
<td>625</td>
<td>612</td>
<td>599</td>
<td>586</td>
<td>573</td>
<td>560</td>
<td>547</td>
<td>533</td>
<td>520</td>
<td>507</td>
</tr>
<tr>
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<td>654</td>
<td>640</td>
<td>626</td>
<td>613</td>
<td>599</td>
<td>585</td>
<td>572</td>
<td>558</td>
<td>544</td>
<td>530</td>
</tr>
<tr>
<td>1.90 (6'3&quot;)</td>
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<td>665</td>
<td>650</td>
<td>636</td>
<td>622</td>
<td>608</td>
<td>593</td>
<td>579</td>
<td>565</td>
<td>551</td>
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</tbody>
</table>

### Peak Expiratory Flow Rate (PEFR) in FEMALES (l/min)

<table>
<thead>
<tr>
<th>Height</th>
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<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (ft/ins)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>282</td>
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<td>403</td>
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<td>382</td>
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<td>361</td>
<td>350</td>
<td>340</td>
<td>329</td>
<td>319</td>
<td>308</td>
</tr>
<tr>
<td>1.60 (5'3&quot;)</td>
<td>433</td>
<td>422</td>
<td>412</td>
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<td>391</td>
<td>380</td>
<td>370</td>
<td>359</td>
<td>349</td>
<td>338</td>
</tr>
<tr>
<td>1.67 (5'6&quot;)</td>
<td>459</td>
<td>448</td>
<td>438</td>
<td>427</td>
<td>417</td>
<td>406</td>
<td>396</td>
<td>385</td>
<td>375</td>
<td>364</td>
</tr>
<tr>
<td>1.75 (5'9&quot;)</td>
<td>489</td>
<td>478</td>
<td>468</td>
<td>457</td>
<td>447</td>
<td>436</td>
<td>426</td>
<td>415</td>
<td>405</td>
<td>394</td>
</tr>
</tbody>
</table>
REFERENCES

The BTS/SIGN British Guideline on the Management of Asthma *Thorax* 2003; Vol 58; Supplement I

Guidelines on the management of asthma: statement by the British Thoracic Society, British Paediatric Association, the Research Unit of the Royal College of Physicians of London, the Kings Fund Centre, the National Asthma Campaign, the Royal College of General Practitioners, the General Practitioners in Asthma Group, the British Association of Accident and Emergency Medicine, and the British Paediatric Respiratory Group following a meeting at the Royal College of Physicians of London on 4 and 5 June 1992. *Thorax* 1993; 48 (Suppl): S1-S24

Salbutamol


Lawford P, Jones BM, Milledge JS. Comparison of intravenous and nebulised salbutamol in initial treatment of severe asthma. *BMJ* 1978; 1: 84


Steroids


Controlled trial of the effects of cortisone acetate in status asthmaticus. Report to the Medical Research Council by the sub committee on clinical trials. *Lancet* 1956; 2: 803-6

Epinephrine / parenteral treatment


Lawford P, Jones BM, Milledge JS. Comparison of intravenous and nebulised salbutamol in initial treatment of severe asthma. *BMJ* 1978; 1: 84


INTRODUCTION

Chest pain is one of the most common associated symptoms of myocardial infarction (MI).

It is also a common feature in many other non-cardiac conditions such as chest infection with pleuritic pain, pulmonary embolus, indigestion, and simple muscular chest pain.

HISTORY

Taking and assessing a history.

There are a number of specific factors that may help in reaching a reasoned working diagnosis, and applying appropriate management measures to the patient. **There must be a high index of suspicion that any chest pain is cardiac in origin.**

The majority of deaths in myocardial infarction occur shortly after the onset of the MI, and are a result of ventricular fibrillation. The sooner a defibrillator arrives by the patient, the better.

**THE NATIONAL SERVICE FRAMEWORK FOR CORONARY HEART DISEASE** requires a defibrillator to be at the patient’s side in cases of suspected MI within eight minutes of the call for help. This is a challenging target but requires both rapid response times and the invariable taking of the defibrillator to all suspected chest pain and breathing difficulty cases.

**THE DEFIBRILLATOR MUST BE TAKEN TO ANY PATIENT COMPLAINING OF CHEST PAIN.**

MI is more likely as a cause of chest pain in patients with a previous history of angina or MI.

**Nature and location of the pain**

Myocardial infarction and angina pain tends to be central in the chest and constricting in nature. It may, however, present in the shoulders, or upper abdomen, and be referred to the neck, jaws and arms. Anginal pain tends to be of minutes in duration, but should it persist for more than 15-20 minutes, myocardial infarction is more likely.

**In suspected cardiac chest pain:**

Administer one metered dose of glyceryl trinitrate spray (400mcg) sublingually OR one tablet of buccal glyceryl trinitrate (Suscard) where systolic B.P. is estimated >90mmHg.

Give high flow O₂ via a non-rebreathing mask.

Where appropriate move the patient to the Ambulance at this stage and continue with further treatments en route (it may sometimes be necessary to treat an arrhythmia such as bradycardia before moving the patient, necessitating cannulation on scene).

Consider a second metered dose of glyceryl trinitrate spray, again where systolic B.P. is estimated >90mmHg.

Give aspirin 300mg orally.

Obtain IV access if not already achieved.

Monitor blood pressure for hypotension and position patient accordingly.

If pain continues morphine at an initial dosage of up to 10mg IV may be administered (nalbuphine up to 10mg IV may be given as an alternative)

Pain assessment scoring should be carried out before and after analgesia has been administered.

Remove to nearest suitable receiving hospital without delay for URGENT THROMBOLYTIC THERAPY. Ensure the hospital receives a pre-alert and a copy of the ECG via telemetry (if this is available locally).

If appropriately trained, and the patient meets all of the criteria for paramedic thrombolysis, consideration to administering thrombolytic agents out of hospital should be given as part of the continuing care pathway.

**ADDITIONAL INFORMATION**

**Thrombolytic Therapy** must be given as soon as possible, as its life-saving potential is reduced by any delay in the patient receiving this definitive treatment. Thrombolytics, which have so far been restricted to hospital use in most of the UK, can reduce mortality by 50% if given within an hour or two of symptoms occurring. Giving aspirin adds to the effectiveness of thrombolytic treatment, hence the importance of aspirin administration by ambulance personnel.

**THE NATIONAL SERVICE FRAMEWORK FOR CORONARY HEART DISEASE** sets a target for the administration of thrombolytic therapy within 60 minutes of the patient contacting the NHS for help (999 call or call to GP). Suspected MI cases must therefore be treated as “Blue Light Emergencies” to and from the scene, and reach hospital (or receive their thrombolytic therapy in the field) if these targets, which are proven to reduce mortality, are to be met.
Pre hospital administration of thrombolytic agents is now taking place in many areas of the UK.

Specifically consider:

Treat as a “Blue Light Emergency”, do not delay at scene. Provide treatment and further assessment en route to hospital. A target on scene time of no more than ten minutes is vital to achieve this objective.

REFERENCES


Oxygen

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Nitrates


Aspirin


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Thrombolytics


Rawles JM. Halving the mortality at one year by domiciliary thrombolysis in the Grampian Region Early Antistreplase Trial (GREAT). J Am Coll Cardiol 1994;23:1-5

INTRODUCTION
COPD is a general term that covers a variety of previously used labels which are now recognised as different aspects of the same underlying problem. The term COPD encompasses:

- chronic bronchitis
- emphysema
- chronic obstructive airways disease (COAD)
- chronic airflow limitation disease (COLD)
- some cases of chronic asthma.

COPD is a chronic progressive disorder characterised by airway obstruction that does not change markedly over several months. Whilst the impairment is considered permanent it may be partially reversible (at least transiently) by bronchodilator and/or other therapies.

COPD usually presents to the Ambulance Service as an acute exacerbation of the underlying illness or as a secondary illness rather than the chief complaint.

Known type II respiratory failure patients should be encouraged to carry some form of identification to aid in their care.

HISTORY
See breathlessness guideline.

Specific presenting features of an acute exacerbation include:

- worsening of a previously stable condition
- increased wheeze
- increased dyspnoea
- increased sputum volume
- chest tightness
- fluid retention.

ASSESSMENT
Assess ABCD.

Specifically consider:

- respiratory rate and effort
- any “bubbling” associated with breathing distress e.g. chest infection or pulmonary oedema
- any audible wheeze
- is this an exacerbation of the underlying condition or something new e.g. pulmonary oedema, acute asthma etc?
- differential diagnoses include pneumonia, pneumothorax, LVF, PE, lung cancer and upper airway obstruction

- evaluate whether any TIME CRITICAL features are present. These may include:
  - extreme breathing difficulty (by reference to patients normal condition)
  - cyanosis (although peripheral cyanosis may be normal in some patients)
  - exhaustion
  - hypoxia (SaO2 <85, unresponsive to O2) – these patients will normally run with a lower SaO2 than non COPD patients.

If any of these features are present correct A and B problems then transport to the nearest suitable receiving hospital.

Provide a hospital alert message/information call.

MANAGEMENT
Follow Medical Emergencies Guideline remembering to:

- ensure ABCD
- position for comfort and ease of respiration – often sitting forwards
- be prepared for respiratory arrest.

Specifically consider:

- monitor using ECG and pulse oximeter
- nebulise with 5mg Salbutamol
- if no response after five minutes, a further 5mg nebulised salbutamol, combined with 0.5mg ipratropium should be considered. Whilst ipratropium is given once only, salbutamol may be repeated at regular intervals unless the side effects of the drug become significant
- after nebulisation has relieved severe/life threatening shortness of breath, controlled oxygen therapy should be applied via a medium concentration mask, looking to maintain an oxygen saturation (SaO2) in the region 90-93%.

ADDITIONAL INFORMATION
Pulse oximetry, whilst important in COPD patients, will not indicate CO2 levels which are assessed by blood gas analysis in hospital.
If the primary illness is NOT COPD but an illness or injury which requires high flow oxygen (such as MI, major trauma etc) then this should NOT BE WITHHELD. The patient should be continually monitored closely for changes in respiratory rate and depth and the inspired concentration adjusted accordingly. In the short time that a patient is in ambulance care hypoxia presents a much greater risk than hypercapnia for most patients.

Whilst blood gas levels are important to continuing long term care of the patient a lack of oxygen will prove fatal far more rapidly in the acute setting than changes in CO₂ levels which alter far more slowly.

Use of systemic corticosteroids as advocated in asthma is of NO proven benefit in acute exacerbations of COPD. A course of oral steroids and/or antibiotics may be appropriate based on the judgement of the assessing hospital doctor or general practitioner.

REFERENCES


Harrison M, Multiple different bronchodilators unnecessary in acute COPD http://www.bestbets.org/cgi-bin/bets.pl?record=00259 accessed 23 January 2004
INTRODUCTION
A fit or seizure is a period of involuntary muscular convulsion, often followed by a period of profound lethargy and confusion and sometimes profound sleep.

Fitting can occur for various reasons. These can include:

Epilepsy
In pre-hospital care, the majority of episodes attended are fits occurring in patients known to have epilepsy. These patients are usually on anti-epileptic medication, (e.g. phenytoin sodium valproate (Epilim), carbamazepine (Tegretol), and phenobarbitone). Urinary incontinence and tongue biting often accompany a full epileptic fit (grand mal).

Febrile Convulsions
The other most common ambulance emergency involving fits are febrile convulsions. These tend to occur in children (between six months and five years) with an infection accompanied by a rapid rise in temperature, and may recur in subsequent pyrexial illnesses. Most children who have febrile convulsions DO NOT go on to develop epilepsy later in life.

Cardiac Arrest in Adults
REMEMBER, as a fit occurs, the brain is acutely starved of oxygen. A convulsion may be the presenting sign of circulatory arrest at the onset of sudden CARDIAC ARREST. Always take a defibrillator to patients who are fitting.

Hypoglycaemia
Fitting may be a presenting sign of HYPOGLYCAEMIA and should be considered in ALL patients, especially known diabetics and children. An early BM reading is essential in all actively fitting patients (including known epileptics).

Hypoxia
Any patient suffering from hypoxia, regardless of cause, may fit. The cause may be very simple which is why good A and B maintenance is important prior to drug therapy.

There are a significant number of other causes of fits and these include:-

● stroke
● cerebral tumour
● electrolyte imbalance
● drug overdose.

It is important not to label a patient as epileptic unless there is a known diagnosis.

HISTORY
Is the patient known to be epileptic?
If so, are they on medication, and are they taking it?

Have they had fits recently?

Has the adult patient been unwell at present? Have they had a high temperature?

Is the patient DIABETIC (could this be secondary to hypoglycaemia)?

Is the patient pregnant (could this be due to eclampsia?) – treatment is the same.

Is there any history of head injury?

Is there any evidence of alcoholism or drug usage? Fits are more common in alcoholics, and associated with hypoglycaemia and can be triggered by a number of prescription or illicit drugs (e.g. tricyclic antidepressants).

ASSESSMENT
Assess ABCD’s.

Evaluate whether there are any TIME CRITICAL features present: These may include:

● any major ABCD problems
● serious head injury
● status epilepticus
● underlying infection, e.g. meningitis (refer to guidelines re penicillin).

If any of these features are present, consider CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT to nearest suitable receiving hospital – in these cases the ease and safety with which the patient can be moved whilst still fitting should be considered and treatment may need to begin in situ.

Provide a hospital alert message / information call

En route – continue patient MANAGEMENT (see below).

If no TIME CRITICAL problems are present, perform a more thorough assessment and a brief secondary survey.
Is there any sign of ARRHYTHMIA in an elderly patient? (e.g. A burst of rapid VT may drop the blood pressure, and cause transient cerebral HYPOXIA, giving rise to a fit).

Assess type of fit if still fitting – is this a generalised convulsion, or one-sided?

Assess for focal neurological loss before, during or after the fit.

Assess for raised temperature (patient may feel hot after a fit) and any sign of a rash, (possible meningitis).

Assess for mouth/tongue injury, incontinence.

MANAGEMENT OF FITTING

Follow Medical Emergencies guideline, remembering to:

● ensure high flow oxygen therapy via a non-rebreathing mask

● all patients who are fitting, post ictal or have a fit secondary to a head injury (even if they appear fully recovered) should receive high flow oxygen

● establish if any treatment e.g. rectal diazepam has already been administered

● obtain IV access if fitting persists or recurs.

Specifically consider:

● position for airway security, comfort and protection from dangers, especially the head

● do not attempt to force an oropharyngeal airway into a fitting patient. A nasopharyngeal airway is a useful adjunct in such patients

● apply ECG and pulse oximetry and monitor especially in the elderly

● check BLOOD GLUCOSE LEVEL to exclude hypoglycaemia. If blood glucose <3.0 mmol or hypoglycaemia is clinically suspected, give oral glucose, glucose 10% IV titrated to response or glucagon 1mg IM (or as per age related chart in children)

● if a patient fits repeatedly in close succession or has one fit lasting >5 minutes then diazemuls 10mg IV titrated to response (repeated once after 5 minutes) should be given

● if the patient can be moved, despite the fitting, it is important to reach hospital for definitive care as rapidly as possible

● in the pyrexial child (temp >37.5ºC) who has ceased fitting and regained consciousness, remove excess clothing and administer paracetamol to reduce pyrexia and make the patient more comfortable. Tepid sponging is associated with increased patient distress and generally unnecessary if the above advice is followed.

● if fitting PERSISTS in the child, administer a single dose of diazemuls 300 micrograms/kg by slow intravenous injection OR, if IV access cannot be immediately achieved, rectal diazepam (age related dose)

● CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT IMMEDIATELY TO NEAREST SUITABLE HOSPITAL

● if fitting persists after ten minutes, the initial treatment was rectal diazepam but IV access has now been gained, a single dose of diazemuls 300 micrograms/kg IV may be given at this time. Otherwise rectal diazepam may be repeated as per the datasheet

● provide a hospital alert message / information call

● at the hospital, provide a comprehensive verbal handover, and a completed Patient Report Form to the receiving hospital staff.

ADDITIONAL INFORMATION

Post ictal

Is the term given to patients who have had a fit but are now in the recovery phase. Fits are extremely disorienting, even for epileptics who may suffer them regularly. It is not uncommon for patients to act out of character when post ictal. This may include verbal or physical aggression. Oxygen therapy and a calm approach are important, remember, when the patient recovers they may be a completely different person.

Febrile Convulsions

A febrile convolution typically presents as a grand mal fit although as with all such episodes the exact nature may vary from patient to patient.
Transport all children with a first febrile fit or under one year of age to an Accident and Emergency Department, even if the fit has ceased on your arrival at the scene, because of the risk of serious underlying illness and because the parent (or carer) will be very frightened.

In patients who have a history of febrile convulsions (which have previously been investigated and management advice given) it is reasonable to consider contacting the GP to agree management rather than transporting the child to hospital but **ONLY** if child appears well, the parents are confident with this **AND** the patient has not had:

- two or more fits in rapid succession
- a fit lasting in excess of ten minutes.

A thorough examination should be performed on any patient who is to be left at home. Any signs of potentially serious underlying illness require assessment in hospital.

If the patient is not removed to hospital the G.P. **MUST** be informed.

**Status Epilepticus**

Patients with continual fitting or a sequence of fits without sufficient time to recover in between are in **STATUS EPILEPTICUS**, and need aggressive ABC care and rapid transport to hospital. Intravenous Diazemuls, 10mg should be given by slow IV injection (300micrograms/kg in children). Stesolid may be given where appropriate (see Diazepam Guideline). **This is a medical emergency and patients must be removed to hospital as rapidly as possible.**

**Epilepsy**

A number of patients with diagnosed epilepsy, who have repeated fits and a well documented history of this, may present regularly to the Ambulance Service.

If they are **fully recovered and not at risk**, and in the **care of a responsible adult**, consideration may be given to not transporting them routinely to hospital unless they wish to travel. These cases must have vital signs recorded on a disclaimer form, along with the explanation given to the patient. Patients and the responsible adult should be advised to contact either the GP if the patient feels generally unwell or 999 if there is repeated fitting.

The reasons for the decision not to transport must be documented on a disclaimer form, which must be signed by the patient and/or carer. Ensure contact is paid with the patient’s GP particularly in cases where the patient has made repeated calls.

There are many causes of fits as outlined above and remember to consider in other settings, such as the RTA with a driver who has “blacked out”, that the accident may be related to the fit.

It is important wherever possible to obtain contact details of any witnesses to a fit in the above circumstances and pass this to the receiving Hospital.

**REFERENCES**


Leppik IE, Derivan AT, Homan RW. Double-blind study of lorazepam and diazepam in status epilepticus. *JAMA* 1983 Mar 18;249(11):1452-4


Medical Emergencies

INTRODUCTION

Gastro-intestinal (GI) bleeding is divided into upper and lower GI tract bleeding.

Upper GI bleeding originates from the:

- Oesophagus: e.g. oesophageal varices
- Stomach: e.g. gastric ulcer, gastritis or gastric cancer.
- Duodenum: e.g. duodenal ulcer.

Lower GI bleeding originates from the:

- Large Bowel: e.g. colitis, diverticulitis or cancer of the bowel.
- Ano-rectal: e.g. haemorrhoids

Upper GI bleeding may present as vomiting of blood – haematemesis. This may be fresh blood or “old” blood, often described as “coffee grounds”.

Lower GI bleeding may present as passing fresh blood if the source of bleeding is in the rectal or anal canal area, or blackened stools with altered blood in them (called melaena) if the bleeding is further up the GI tract.

Acute upper gastrointestinal bleeding is commonest in areas of the lowest socio-economic status (British Society of Gastroenterology Endoscopy Committee [BSGEC], 2002).

The most common cause of acute upper gastrointestinal bleeding is peptic ulcer (30-50%) (BSGEC, 2002)

11% mortality rate for patients admitted because of gastrointestinal bleeding (BSGEC, 2002). The elderly are at most risk of critical incidents (ACEP, 2000) and most deaths occur in the elderly with significant comorbidity (BSGEC, 2002).

“Patients who present with haematemesis & melaena have more severe bleeding than melaena alone” (BSGEC, 2002)

Active bleeding from a peptic ulcer in a shocked patient carries an 80% risk of continuing bleeding or death (BSGEC, 2002)

HISTORY

Is the upper or lower GI bleeding?

Is there evidence of blood loss, and what volume?

Has the patient a history of an ulcer or bowel problem?

Has the patient been taking medication that may cause bleeding? E.g. aspirin may cause upper GI bleeding.

Is the patient on anticoagulants, e.g. warfarin?

Are there other associated GI symptoms such as pain, nausea and vomiting, diarrhoea or constipation.

Does the patient have any other bleeding problems

It is crucial to ascertain if the patient has underlying liver disease, as this will require specific treatment in hospital (BSGE, 2002)

ASSESSMENT

Assess ABCD’s.

Evaluate whether the patient has any TIME CRITICAL features, These may include:

- any major ABCD problems (including large volume blood loss)
- in particular, signs of hypovolaemic shock such as tachycardia, skin coolness/ sweating, and/or hypotension.

Look for evidence of acute bleeding

- supine tachycardia (pulse >100bpm)
- supine hypotension (systolic BP <95mmHg)
- postural pulse increase of >30bpm or severe dizziness on sitting up.

If any of these features are present, CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT to nearest suitable receiving hospital.

Provide a hospital alert message / information call.

En route – continue patient MANAGEMENT (see below).
If there are no TIME CRITICAL features present, perform a more thorough assessment and a brief Secondary Survey:

Assess for abdominal tenderness.

**MANAGEMENT OF GASTRO-INTESTINAL BLEEDING**

Follow Medical Emergencies Guideline remembering to ensure:

ABCD's.

**High flow O₂ Therapy** (Revell, Porter & Greaves, 2002)

It is important to establish early IV access if any evidence of hypovolaemia (Revell, Porter & Greaves, 2002 & BSGE, 2002) and if haemodynamically compromised insert two large bore cannulae (BSGEC, 2002). Before cannulating consider offering entonox (Ducharme, 2000) for abdominal pain.

**IV fluid replacement should follow** in order to restore blood pressure (BSGEC, 2002) and fluids should be warmed (cited in Revell, Porter & Greaves, 2002).

The elderly tolerate hypotension badly (Revell, Porter and Greeves, 2002).

Crystalloids are the fluid of choice for IV fluid replacement (Revell, Porter & Greaves, 2002)

**Specifically consider;**

- ensure position of comfort (Blendis in Wall & Melzack, 1994)
- ensure systolic BP of >90-100mmHg before administering IV morphine or nalbuphine. Tailoring doses to individual patient requirements rather than bolus doses (Ricard Hibbon et al 1999).

**ADDITIONAL INFORMATION**

If the patient has vomited either fresh blood or “coffee grounds” into a container, try to transport a sample of this for analysis to the hospital with the patient.

Oesophageal varices are found in alcoholics and some patients with liver disease. They are distended “varicose veins” in the lower oesophagus. If they rupture, haemorrhage is rapid and TIME CRITICAL.

Drugs and a special compression tube may help slow the bleeding, but surgery is almost always needed.

Ulcers, both gastric and duodenal, rarely need surgery these days, as new drugs such as ranitidine (Zantac) cimetidine (Tagamet) and omeprazole (Losec) heal ulcers rapidly by reducing gastric acid in the upper GI tract.

**REFERENCES**


INTRODUCTION
A non-diabetic person has a narrow band of normal blood glucose, regulated on one hand by insulin to keep the blood sugar from becoming excessively high and on the other hand by the release of glucose from body stores, mainly from the liver, to prevent the blood sugar level from falling too low.

The normal blood glucose level (BM) ranges from approximately 3.0 to 5.6 mmol/L in non-diabetics.

In diabetics a much higher BM may be normal and relative hypoglycaemia may occur despite a reading which would be “normal” for a non-diabetic patient.

In suspected diabetic patients, when tested in hospital or by the GP, diabetes is diagnosed where the blood glucose, on two separate occasions,

Is >7.8mmol/l when starving or,
Is >10.0mmol/l after eating

Without treatment the blood glucose level in diabetic patients would remain abnormally high so it is kept within the normal range by a combination of diet control and tablet medication (oral hypoglycaemic drugs) or insulin by injection.

Diabetic management aims to keep the blood glucose within the normal range.

HYPOGLYCAEMIA
Abnormally low blood glucose level (usually <3.0mmol/l but may be higher in diabetics, where clinical judgement is as important as BM reading)

If there is an excessive dose of insulin given by the patient, or they have a normal dose and omit, or are late with a meal, their blood glucose may fall abnormally low. Similarly, if excessive exercise or alcohol is taken, an insulin dependent diabetic may utilise more glucose than normal and the blood sugar may be excessively low. Some oral hypoglycaemic agents e.g. glibenclamide may also cause hypoglycaemia, particularly in elderly patients.

HISTORY
What happened?

Is the patient diabetic?

Is the patient taking insulin and when was their last dose?

Is the patient on oral hypoglycaemic tablets?

Has the patient eaten?

Has the patient undertaken an unusual amount of exercise or activity?

Has the patient recently consumed alcohol?

Has this occurred before?

SIGNS AND SYMPTOMS
Can be highly variable from patient to patient. Some patients are often able to detect the early symptoms for themselves but others may deteriorate rapidly and without warning.

Early stages,
- feeling of hunger
- vagueness
- sweating
- all these may alert the patient to take food or glucose
- other symptoms may include:
  - tingling feeling around the mouth and the hands
  - feeling faint
  - loss of concentration

In the later stages,
- confusion
- aggression
- sweating
- fitting
- lapsing into unconsciousness
- abnormal neurological events (one-sided weakness like a mild CVA) may occur.

ASSESSMENT
Assess ABCD’s.

Assess blood glucose level.

Evaluate whether patient is hypoglycaemic taking into account, where the relevant information is readily available, what is “normal” for that individual. The reversal of hypoglycaemia is an important pre-hospital intervention, and scene time may be extended to achieve this.
MANAGEMENT OF HYPOGLYCAEMIA

Follow Medical Emergencies guideline, remembering to:

- ensure ABC’s
- obtain and record blood glucose levels before and after any treatment.

Specifically consider:

- **early stages** – where the patient is co-operative and conscious with an intact gag reflex, oral glucose (Lucozade, milk with sugar, Dextrasol or Hypostop gel) may be given until the glucose level has improved to at least 5.0mmol/l

- **in more severe cases** – where the patient has impaired consciousness, is uncooperative, or is unable to swallow safely, administer glucose 10% approximately 100ml (10g) by IV slow infusion via a free flowing IV cannula which must be assessed for patency first. Give glucose 10% at 5ml/kg in children and titrated against effect in pregnant females. Re-check blood glucose level after 5 minutes to ensure that it has improved to at least 5mmol/l. An improvement in the patient’s condition should be seen almost immediately, as the effects of glucose IV are very rapid. On rare occasions a further repeat dose of glucose IV may be required

- if IV glucose cannot be administered, glucagon (1mg) may be given via the IM route. However, remember it may take 5-10 minutes for glucagon to begin to work and it requires the patient to have adequate glucose stores. Thus it may be ineffective in intoxicated or anorexic patients or non-diabetic hypoglycaemic patients

- it is important therefore, especially in patients who had been given glucagon, that once they are alert and able to swallow, they are given a drink containing glucose and if possible a carbohydrate containing food e.g. sandwich.

If no improvement after a further 5 – 10 minutes, **CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT** to nearest suitable receiving hospital.

Provide a hospital alert message / information call.

En route – continue patient MANAGEMENT.

Diabetic patients who are fully recovered and have returned to their normal mental state after being treated with 10% glucose IV, and have a blood glucose of >5.0mmol/l, and are in the care of a responsible adult, may be considered for leaving at home with advice to take further food by mouth. They must also be advised to call for help if any symptoms of hypoglycaemia re-appear.

All other patients who have been hypoglycaemic and have received treatment should be encouraged to attend hospital, especially if they:

- are elderly
- are taking oral hypoglycaemic agents as they are prone to lapsing back into a hypoglycaemic state
- have no history of diabetes and have suffered their first hypoglycaemic episode
- have blood glucose level < 5 mmol/l after treatment
- have not returned to normal mental state within 10 minutes of IV glucose
- have been treated with glucagon IM
- have any additional disorders or other complicating factors e.g. renal dialysis, chest pain, cardiac arrhythmias, alcohol consumption, dyspnoea, seizures or focal neurological signs or symptoms.

Recovered patients who were unconscious as a result of hypoglycaemia **MUST NOT be left unaccompanied and medical advice should be sought from the patient’s GP or on-call Doctor** before agreeing to leave the patient.

**NB** Any patient (diabetic or not) found in an unconscious state is potentially hypoglycaemic. If one is unable to assess the actual blood glucose level, do not hesitate to give glucose 10% IV or glucagon IM. It will make very little difference if the patient is not suffering from hypoglycaemia, but will improve the blood glucose level and lessen the risk of brain injury if they are.

**HYPERGLYCAEMIA**

Abnormally high blood glucose level (often >20mmol/l).

Very high blood glucose levels can be due to diabetic ketoacidosis (DKA) or hyperosmolar non-ketotic syndrome (HONK) which are both potentially life-threatening complications of diabetes.
If the balance between insulin requirements and insulin availability is disturbed then blood glucose levels may rise causing associated metabolic and electrolyte disturbances, including excessive urine production and salt loss resulting in dehydration and thirst.

This balance may be disturbed because of:

- decreased insulin dose
- increased requirements for insulin (e.g. sepsis, AMI, trauma, reduced activity)
- increased intake of carbohydrates.

The history, unlike most episodes of hypoglycaemia, is not of an illness of sudden onset. The patient has often been ill for some hours or days and has now deteriorated.

**HISTORY**

Is the patient diabetic?

Is the patient on insulin, tablets or controlled by diet?

Is the patient’s diabetes usually well controlled?

Has the patient been taking medication as prescribed?

Has the patient been unwell for the last few days?

Has there been a change in the patient’s diet?

Has the patient been vomiting?

Has this happened before?

**SIGNS AND SYMPTOMS**

Usually an insulin-dependant diabetic who is very unwell.

Diabetic control may be poor.

Dehydrated.

Drowsy.

Deep, sighing respiration (Kussmaul’s breathing).

Acidotic.

Fruity odour of ketones on the breath (ketoacidosis).

**ASSESSMENT**

Assess ABCD’s.

Assess blood glucose level to evaluate if patient is hyperglycaemic.

Dehydration – the patient’s mouth may be dry, the skin may be warm, and if forearm skin is raised in a gentle pinch it remains “tented”.

**MANAGEMENT OF HYPERGLYCAEMIA**

Follow Medical Emergencies Guideline, remembering to:

- ensure ABC’s
- ensure high flow O₂ therapy

Specifically consider,

- obtain IV access, and commence rehydration using sodium chloride intravenous infusion 0.9%, 250ml rapidly (up to 20ml/kg in children) and then reassess vital signs, preferably on route to hospital
- if vital signs and perfusion improve, slow down infusion “to keep vein open” (TKVO) rate
- if no improvement, give a further 250ml (up to 20ml/kg in children) and reassess, repeating process to maximum 2 litres of fluid (40ml/kg in children).

**CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT TO NEAREST SUITABLE RECEIVING HOSPITAL** as these patients have a potentially life-threatening condition and need URGENT hospital treatment including insulin and fluid/electrolyte therapy.

Provide a hospital alert message / information call.

**ADDITIONAL INFORMATION**

Diabetes mellitus is a multi-system disease, which has its origins in a relative or absolute lack of insulin production by the pancreas. Insulin enables the transport of glucose from the blood stream into cells for use as an energy source. A lack of insulin leads to two fundamental problems:

- high amounts of glucose circulating in the blood stream. This stimulates the kidney to produce more urine to try to eliminate the excess glucose that can cause dehydration and loss of body salts
little or no glucose is available in the body cells for normal metabolism. Therefore the cells have to use secondary, less efficient, food sources for energy, namely fats. Fats produce problematic waste products when metabolised in cells, producing a state of acidosis in the body.

This process produces the familiar weight loss (due to abnormal use of body fat for energy production in cells), thirst and polyuria (excessive passing of urine) seen when diabetes first presents, or goes out of control.

**TYPES OF DIABETES**

Diabetes occurs in two forms:

- **TYPE 1**: Insulin dependent diabetes, classically in the younger patient, and tends to have a rapid onset over days to weeks. Type 1 diabetes virtually always needs insulin injection and diet management early on.

- **TYPE 2**: Late onset diabetes in older patients, and often presenting over weeks to months. Type 2 diabetes seldom needs insulin therapy and is usually managed by a change to reduced sugar, low fat, high fibre diet, weight loss if needed, and oral hypoglycaemic tablets that stimulate the failing pancreas to produce more insulin. Some older patients may ultimately need insulin injections if tablets and diet are not working adequately.

**DIABETIC DRUGS**

**Type 1 Diabetes : Insulin Dependent**

Three broad types of insulin:

- **Short acting** – within the hour of injection, lasts around 6-8 hours, e.g. Humulin S, Velosulin, and Actrapid.

- **Intermediate and long acting** – onset in 1-4 hours and long acting may last for 12-35 hours, e.g. Humulin I, Human Monotard.

- **Biphasic** – which are a pre-determined mix of the others, to allow rapid onset of effect, but a long duration of action, e.g. Human Mixtard.

These are mainly self administered by the patient, often twice daily by sub-cutaneous injection. The doses vary around the eating patterns and the daily routines of the patient. Patients may use a pen system with cartridges of insulin, which are patient-triggered injection devices, with a dial-in dose facility. The patient can dial in a dose of insulin before eating, for example, and inject a varying dose as required. Alternatively some diabetic patients use syringe pumps to administer their insulin.

**Oral Hypoglycaemic Tablets**

These are used by type 2 diabetic patients as a supplement to diet, and must be taken regularly, e.g. glibenclamide (Daonil, Euglucon), gliclazide (Diamicron).

**Glucagon (Glucagen)**

This drug, which is normally administered IM, acts by releasing glucose stored in the liver into the blood stream and is kept by many relatives of Type 1 (insulin taking) diabetics to give in case of hypoglycaemia. It may also be administered by paramedics and ambulance technicians, but only where oral or IV glucose administration is not possible.

**Diabetic monitoring**

A variety of sticks for testing urine glucose (Diastix) and blood glucose (BM stix, Glucostix) are used, some of the latter requiring a meter to obtain a reading.

All patients on insulin will check and record their blood glucose levels regularly, which is much more accurate than urine testing. These records provide a valuable source of information for ambulance personnel as part of their patient assessment.

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INTRODUCTION

Patients with heat related illness will demonstrate a variety of symptoms varying from, in mild cases, ankle swelling, calf cramps and heat rash (prickly heat), to severe heat stroke, which can be fatal.

Minor types of heat related problems may be seen by ambulance staff in spells of hot weather, but marathon runners and soldiers, who collapse during running may well present with heat exhaustion and occasionally heat stroke.

Another environment that heat exhaustion may arise in is “the rave” where long periods of physical exercise, minimal fluid intake and stimulant drugs may act to produce collapse.

History

Obtain a history of the circumstances from the patient and bystanders. Enquire about previous health prior to collapse and any pre-collapse symptoms. Assess the circumstances of the incident, the activity of the patient and weather conditions.

Often the patient will be undertaking exercise in hot or at least warm conditions. They may be fit athletes, or over enthusiastic amateurs, but often will have either been recently unwell, or misjudged the pace of the race or the weather conditions. Inadequate fluid intake is a common finding. CAUTION – do not assume that heat is the cause of a collapse, even in a fit athlete, cardiomyopathy often first presents as VF cardiac arrest.

ASSESSMENT

Assess ABCD’s.

You may find:

- tachycardia
- hypotension
- the patient is often confused, sweaty and vomiting.

Take temperature.

Exclude other medical cause of collapse, e.g. diabetes.

Remember the use of certain drugs e.g. amphetamines may increase the risk of heat exhaustion as a result of their stimulant effect.

Evaluate if any TIME CRITICAL features are present. These may include:

- any major ABCD problem
- impaired level of consciousness*
- core temperature >40°C.

* If the patient has impaired level of consciousness, along with the other features of heat exhaustion, consider HEAT STROKE. This is a serious, potentially fatal emergency, demanding external cooling and IV rehydration.

If any of these features are present, CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT to nearest suitable receiving hospital.

Provide a hospital alert message / information call.

En route continue patient MANAGEMENT (see below).

If patient has no TIME CRITICAL features, perform a more thorough patient assessment and a brief Secondary Survey.

Assess for any injuries

MANAGEMENT OF HEAT EXHAUSTION/ HEAT STROKE

Follow Medical Emergencies Guideline, remembering to:

- ensure ABCD’s (including C-spine consideration if the patient has fallen)
- ensure adequate O₂ therapy
- obtain IV access
- commence with crystalloid 250ml (to 2,000ml max) NOT warmed, particularly if patient is vomiting (up to 20ml/kg initial dose in children, repeated once if necessary)
- commence tepid sponging or water mist
- reassess vital signs before further IV infusion.
- commence ECG and pulse oximetry monitoring.
- remove to a COOL place and remove heavy clothing to help COOL the patient.
ADDITIONAL INFORMATION

Minor heat illness does not disturb the body’s temperature regulatory (thermo-regulatory) functions. Oral fluid replacement, cooling and rest, will suffice.

Heat exhaustion and more serious heat stroke are problems requiring further intervention.

Heat exhaustion often occurs in marathon runners or fire-fighters, when exerting over a period in hot or warm conditions. Preceding illness or prior lack of adequate fluid intake can aggravate the situation. Sleeping after exertion in hot tents or cabins can induce this condition.

In heat exhaustion, core temperature (rectal) often rises to 39° – 40°C, but cooling and rehydration with water and electrolyte solutions (e.g. Diorylate) will often improve the condition. IV fluids are needed if vomiting prevents rehydration by mouth.

Heat Stroke is more severe and threatens the patient’s life.

Thermo-regulatory control is lost in the body, and core temperature often exceeds 41°C. Sweating may be absent. This causes multi-system organ damage, and impaired consciousness and external cooling is needed with ICE packs in the armpits and groin areas, and to the scalp. Mortality is related to the time the excessive temperature (hyperthermia) is present, so the quicker the patient is cooled, the better.

REFERENCES


INTRODUCTION

Hyperventilation can be defined as “A rate of ventilation higher than that required to maintain a normal level of plasma CO₂”.

Hyperventilation is a response to a stress placed on the body. Such stresses can range from life threatening conditions such as pulmonary embolus or diabetic ketoacidosis to the emotional stress of an argument.

HISTORY

See breathlessness guide.

Specific presenting features can include:
- tetany due to calcium imbalance
- numbness and tingling to the mouth and lips
- carpopedal spasm
- aching of the muscles of the chest.

ASSESSMENT

Assess ABCD.

Specifically consider:
- history of onset of hyperventilation
- previous history and cause of hyperventilation episodes
- previous medical history
- differential diagnosis such as pulmonary oedema, acute asthma, chest infection, pulmonary embolism, diabetic ketoacidosis, pneumothorax, drug overdose or AMI
- auscultation of breath sounds during assessment of breathing
- associated signs and symptoms such as
  - cyanosis
  - reduced levels of consciousness
  - reduction in SPO₂.

MANAGEMENT

Ensure ABCD.

Maintain a calm approach at all times.

Reassure the patient and try to remove the source of the patients anxiety if this is believed to be the cause of hyperventilation.

Coach the patients respirations whilst maintaining a calm environment.

Maintain a high index of suspicion for causes of physiological hyperventilation that may require treatment of the underlying conditions.

ADDITIONAL INFORMATION

The cause of hyperventilation cannot always be determined with sufficient accuracy (especially in the early stages) in the pre hospital environment.

Always presume hyperventilation is secondary to hypoxia or other underlying respiratory disorder until proven otherwise.

The resulting hypocapnia will result in respiratory alkalosis bringing about a decreased level of serum ionized calcium.

This electrolyte imbalance will result in tetany, paresthesia and carpopedal spasm.

Physiological indicators as to the acid base state of the patient (such as blood gas analysis) cannot be measured in the prehospital environment.

The practice of encouraging the patient to rebreathe their own air (via a paper bag) can be potentially harmful if the cause of the hyperventilation is due to an increased oxygen demand from a medical cause. This practice should therefore be abandoned in pre hospital care.

Treatment aims are to restore a normal level of PCO₂ over a period of time by reassuring the patient and coaching the patients’ respirations.

The administration of oxygen can help to relieve cerebral hypoxia caused by cerebral vasoconstriction secondary to hypocapnia.

REFERENCES


Medical Emergencies

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INTRODUCTION

Hypothermia is defined as a core body temperature below 35ºC.

Hypothermia may present in a variety of situations. It may occur in normal patients with normal temperature regulation, as a result of overwhelming cold exposure, e.g. cold water immersion. It can occur in more vulnerable patients, e.g. the elderly with only mild to moderate cold exposure. The risks of hypothermia may be maximal in cold weather, but it may occur at any time. Remember the effects of wind – chill factor.

HISTORY

The history will usually alert the crew to the possibility of hypothermia. The circumstances of discovery – a patient found on the floor in a cold flat, exposed outdoors or immersed in cold water, should alert the crew to the possibility of hypothermia.

Remember also, the injured fell walker with limb fractures, may well be hypothermic, if the injuries have immobilised the walker in cold conditions. Similarly the elderly patient with a hip fracture may become hypothermic, if they are lying on the floor overnight. Did the patient collapse before they became hypothermic, if so why?

Length of exposure, wearing of wet clothes, sub-zero external temperature, should also be noted. Any other relevant medical circumstances, such as alcohol consumption, or use of tranquillisers, that may aggravate the effects of cold, should be noted.

Similarly, accompanying illnesses, such as diabetes, and evidence of injury must be observed and noted.

ASSESSMENT

Assess ABCD’s.

Assess for any evidence of cardio-respiratory arrest.

Remember breathing may be very shallow.

Remember pulse may be very slow and weak volume, so check for one minute.

Assess whether any TIME CRITICAL features are present. These may include:

- any major ABCD problem
- profound bradycardia
- accompanying major injuries.

If any of these features are present, CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT to nearest suitable receiving hospital.

Provide a hospital alert message / information call.

En route – continue patient MANAGEMENT (see below).

If the patient’s condition is not TIME CRITICAL, perform a more thorough patient assessment and a brief Secondary Survey.

Assess ECG rhythm, and maintain ECG monitoring. Patient may be VERY bradycardic.

Measure blood glucose level, treating hypoglycaemia as appropriate

Assess mental state. Confusion and impaired levels of consciousness are common.

Assess for injuries.

Assess whether shivering.

Assessment of accurate core temperature would require a tympanic membrane thermometry although the efficacy of such devices in the pre-hospital arena is unproven.

REMEMBER DEATH MUST NEVER BE DIAGNOSED IN THE FIELD. HYPOTHERMIC OR POSSIBLE HYPOTHERMIC CASUALTIES ARE NOT DEAD UNTIL THEY ARE “WARM AND DEAD”.

MANAGEMENT OF HYPOTHERMIA

Follow Medical Emergencies Guideline, remembering to:

- handle patient with care, as careless handling can induce ventricular fibrillation (VF)
- ensure ABCs. If patient is very cold, assess breathing and pulse for at least 1 minute
- ensure adequate O₂ therapy. Remember to keep O₂ cylinder warm where possible, as if oxygen is administered cold, it will induce further cooling of patient as the cold oxygen enters the lungs.
Specifically consider:

- secure C-Spine, if any evidence of head or other significant injury is suspected, follow Trauma Emergencies Guidelines
- secure airway with intubation, ONLY if needed, and monitor ECG, as airway manoeuvres may induce ventricular fibrillation (VF) in hypothermic patients. Try basic airway methods first
- monitor ECG. If VF is noted, follow VF Guideline, BUT defibrillation and cardiac drugs are often ineffective until core temperature is above 32°C. Attempt one loop of defibrillation/drug therapy then revert to basic CPR
- ensure IV access where possible. IV fluids are only needed if hypovolaemia as a result of bleeding from injuries. DO NOT delay on scene to commence IV
- remove WET clothing in the ambulance/under shelter, and cover with blankets when dry. Ensure the head is covered to prevent further heat loss. Protect from the elements and further cooling
- do not RUB skin to warm patient or apply external heat. This diverts core blood to the skin and further aggravates cooling
- if the patient is conscious and a hot drink is available this may benefit the patient.

ADDITIONAL INFORMATION

Exposure to extreme cold

In normal individuals, body temperature regulation is very effective. Exhaustion renders it less so, and when exposed to extremes of cold for a period of time, when under maximal physical effort, hypothermia is often involved, as a cause of emergency problems. Windy conditions cause more rapid loss of body heat and the "wind-chill" effect can double heat loss.

Immersion

In immersion, the heat loss is mainly by conduction of heat from the body to surrounding water. Heat loss by conduction through water is increased 25 fold compared to air, so body cooling occurs more rapidly.

Shivering

Shivering, because it increases muscle activity, is one of the body’s main methods of heat production. However about half the heat generated in this process is lost by conduction.

Vasoconstriction aids in retaining the heat, but as vasoconstriction in the head and neck areas is minimal, heat loss from the head is considerable. Additionally vasoconstriction may cause diuresis which, when warming and vasodilation occur, may lead to relative hypovolaemia.

Adopting the foetal position and huddling together are techniques developed by climbers to minimise heat loss.

Oxygen Therapy

Cold oxygen administered during ventilation of a hypothermic casualty has been known to trigger VF – keep the oxygen cylinder as warm as possible.

Cardiac Drugs

These drugs are often not effective in very hypothermic patients (<32°C), in cardiac arrest. The additional problem is the effect of a number of doses in the blood stream, when the patient is re-warmed and the drugs suddenly have an effect. If single doses do not perform as expected in a very hypothermic patient, do NOT give repeated doses, continue with CPR, and transport or seek medical advice.

Remote Locations

In extremely remote locations, with a severely hypothermic patient, it is recommended that CPR should not be started unless it is possible to continue it throughout the rescue period. It is better to wait to commence initial CPR rather than start then have to stop, then start again.

REFERENCES


INTRODUCTION

Meningococcal disease is the leading infectious cause of death in children and can kill a healthy person of any age within hours of their first symptoms. There are two main clinical presentations; meningitis and septicaemia. These can occur on their own, but often occur together.

Septicaemia in the absence of signs of meningitis can be even more life-threatening than meningitis alone.

Meningococcal septicaemia occurs when meningococcal bacteria invade the bloodstream and release their toxic products. This can progress rapidly to shock and circulatory collapse. Deterioration can be rapid and irreversible, with treatment becoming less effective by the minute.

The speed with which the disease is identified and treatment started mainly determines the outcome.

ASSESSMENT

Airway.

Breathing – rate and effort. Measure oxygen saturation.

Circulation – pulse and capillary refill time.

Disability – AVPU.

Expose – look for rash.

take temperature if appropriate.

NB The patient may have been previously unwell with non-specific symptoms e.g. raised temperature, cold symptoms

THE RASH

Classically bruised haemorrhagic type (purpuric), or may appear "flea bitten". In pigmented skin look at conjunctivae under lower eyelid.

If a glass tumbler is pressed firmly against a purpuric rash the rash will NOT fade, rash remains visible through the glass.

If there is a non blanching rash in an unwell person, meningococcal septicaemia must be assumed.

A non blanching rash is indicative of meningococcal septicaemia but is not a foolproof technique.

There may be NO rash.

Up to 30% of cases start with a blanching pink rash which fades with pressure and then becomes purpuric.

Any patient in whom meningococcal disease is suspected should be reassessed regularly for the appearance of a non blanching rash.

FINDINGS

Respiratory rate and effort – raised.

Heart rate – raised (relative bradycardia is a very late sign).

Capillary refill >2 seconds, skin cold to touch (especially in extremities). Skin may appear mottled (early in illness, skin may be warm).

Oxygen saturation reduced or may be unrecordable (poor perfusion).

Temperature – raised (peripheral shutdown or any antipyretics given may mask this).

Rigors.

Vomiting / abdominal pain / diarrhoea.

Rash – develops into a petechial, bruise like purpuric rash or blood blisters.

May be no rash.

Pain in joints, muscles and limbs.

Seizures.

Level of consciousness:

● early in shock alert / able to speak
● as shock advances:-
  – babies – limp, floppy and drowsy

Some symptoms may be absent and the order in which they appear may vary.
MANAGEMENT

Open airway.

High flow oxygen with assisted ventilation (as needed).

Correct A and B problems at scene then DO NOT DELAY TRANSPORTATION to nearest receiving hospital.

Give benzylpenicillin (see below) IN TRANSIT.

Treat shock with i.v. crystalloid if time allows (Children- up to 20ml/kg repeated twice if necessary (max 60ml/kg) or adults – 250ml repeated up to a maximum of 2 litres

Check blood sugar and treat if necessary.

Provide hospital alert message including age of patient.

Repeat assessment and further management of ABCs as necessary en route.

BENZYLPCENICILLIN ADMINISTRATION

The illness may progress rapidly – the sooner benzylpenicillin is administered the better the outcome.

Dissolve benzylpenicillin in sterile water (as in table below).

Give IV if access can be obtained easily, otherwise IM (or IO in children).

<table>
<thead>
<tr>
<th>Age</th>
<th>Dose</th>
<th>Volume IV / IO 600mg/10ml</th>
<th>IM 600mg/2ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td>300mg</td>
<td>5ml</td>
<td>1ml</td>
</tr>
<tr>
<td>1-9 years</td>
<td>600mg</td>
<td>10ml</td>
<td>2ml</td>
</tr>
<tr>
<td>&gt;9 years and Adult</td>
<td>1200mg</td>
<td>20ml</td>
<td>4ml</td>
</tr>
</tbody>
</table>

This type of exposure is unlikely to occur unless undertaking airway management or if patient coughed in their face.

When a case of meningococcal disease is confirmed, the public health doctor will ensure that antibiotics are offered to any contacts of the case whose exposure puts them at increased risk of infection.

Note

We are grateful for the support of the Meningitis Research Foundation in the development of this protocol.

REFERENCES


INTRODUCTION

Accidental and deliberate drug overdose is a common problem met by ambulance staff. Accidental poisoning with ingestion, inhalation and skin contact with noxious chemicals is a more rarely encountered emergency. The majority of these episodes of poisoning are dealt with along similar lines with general supportive care, but some require more specific action.

HISTORY

Take a history of the event and drug, or substance involved.

What mode of poisoning has occurred, e.g. ingestion, inhalation?

When did it happen, and are there any other factors that may be relevant, e.g. paracetamol taken with alcohol is more toxic to the liver than if taken alone?

Has any treatment occurred yet, e.g. induced vomiting?

ASSESSMENT

Assess ABCD’s.

Assess the nature of the drug or substance involved. Where expert advice is required in an unusual situation this can be obtained via dispatch/control centre, A&E from the nearest poisons centre.

Evaluate if there are any TIME CRITICAL features present. These may include:

- impaired ABCD’s
- impairment of consciousness and respiration are often combined in overdose
- extreme hypotension (BP <70mmHg) is common in sedative and anti-depressant overdose
- arrhythmias
- convulsions
- hypothermia – especially if patient has been unconscious for a time.

Specific drugs may be commonly TIME CRITICAL in overdose – see ADDITIONAL INFORMATION.

If any of these features are present, CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT to nearest suitable receiving hospital. Provide a hospital alert message / information call.

En route – continue patient MANAGEMENT (see below).

MANAGEMENT OF OVERDOSE AND POISONING

Follow Medical Emergencies Guidelines, remembering to:

- ensure ABCD’s
- provide adequate O₂ therapy, and in cases of INHALED TOXINS ALWAYS PROVIDE 100% O₂.

Specifically consider:

- provide aggressive AIRWAY management
- ensure adequate ventilation. If respiration and levels of consciousness are impaired, and drugs such as morphine, heroin or other related drugs are at all suspected, administer naloxone 400 micrograms IV/IM and provide respiratory support to attempt to relieve respiratory depression
- establish IV access as appropriate en route to hospital. CAUTION if any evidence of IV DRUG ABUSE, take additional care with SHARPS
- if patient is exposed to chemicals, remove patient from the source of chemical at once
- in the case of SKIN CONTAMINATION with chemicals, remove clothing with care NOT to contaminate rescuers, and IRRIGATE with generous amounts of water
- if patient has impaired consciousness – ALWAYS check blood glucose level and correct if low (blood glucose <3.0mmol/l) with glucose 10% IV or glucagon 1mg IM
- collect up any TABLET CONTAINERS or ACTUAL TABLETS and take with patient
- if patient vomits, retain a sample for hospital inspection if possible
- NEVER induce vomiting in the case of ingested caustics or petroleum products
- in the case of swallowed caustics and petroleum products dilute by giving milk at the scene wherever possible.
ADDITIONAL INFORMATION

Overdose with a number of drugs are potentially TIME CRITICAL, some of which are dealt with in more detail below:

Tricyclic antidepressants (amitriptyline (Tryptizol), Clomipramine (Anafranil), Dothiepin (Prothiaden), imipramine (Tofranil)).
- **serious effects** – cardiac arrhythmias, hypotension
- **immediate care** – activated charcoal (prehospital evaluation ongoing).

Opiate and opioid drugs, such as morphine, diamorphine (heroin), and compound drugs containing an opioid drug such as co-proxomol.
- **serious effects** – respiratory and cardiac depression
- **immediate care** – naloxone.

Beta-blockers (atenolol, sotalol, propranolol)
- **serious effects** – bradycardia
- **pre-hospital care** – atropine.

Digoxin
- **serious effects** – cardiac arrhythmias
- **pre-hospital care** – dependent on arrhythmia.

Other substances may also cause major problems:

Carbon Monoxide – CO poisoning.

Organophosphate insecticides – respiratory depression, fits, wheezing and sweating. Atropine may be needed.

Paraquat – pulmonary, renal and liver damage which is progressive and irreversible – O2 THERAPY IS CONTRA-INDICATED IN THESE PATIENTS.

SPECIFIC COMMON POISONS

Carbon monoxide poisoning

The essential requirement with carbon monoxide poisoning is to be alert to the possibilities of the diagnosis. Any patient found unconscious or disorientated in an enclosed space, where ventilation is impaired, or a heating boiler may be defective, should be considered at risk. The supposed cherry red skin colouration in carbon monoxide poisoning, is in fact, rarely seen in practice.

The immediate requirement is to remove the patient from the source as carbon monoxide is displaced from haemoglobin more rapidly if the patient is given 100% O2. This must be given continuously. There is currently a revival of interest in the role of hyperbaric O2 in more serious cases of CO poisoning.

Paracetamol and Paracetamol-containing compound drugs

Remember that many analgesic drugs contain paracetamol and a combination of codeine or dextropropoxyphene. This, in overdose, creates two serious dangers for the patient. The codeine and dextropropoxyphene are both derived from opioid drugs. This in overdose, especially if alcohol is involved, may well produce profound respiratory depression. **This can be reversed with naloxone.**

The secondary problem is the paracetamol that, even in modest doses (20 – 30 tablets), may induce severe liver and kidney damage in susceptible patients. There is no evidence of this initially and this may lull the patient and ambulance staff into a false sense of security. It frequently takes 24 to 48 hours for the effects of paracetamol damage to become apparent and urgent blood levels are required to assess the patient’s level of risk.

If available (trial sites only) activated charcoal should be administered if the time from ingestion to arrival on scene is less than four hours. Current pre-hospital evaluation is ongoing prior to formal recommendation.

Alcohol

Alcohol intoxication is a common emergency, and is usually a transient problem. However, when combined with drugs in overdose, it may pose a major problem. When combined with opiate drugs or sedatives, it will further decrease the level of consciousness and increase the risk of **ASPIRATION OF VOMIT**. In combination with paracetamol it increases the risk to the liver.

Remember to check the blood glucose levels especially in children and young adults who are “drunk”, as hypoglycaemia (blood glucose <3.0mmol/l) is common and requires treatment with oral glucose, glucose 10% IV or glucagon 1mg IM.
Cyanide

Cyanide poisoning is fortunately exceedingly rare and requires specific treatment outside the remit of ambulance paramedics and technicians. However full supportive therapy should be given to these patients who should be transported immediately to hospital.

Poisoning may occur in certain industrial settings. Cyanide “kits” should be available and staff at the hospital should be trained in its use. The patient requires injection with Dicobalt edetate 300ml IV over one minute followed by 250ml of glucose 10% IV or administration of the currently unlicensed drug hydroxycobalamin.

There is a proposal by the H&SE, that cyanide kits may be withdrawn from establishments, as there are uncertainties about safety and effectiveness of the drugs, and the judgements of when to use them.

Iron

Iron pills are regularly used by large numbers of the population including pregnant mothers and “growing children”. In overdose, especially in children, they are exceedingly dangerous. They may cause extensive damage to the liver and gut and these patients will require hospital assessment and treatment.

Tricyclic antidepressants (see page 2 of 5).

Poisoning with these drugs may cause impaired consciousness, profound hypotension and cardiac arrhythmias. They are a common treatment for patients who are already depressed, and not surprisingly are frequently taken in overdose. Newer anti-depressants such as fluoxetine (Prozac) and paroxetine (Seroxat) do not have these hazards in overdose. Activated charcoal may be of benefit but is not currently listed for paramedic use.

ECG monitoring and IV access should be established early in the treatment of tricyclic overdose. The likelihood of fitting is high.

ILLEGAL DRUGS

Cocaine

Cocaine is an alkaloid found in the leaves of the South American shrub Erythroxylon Coca. It is a powerfully reinforcing psychostimulant. Crack is made from cocaine in a process called freebasing, in which cocaine powder is cooked with ammonia or sodium bicarbonate (baking soda).

Outward Signs:

- hyperexcitability; agitated, irritable and sometimes violent behaviour
- sweating
- dilated pupils.

Effects:

The drug induces a sense of exhilaration, euphoria, excitement and reduced hunger in the user primarily by blocking the re-uptake of the neurotransmitter dopamine in the mid-brain, and also blocks noradrenaline uptake causing vasoconstriction and hypertension. Since crack is purer and therefore more potent than street cocaine, it enters the bloodstream more quickly and in higher concentrations. Because it’s smoked, crack cocaine’s effects are felt more quickly and they are more intense than those of powder cocaine. However, the effects of smoked crack are shorter lived than the effects of snorted powder cocaine.

Administration:

Cocaine comes in the form of a powder that is almost always ‘cut’ or mixed with other substances. It is usually ‘snorted’ through the nose, but can be rubbed into the gums, smoked or injected. Crack comes in the form of solid rocks, chips, or chunks that are smoked.

Side effects:

The symptoms of a cocaine overdose are intense and generally short lived. Although fairly uncommon, people do die from cocaine or crack overdose, particularly following ingestion (often associated with swallowing ‘evidence’). All forms of cocaine/crack use can cause coronary artery spasm, myocardial infarction and accelerated ischaemic heart disease, even in young people.
Various doses of cocaine can also produce other neurological and behavioural effects such as:
- dizziness
- headache
- movement problems
- anxiety
- insomnia
- depression
- hallucinations

The unwanted effects of cocaine or crack overdose may include some or all of the following:
- tremors
- dangerous or fatal rise in body temperature
- delirium
- myocardial infarction
- cardiac arrest
- seizures including status epilepticus
- stroke
- kidney failure

Treatment:
- cocaine toxicity must be treated as a medical emergency and the patient transferred rapidly to hospital. In addition to the usual management of overdose/poisoning, the specific treatment of acute cocaine poisoning in the pre-hospital environment should take into account the likely necessity for:
  - assisted ventilation and / or oxygen therapy
  - monitoring ECG
  - administration of aspirin and GTN if the patient complains of chest pain
  - administration of diazemuls 10mg IV, repeated once if necessary, or stesolid if the patient has severe hypertension, chest pain or is fitting
  - administration of paracetamol and cooling if the body temperature is elevated.

NOTE: Swallowed crack cocaine represents a severe medical emergency and needs urgent transportation to hospital even if unsymptomatic.

Amphetamines
(speed, whizz or uppers) Amphetamines have been around since the 1930's and has been medically prescribed in the past for diet control and as a stimulant.

Effects:
- increases energy levels, confidence and sociability.

Administration:
- swallowed, sniffed or rarely injected. Onset at about 30 minutes. Lasts for several hours. Used with other drugs or alcohol, the effects are magnified.

Outward Signs:
- mood swings, extreme hunger, sleeplessness, and hyperactivity.

Side Effects:
- cardiovascular:
  - tachycardia – can lead to heart failure even in healthy individuals.
  - hypertension – can produce pinpoint haemorrhages in skin, especially on the face and even lead to stroke.
- central nervous system:
  - “high” feelings, panic, paranoia can produce mental illness picture in long term use. Poor sleep.
- gastrointestinal:
  - liver failure.

Ecstacy “E”
(doves, apples, strawberries, diamonds) Chemical name: 3-4 methylene dioxymethamphetamine (MDMA)

Effects:
- feeling warm, energetic, friendly, rising to a state of euphoria.

Administration:
- “E” tablets may be white embossed “headache” sized pills, or coloured capsules. They take some 40 minutes to work, lasting for 2 – 6 hours. “E” may not be addictive but is illegal.

Outward Signs:
- sweating, dilated pupils and elevated mood.

Side effects:
- cardiovascular system:
  - tachycardia
  - capillary rupture, causing red marking on the face in particular
Medical Emergencies

● central nervous system:
  – heatstroke, hyperthermia as a result of energetic dancing and dehydration, combined with the drug’s effect of blocking signals to the brain to slow down.
  – depression, panic and anxiety may also occur.

● liver and kidney damage:
  – liver failure and severe kidney damage may occur. Cystitis and heavy periods may occur in females who use “E”.

LSD

(Lysergic acid diethylamide) LSD or “acid” is a “mind altering drug” that works on the brain to alter the brain’s perception of things. It was discovered in 1943, and was used in the 1960s as a “recreational drug”.

Outward Signs:

● agitated, weird behaviour, or clear mental disturbance. The patient may appear distant and display anxious behaviour. Do not interfere unduly, as the trip wills self limit, and communication is easier then. Keep them safe, and remember other drugs and alcohol will aggravate the effects of LSD.

Effects:

● the alterations in perception may be pleasant or “nightmarish”, or a mix of both, and last for some 12 hours.

Administration:

● produced on patches of blotting paper, called tabs or trips, often with printed motifs including cartoon characters. Once swallowed they take 30-60 minutes to work. The trip will last up to 12 hours and cannot be stopped. LSD is not addictive but is illegal.

Side effects:

● central nervous system:
  – visual hallucinations (distortion and delusions), which can cause dangerous behaviour.
  – nightmarish perceptions “bad trips” may last for 12 hours. Nausea and vomiting.
  – personality changes and psychiatric illness.
  – nightmarish flashbacks that can last for years after drug use stops.
  – delusions – false sensations or visions – may affect taste, hearing and vision.
  – can trigger hidden mental illness in individuals.
  – permanent eye damage can occur.

DUTY OF CARE

It is not uncommon to find patients who have or claim to have taken an overdose and subsequently refuse treatment or admission to hospital. If, despite reasonable persuasion, the patient refuses treatment, it is not acceptable to leave them in a potentially dangerous situation without any access to care.

Assistance may be obtained from the Medical / Clinical Director or a member of the clinical team and in extreme cases a judgement must be made to seek appropriate advice including, if necessary the attendance of the Police where the patient is clearly, seriously at risk.
INTRODUCTION
A function of the pulmonary capillary bed is to filter the circulation of the minute blood clots that are a daily occurrence in health. Pathological obstruction of the pulmonary vessels usually presents in one of four types:

- multiple small pulmonary emboli – characterised by progressive breathlessness more commonly identified at outpatients appointments than through emergency presentation due to the long standing nature of the problem
- segmental emboli with pulmonary infarction – may present with pleuritic pain and/or haemoptysis but with little or no cardiovascular compromise
- major pulmonary emboli – obstruction of the larger branches of the pulmonary tree may present with sudden onset of shortness of breath with transient rise in pulse and/or fall in blood pressure. Often a precursor to a massive PE
- massive pulmonary emboli – often presenting with loss of consciousness, tachypnoea and intense jugular vein distension may prove immediately or rapidly (within 1 hour) fatal and unresponsive to cardiopulmonary resuscitation

Evidence has shown that PE was not diagnosed in as many as 70% of people in whom it was subsequently found to be a main cause of death.

HISTORY
See breathlessness guideline.

The most common symptoms of PE are (in order of frequency, most common first)
- dyspnoea
- tachypnoea
- pleuritic pain
- apprehension
- tachycardia
- cough
- haemoptysis
- leg pain / clinical DVT.

PE can present with a wide range of symptoms and is often atypical however 80-90% of all confirmed PE patients exhibit one or more predisposing factors.

Any patient presenting with any symptom suggestive of PE, but in particular shortness of breath and/or chest pain, who also has a predisposing factor should be considered at risk of PE.

Predisposing Factors for PE (at least one present in 80-90% cases)

- Surgery
  - Especially recent abdominal, pelvic, hip or knee surgery or post operative intensive care
- Obstetrics
  - Pregnancy
- Cardiac
  - Recent acute MI
- Limb problems
  - Recent lower limb fractures
  - Varicose veins
  - Lower limb problems secondary to stroke or spinal cord injury
- Malignancy
  - Abdominal and/or pelvic in particular
  - Advanced metastatic disease
  - Concurrent chemotherapy
- Miscellaneous
  - Age >40 (and risk continues to increase with age)
  - Previous proven PE/DVT
  - Immobility
  - Thrombotic disorder
  - Other recent trauma.

Lesser risk factors include prolonged air, coach or other travel leading to prolonged periods of immobility, especially whilst sitting, oral oestrogen (some contraceptive pills) and central venous catheterisation

Over 70% of patients who suffer PE have peripheral vein thrombosis and vigilance is therefore of great importance – it may not initially appear logical to check the legs of a patient with chest pain but can be of great diagnostic value in such cases

ASSESSMENT
Assess ABCD.

Specifically consider:
- respiratory rate and effort
- any signs and symptoms combined with predisposing factors
- lower limb assessment may reveal unequal/swollen limbs that are occasionally hot and red. Calf tenderness/pain may be present. Extensive leg clots may also lead to femoral tenderness
- evidence of right heart strain (jugular vein distension)
● differential diagnoses include pleurisy, pneumothorax or cardiac chest pain

● evaluate whether any TIME CRITICAL features are present. These may include
  – extreme breathing difficulty
  – cyanosis
  – severe hypoxia (SaO2 <90%, unresponsive to O2).

If any of these features are present correct A and B problems then transport to the nearest suitable receiving hospital.

Provide a hospital alert message/information call.

MANAGEMENT

Follow Medical Emergencies Guideline remembering to:

● ensure ABCD

● position for comfort and ease of respiration – often sitting forwards but be aware of potential hypotension

● be prepared for cardiorespiratory arrest.

Specifically consider:

● monitor using ECG and pulse oximeter
  – Be aware that the classic S1Q3T3 12 lead ECG presentation is often NOT present, even during massive PE

● high flow oxygen

● rapid transfer

● IV access en route where appropriate.

ADDITIONAL INFORMATION

Whilst there is no specific pre-hospital treatment available there may be a window of opportunity to deal with massive PE before the patient progresses to cardiac arrest. Thrombolytic therapy has been proved of benefit to many of these patients but because of the difficulty in accurate diagnosis should only be performed in the hospital setting. Surgical intervention (embolectomy) may also be required.

High index of suspicion and rapid transport are the keys to saving these patients.

REFERENCES


Hoellerich VL, Wigton RS. Diagnosing pulmonary embolism using clinical findings. *Arch Intern Med* 1986 Sep;146(9):1699-704
INTRODUCTION
Heart failure is the end stage of many diseases of the heart,¹ with the commonest cause being left ventricular failure (LVF)² due to coronary artery disease and hypertension.³

Prevalence of heart failure is reported varyingly as between 0.27% and 2%.⁴ Assuming a prevalence of 1%, this would equate to about 600,000 patients with heart failure in the UK, of whom 25-30% are admitted each year.⁵ This suggests around 150,000 admissions per annum for heart failure in the UK.

Prognosis is poor; average survival from first diagnosis was less than 1.5 years for both men and women in the 1990s.⁶

Pulmonary oedema usually presents to the Ambulance Service secondary to a cardiac cause and is often associated with recent MI. Despite intensive research, the precise mechanism of cardiogenic pulmonary oedema is still unknown. In the majority of patients, the cause is an acute increase in left ventricular end diastolic pressure (preload) that is transmitted backwards to the pulmonary veins, thus causing exudation into the alveoli. The preload increase, is often due to acute ischaemia, which decreases left ventricular diastolic function and systolic function.⁷ It has also been suggested that pulmonary oedema is due to a vicious cycle in which the decrease in cardiac output is compensated by peripheral vasoconstriction leading to an increase in systemic vascular resistance and afterload. If the peripheral vasoconstriction is excessive, the significant increase in afterload causes further reduction in cardiac output leading to even more vasoconstriction and afterload increase.⁸

The signs and symptoms can be difficult to differentiate from other causes of breathlessness. A thorough history taking and physical exam is essential therefore and care should be exercised before providing the full range of treatment options.

Accuracy of paramedic assessment in acute LVF has been reported as between 77% and 89%¹⁰,¹¹,¹² compared to an accuracy of in-hospital diagnosis of 94.5%.¹³

HISTORY
See Breathlessness Guideline for evidence based differential diagnosis.

Specifically, ask:
Smoker?
Ischaemic Heart Disease (IHD).

Hypertension.
History of Asthma / COPD (to rule out).
Acute exacerbation of chronic condition
● known heart failure (fluid on lungs, ankle swelling, “on water tablets”)
● fluid on lungs
● ankle swelling
● diuretics (water tablets) furosemide, bumetanide, bendrofluazide …
● ACE-Inhibitors are commonly prescribed for Heart Failure and Hypertension, (e.g. captopril, enalapril, lisinopril, ramipril …)
Orthopnea (shortness of breath on lying down).
● sleeping upright
Waking at night (nocturnal dyspnoea).
Other symptoms.
● chest pain indicative of acute MI (or a recent MI over past few weeks)
● patient anxious or restless.

ASSESSMENT
Primary Survey: Assess ABCD’s
● base line Observations
Specifically assess: (Inspect, Percuss, Palpate, Auscultate)
Respiratory rate and effort.
Degree of dyspnoea (VAS) (see Breathlessness Guideline).
Jugular Vein Pressure (JVP) and peripheral oedema.
Productive cough, sputum or bubbling.
● frothy white / pink sputum
● (yellow/green sputum suggests chest infection)
● chest sounds
● audible wheeze on expiration: asthma or pulmonary oedema
● auscultation
● rales – fine crackling (crepitations) – common bilaterally in posterior lung bases.
12 – lead ECG abnormalities commonly seen:
● (Atrial fibrillation, previous MI evidence, LV hypertrophy, bundle branch block, left axis deviation.

Evaluate TIME CRITICAL factors:
These may include:
● extreme breathing difficulty
● cyanosis
● hypoxia – i.e Saturation levels on pulse oximeter (SpO₂) <95% or not responding to high flow O２ (see Breathlessness Guideline)
● exhaustion
● decreased level of consciousness
● systolic BP <90mmHg
● if any of these features are present, correct A and B problems, give O₂, LOAD AND GO to nearest suitable receiving hospital, giving appropriate treatment enroute.

Provide a hospital alert message / information call.

**MANAGEMENT**

Diagnosis can be difficult. If you are unsure, treat with O₂, GTN, and consider nebulisation only.

Follow Medical Emergencies Guideline remembering to:

● ensure ABC’s

● provide high flow (10-15lpm 100%) O₂, via non-rebreathing mask with reservoir bag

● position for comfort (often sitting upright or forwards)
  – These patients often describe “drowning” if they try to lie down.

● prepare for respiratory arrest (can occur rapidly)

Specifically consider (in this order)

● check systolic BP >90mmHg before other interventions:

● Continuous Positive Airway Pressure (CPAP) ventilation if trained
  – 10cm H₂O and titrate to comfort

● Glyceryl Trinitrate
  – 400mcg GTN sublingual spray OR
  – 2mg/3mg Suscard buccal

● move patient to ambulance and commence transport

● glyceryl trinitrate repeat dose
  – If using GTN sublingual spray

● gain IV access where possible

● if respiratory distress continues after 5-10 mins:
  – Furosemide 40mg or 50mg (local variable) every 10 mins: Maximum Cumulative Dose (MCD) 120mg or 100mg.
  – If wheezy, give 5mg salbutamol by nebuliser.

This is a lengthy protocol. Except for remote areas it will often not be completed prior to arrival at hospital. There should be no concern about this as transport is the priority. Hospitals will often commence nitrate infusions which are not available pre-hospitally.

Patients may also present with concurrent signs of MI and in such cases the benefit of aspirin should be considered.

**ADDITIONAL INFORMATION**

**Continuous Positive Airway Pressure (CPAP)**

CPAP is a single level of positive pressure ... applied throughout the whole respiratory cycle.¹⁴

A modest amount of favourable evidence supports CPAP for patients with cardiogenic pulmonary oedema. CPAP appears to decrease intubation rates and data suggest a trend towards decreased mortality.¹⁵,¹⁶,¹⁷,¹⁸,¹⁹

Three pre-hospital studies exist suggesting the use of CPAP is feasible in this setting, and may reduce severity of acute LVF, increasing SpO₂ levels.²⁰,²¹,²²

Expert opinion has recommended CPAP for use in the pre-hospital environment.²³,²⁴,²⁵ Obviously this requires sufficient knowledge, training and equipment in place before it can be done safely.²⁶

**Glyceryl Trinitrate**

The use of nitrates in pulmonary oedema is associated with improved survival to hospital discharge.²⁶

Nitrates have some benefit as the first line treatment in acute pulmonary oedema.²⁷

Buccal nitrates produce an immediate reduction in preload, comparable with IV GTN.²⁸

The Task Force of the European Society of Cardiology and the European Resuscitation Council (1998) recommend use of nitrates up to 150mcg/min IV, given after O₂ and before furosemide in the pre-hospital environment. Furthermore buccal nitrate is a more convenient preparation for pre-hospital use and can provide rapid and useful nitrate concentrations.²⁹
Furosemide

There is little high-level evidence for or against the use of furosemide in the emergency setting. Anecdotally vast improvements are noted after using this drug.

There is some evidence that furosemide can have a transient adverse vasoconstrictor effect.29,30,31

One study31 showed that furosemide triggers an initial rise in pulmonary capillary wedge pressure (PCWP) for up to 15 minutes, and then a diuresis induced fall in PCWP below baseline levels by one hour. This effect was observed in patients receiving no vasoactive drug, and in those receiving predominantly preload reducing agents. Patients receiving both preload and afterload reduction showed an immediate drop in PCWP on receiving furosemide which was sustained. It was noted that this trend is independent of underlying pathology or dose of furosemide used.

Furosemide should therefore only be given after nitrates (which act on both preload and afterload.)

The acute vasodilator effect of furosemide is inhibited by aspirin.32

Salbutamol

Some bronchoconstriction is present in chronic heart failure patients.33 There is also evidence that bronchodilators can markedly stimulate alveolar fluid clearance in pulmonary oedema.34

Nebulised salbutamol should therefore be considered after furosemide in wheezy patients.

REFERENCES


INTRODUCTION
Sickle Cell Anaemia is a hereditary condition affecting the haemoglobin contained within red blood cells. It predominantly affects people of African or Afro-Caribbean origin, but can also affect people of Mediterranean, Middle Eastern and Asian origin.

When a Sickle Cell Crisis occurs, the red blood cells change shape from the usual discoid shape to a crescent shape. This leads to clumping of red blood cells, which in turn can reduce the blood flow in the capillaries causing hypoxia.

HISTORY
A previous history of sickle cell anaemia and sickle cell crisis will be present in most cases, with the patient almost always being aware of their condition.

The crisis may follow as a result of an infection, during pregnancy, or after the patient has been anaesthetised.

Patients who suffer from frequent, repeated crises are at risk of longer term medical conditions such as CVA and heart failure through the ischaemic effect of reduced blood flow.

SIGNS AND SYMPTOMS
● severe pain, most commonly in the joints of the arms and legs, but also in the back and abdomen
● swelling of the joints
● high temperature
● difficulty in breathing
● pallor
● tiredness/weakness.

MANAGEMENT
Follow Medical Emergencies Guideline. In addition:
● administer high concentration oxygen therapy to counter hypoxia due to cell clumping
● paramedics should establish IV access and instigate fluid therapy if the running time to hospital will be longer than ten minutes
● consider pain relief with Entonox (note: Entonox should not be used for extended periods for sickle cell patients). If Entonox is not effective paramedics should consider IV analgesia
● position the patient so as to minimise pain
● patients should not walk to the ambulance, as this will exacerbate the effects of hypoxia in the tissues
● unless there is a life threatening condition present, patients in sickle cell crisis should be transported to the specialist centre where they are normally treated.
ASSESSMENT

Assess ABCD's.

● may have airway and breathing problems if deeply comatose
● level of consciousness may vary from alert to unresponsive.

Evaluate if the patient has any TIME CRITICAL features – these may include:

● any major ABC problem
● deeply unconscious.

If any of these features are present, correct A and B problems then transport to the nearest suitable receiving hospital.

Provide a hospital alert message / information call.

En route – continue patient MANAGEMENT (see below).

Assess blood glucose level. Always check if the patient is diabetic, as hypoglycaemia may present as one sided weakness.

If there are no TIME CRITICAL features present, perform a more thorough assessment as a brief Secondary Survey:

● assess BP as often in the early stages the blood pressure is markedly raised, e.g. 240/130

● assess Glasgow coma scale (GCS) on unaffected side – eye and motor assessments may be more readily assessed if speech is badly affected

● assess limb power and sensation. May have mainly sensory impairment with numbness or “pin and needles” down affected side

● assess for presence of speech abnormality, either slurred speech (dysarthria), or problems speaking or with the understanding of speech (dysphasia)

● assess for sudden onset of weakness of the face and arm, as when combined with speech abnormality, stroke is the most likely diagnosis (see below).

Test for:

● facial weakness – ask the patient to smile, showing their teeth. This makes one sided facial weakness apparent

● arm weakness (motor) – ask the patient to hold both arms outstretched at 90 degrees in front of them with palms downward, and close their eyes for five seconds. The arm with motor weakness will drift downwards compared to the unaffected limb

● speech – ask the patient to repeat a phrase. Assess for slurring or difficulty with the words or sentence.

These components make up the FAST (face, arms, and speech test) assessment that should be carried out on all suspected stroke patients.

MANAGEMENT OF STROKE

Follow medical Emergencies guideline, remembering to:

● ensure ABC's
● ensure high flow O₂ therapy
● obtain IV access, if appropriate.

Specifically consider:

● check blood glucose level if unconscious or a known diabetic. If blood glucose level is <3.0mmol/l or hypoglycaemia is clinically suspected, administer glucose or glucagon as per glycaemic emergencies guideline.

ADDITIONAL INFORMATION

Over 100,000 people a year in England and Wales have their first stroke, and some 60,000 deaths are associated with stroke annually. Stroke is the third most common cause of death after heart disease and cancer.

85% of strokes are caused by cerebral infarction, 10% by primary cerebral haemorrhage, and 5% result from subarachnoid haemorrhage.

Thrombolytic treatment for embolic stroke needs to be undertaken early to be successful but the need for it can only be determined by scanning, therefore rapid transfer to hospital is important.

The most sensitive features associated with diagnosing stroke are facial weakness, arm weakness, and speech disturbance. 80% of all strokes will demonstrate these three features.
REFERENCES


INTRODUCTION

All trauma patients should be assessed and managed in a systematic way, using the primary survey to identify patients with actual or potentially life threatening injuries.

This guideline uses **mechanism of injury**, and **primary and secondary surveys** as the basis of care for all trauma patients. Further guidelines are available for managing specific injuries and types of trauma, but these are related to and stem from this guideline.

All these guidelines reflect the principles of the Pre-Hospital Trauma Life Support (PHTLS), and Advanced Trauma Life Support (ATLS) training courses.

SECTION 1

Basic Trauma Incident Procedure

Safety:
- of yourself, your colleagues, your patient, and others
- fluorescent jackets and safety helmets are mandatory at road traffic accidents, on the public highway, at mass gatherings, on building sites and at any other scene where there is potential danger.

Scene:
- assess – resources required, e.g. more ambulances, medical support, officer support, Fire and Police support, helicopter, utilities etc
- triage – if more than one casualty.
- operational sitrep. to control: State incident type, request necessary resources, report on casualty numbers, entrapments (see Appendix 1), special hazards, scene access, other relevant factors
- clinical sitrep. to control: using the accepted MIMMS format of ‘methane’.

M > major incident standby or declared (if appropriate)
E > exact location of incident
T > type of incident
H > hazards (both present and potential)
A > access and egress routes
N > number, severity and type of casualties
E > emergency services present on scene and further resources required

● remember to check the scene for other casualties e.g. the ejected casualty from an RTA.

SECTION 2

Patient Assessment

Although viewed as a trauma procedure, the Primary Survey is an invaluable tool to initially assess any ill patient, and detect any **TIME CRITICAL / POTENTIALLY TIME CRITICAL** problems.

**Primary Survey** – rapid in-depth primary survey (60 – 90 seconds)
- airway with cervical spine control. (immediate in-line immobilisation, C-spine collar and head restraints)
- breathing
- circulation
- disability
- EXPOSURE and ENVIRONMENT.

Stepwise Patient Assessment and Management

In ABCDE management, manage deficits as they are encountered: i.e. do not move on to rectification of breathing or circulation until airway is secured.

Airway Assessment

Observe mouth and upper airway for air movement, and open airway as required.

Exclude and be prepared to manage airway obstruction resulting from vomit, blood, dislodged dentures and debris from maxillo-facial trauma.

Note any noisy respiration, either on inspiration or expiration.

In burns, CHECK for AIRWAY burns, sooting in the mouth, lip and nasal oedema.

**AT ALL** times immobilise CERVICAL SPINE during airway manoeuvres. Apply collar and head restraints, as soon as possible.
Stepwise Airway Management
Correct any AIRWAY deficits immediately by:

- positioning, chin lift, trauma jaw thrust (no neck extension)
- aspiration
- oropharyngeal airway (OP)
- nasopharyngeal airway (NP)
- laryngeal mask airway (LMA)
- endotracheal intubation (ET)
- needle cricothyroidotomy.

Breathing Assessment
Assess for skin colour and for any evidence of cyanosis

Expose the chest to observe chest wall movement and assess for chest trauma as a cause of breathing problems, e.g. flail segment with paradoxical movement requiring stabilisation, open or sucking chest wounds.

If breathing is absent proceed to resuscitation guidelines.

Assess respiratory rate and effort, along with any inequality of either side of the chest’s movement. Listen for stridor (high pitched noise on inspiration), suggestive of upper respiratory injury and obstruction.

Assess breathing adequacy – respiratory rate and volume (adult respiratory rate 12 – 20 bpm). Equality of air entry and SaO2 (>= 95%) 

Gently palpate the chest wall, feeling for skin crackling and swelling (surgical emphysema) which may extend over the chest, neck and face. Feel also for crepitus of rib fractures or flail segments, and percuss the chest, front and back.

Check position of trachea in suprasternal notch.

Listen to the chest with a stethoscope. Ask the patient to breathe in and out through their mouth. Listen on both sides of the chest:

- above the nipples in the mid-clavicular line
- in the mid-axilla under the amput
- at the rear of the chest, below the shoulder blade (where possible).

Listen for:

- normal or reduced air entry
- equal air entry to each side
- wheezing (on expiration)
- crepitations at the rear of the chest (crackles, heard low down in the lung fields at the rear – indicates fluid in the lung in heart failure).
- additional crackles and wheezes on inspiration that may be associated with inhalation of blood or vomit.

Assess for tension pneumothorax (see below – Thoracic Trauma Guideline)

REMEMBER: SUSPECT TENSION PNEUMOTHORAX IF:

- progressive, increasing breathlessness (often 25-35 bpm)
- absent or very reduced breath sounds on affected side of chest
- reduced chest movement on affected side
- hyper-resonance on the affected side
- in ventilated patients, increased resistance to ventilation, with reduced or absent air entry on the affected side is noted.
- distended neck veins
- tracheal deviation away from the affected side (later sign)
- cyanosis (later sign).

Stepwise Breathing Management
Correct any BREATHING deficits immediately by.

High flow oxygen.

Seal sucking chest wounds (see Thoracic Trauma Guideline).

If respiratory rate is <10 or >30 breaths per minute, expansion is inadequate or SaO2 <95% on 100% O2 consider assisted ventilation at a rate of 12 – 20 breaths per minute.

Assist or provide IPPV with bag, mask and reservoir or mechanical ventilation.

Decompress tension pneumothorax if present if trained and authorised to do so.

Circulatory Assessment
Assess for and control external haemorrhage but remain alert to the possibility of internal bleeding which may require rapid evacuation from scene.
Assess skin colour and temperature.

Palpate a radial pulse – if present this implies a systolic blood pressure of >80–90mmHg and adequate perfusion of the organs. If absent, assess for a carotid, which, if present implies asystolic blood pressure of >60mmHg.

Assess for pulse rate, volume, and regularity.

Check capillary refill time in finger nailbeds or centrally, (normally <2 seconds). Clearly this can sometimes be difficult in the field.

 Attempt to estimate the amount of external blood loss as accurately as possible.

**Recognition of Shock**

In adults, loss of 750–1000ml of blood will produce little evidence of shock, apart from a slight tachycardia.

Blood loss of 1000–1500ml is required before the more classic signs of shock appear, namely a small drop in systolic BP, mild anxiety, skin coolness and a more obvious tachycardia.

Blood loss of over 1500–2000ml is necessary before sweating and increased respiratory rate are noted. (See table)

**REMEMBER** this loss is from the circulation NOT necessarily from the body. In major internal injuries the entire circulation can be lost without external haemorrhage.

The key to effective shock management is EARLY RECOGNITION and EARLY MANAGEMENT. If blood loss is suspected, the presence of skin coolness and even a slight tachycardia (pulse >100), must trigger the need for obtaining IV access and considering fluid replacement.

If in the slightest doubt, obtain secure IV access with a wide bore cannula at an early stage, **wherever possible, en route to hospital.**

<table>
<thead>
<tr>
<th>Blood Loss in Adults</th>
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<tbody>
<tr>
<td><strong>BLOOD LOSS</strong></td>
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<td>%</td>
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<td>15 – 30%</td>
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<tr>
<td><strong>VOLUME</strong></td>
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<tr>
<td>ml</td>
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<tr>
<td><strong>BP</strong></td>
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<td>systolic</td>
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<td>diastolic</td>
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<td><strong>PULSE</strong></td>
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<td>Bpm</td>
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<tr>
<td><strong>CAPILLARY</strong></td>
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<td>REFILL</td>
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<tr>
<td>Normal (&lt;2secs)</td>
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<tr>
<td><strong>RESP. RATE</strong></td>
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<tr>
<td>Bpm</td>
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<tr>
<td><strong>MENTAL STATE</strong></td>
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<tr>
<td>Alert</td>
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<tr>
<td><strong>COMPLEXION</strong></td>
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<tr>
<td>Normal</td>
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</tbody>
</table>
Stepwise Circulatory management

Correct any CIRCULATION deficits immediately by:

Arrest external haemorrhage by using pressure dressings or other direct pressure.

Splintage of major long bone fractures, by immobilisation on longboard, rapid application of vacuum or box splints, or by rapid application of traction splintage to femoral fractures.

Where appropriate, consider fluid replacement EN ROUTE TO HOSPITAL.

Commence crystalloid solution via 1or 2 wide bore 14 or 16G lines. Infuse crystalloid 250ml and reassess pulse and systolic BP. Give further crystalloid as required to maintain a systolic BP of >90mmHg equivalent to a return of and maintenance of a radial pulse, up to 2,000ml max.

Disability Assessment

Note initial level of responsiveness on AVPU scale, and time of assessment.

- A Alert
- V Responds to voice
- P Responds to painful stimulus
- U Unresponsive.

Assess and note pupil size, equality and response to light.

Observe and note any spontaneous limb movement.

Evaluate

At this stage further monitoring may be applied and care must be taken to ensure the patient does not suffer from exposure to cold or wet conditions.

- apply patient monitoring, e.g. pulse oximetry, and ECG
- ensure patient is kept warm
- evaluate at this stage whether the patient is time critical or non-time critical on the basis of the following criteria:

Serious problems with:

- Airway
- Breathing
- Circulation
- Level of consciousness (AVPU).

Serious Injury Pattern:

- penetrating trauma to: head, neck or chest
- serious chest trauma
- serious head trauma
- multiple injuries involving head and chest
- spinal cord injury
- serious burns, especially where the airway may be involved, or the patient has accompanying injuries.

Mechanism of Injury Factors:

- entrapment with serious injuries
- injuries from falls from over 2-3 metres especially onto solid surfaces
- ejection from vehicle
- death of other occupant in the vehicle
- car v pedestrian.

If patient has any of the above time critical features prepare longboard with head and body restraints for immediate transportation after A and B problems have been relieved.

LOAD ON TO LONGBOARD and commence TRANSPORT

- these patients must be removed to the nearest suitable ACCIDENT AND EMERGENCY DEPARTMENT
- provide a HOSPITAL ALERT MESSAGE en route (see hospital alert message guideline).
- en route – continue patient MANAGEMENT.

If patient is NON-TIME CRITICAL proceed to SECTION 3 – Secondary Survey

SECTION 3

Secondary Survey

If patient is NON-TIME CRITICAL on the above basis, a brief SECONDARY SURVEY may be undertaken.

Head

- assess skin colour and temperature, and reassess AIRWAY
- assess and palpate for bruising, lacerations, tenderness and evidence of fractures
- reassess pupil size and activity
- Glasgow Coma Scale. Assess the neurological status using the Glasgow coma scale (see below). (Coma = GCS <8) :
GLASGOW COMA SCALE (Adult)

<table>
<thead>
<tr>
<th>Eyes Open</th>
<th>Score</th>
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<tbody>
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<td>Spontaneously</td>
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<tr>
<td>To Speech</td>
<td>3</td>
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<td>To Pain</td>
<td>2</td>
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<td>Never</td>
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Best Motor Response

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<td>Obey commands</td>
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</tr>
<tr>
<td>Localise pain</td>
<td>5</td>
</tr>
<tr>
<td>Flexion withdrawal</td>
<td>4</td>
</tr>
<tr>
<td>Decerebrate flexion</td>
<td>3</td>
</tr>
<tr>
<td>Decerebrate extension</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
</tr>
</tbody>
</table>

Best Verbal Response

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientated</td>
<td>5</td>
</tr>
<tr>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td>Silent</td>
<td>1</td>
</tr>
</tbody>
</table>

MODIFICATION OF GLASGOW COMA SCALE FOR CHILDREN UNDER 4

<table>
<thead>
<tr>
<th>Best verbal response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate words or social smiles, fixes on and follows objects</td>
<td>5</td>
</tr>
<tr>
<td>Cries, but is consolable</td>
<td>4</td>
</tr>
<tr>
<td>Persistent irritable</td>
<td>3</td>
</tr>
<tr>
<td>Restless, agitated</td>
<td>2</td>
</tr>
<tr>
<td>Silent</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eyes open:</th>
<th>As per Adult Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor response:</td>
<td>As per Adult Scale</td>
</tr>
</tbody>
</table>

Neck

- to assess the neck, the front piece of the collar may need to be temporarily removed whilst in-line immobilisation continues
- assess for any signs of trauma
- assess larynx, reassess neck veins, and carotid pulse. Assess for spinal tenderness, and reassess trachea for deviation.

Chest

- reassess respiratory rate and depth
- reassess for contusions, seat belt marks, and flail segments. (flail segments may only be intermittently visible, unless very large)
- feel for rib fractures, instability and surgical emphysema (skin swelling with air in the tissues, and feel of “crackling” when the skin is pressed with a finger).
- re-listen for breath sounds in all lung fields, assess / reassess the chest for the development of:

Tension Pneumothorax

- extreme breathlessness, absent or greatly diminished air entry, with reduced chest movement on affected side. Distended neck veins, and tracheal deviation away from affected side may also be present.

Simple Pneumothorax

- some breathlessness, reduced air entry and chest movement on affected side. In small pneumothorax – no clinical signs may be present.

Massive haemothorax

- signs of hypovolaemic shock and some breathlessness. Breath sounds reduced or absent on affected side posteriorly, in the lower chest
- assess heart sounds; assess and confirm heart rate; assess clarity or muffled nature of heart sounds.

Cardiac tamponade

- muffled heart sounds, tachycardia, hypotension and distended neck veins, in cases of blunt or, more commonly, penetrating chest trauma may indicate cardiac tamponade. Less common than tension pneumothorax, and unlike the pneumothorax, breath sounds are present on both sides
- this condition is rapidly fatal and requires immediate treatment in hospital.

Abdomen

- examine for open wounds, contusion, seat belt marking
- feel gently for tenderness and or guarding in all four quadrants.

Pelvis

- the risk of starting a catastrophic bleed outweighs the benefits of compressing the pelvis to assess for potential fractures. This injury should be assumed from the mechanism and other associated injuries.
Lower and upper limbs

- look for wounds and evidence of fractures
- check for MSC x 4 (ask patient to wiggle fingers and toes distal to injuries):

M = MOTOR - test for movement
S = SENSATION - apply light touch to evaluate sensation
C = CIRCULATION - assess pulse and skin temperature

x 4 = ALL FOUR LIMBS

Continuously re-assess patient en route to hospital.

Management of Non-Time Critical Trauma

Ensure ABCs.

Ensure high flow oxygen through non-rebreathing mask.

Apply wound dressings as required to arrest haemorrhage.

Obtain IV access / infusion if required (see Additional Information).

Immobilise any patient on the longboard, where injuries or mechanism of injury, suggests spinal immobilisation is required.

Apply appropriate splintage as required (see Extremity Trauma Guideline).

Apply appropriate patient monitoring – ECG and Pulse Oximetry.

Consider analgesia – see Appendix 2.

Transport to nearest suitable receiving hospital.

Provide a hospital alert message / information call if required.

In non-time critical patients, continually reassess ABCD’s en route to hospital, to ensure no deterioration to time critical status.

At the hospital provide a comprehensive verbal handover, and a completed Patient Report Form to the receiving Hospital Staff.
APPENDIX 1

Special Circumstances in Trauma

The Trapped Patient

● patients who are trapped in wreckage pose special problems. Entrapment can be relative – where a patient with minor injuries is prevented from removal as a result of minor intrusion or a jammed door lock, or absolute where the patient is seriously injured and trapped within severely deformed wreckage. In the latter case, this results from severe impact forces exerted on the vehicle and its occupants, therefore making severe injury likely.

● in absolute entrapment, the distorted metalwork prevents reasonable access for rescuers to assess and resuscitate the casualty. This results in patients with severe injuries being delayed by virtue of their entrapment, from being removed to hospital for definitive care

● a suitably experienced scene/incident manager and a suitably experienced and equipped Doctor must attend ALL ABSOLUTE ENTRAPMENTS, to assist with patient assessment, resuscitation and analgesia

● teamwork is the critical component in caring for the trapped casualty

● perform scene and patient survey as above

● pay particular attention to mechanisms of injury in trapped patients

● request resources required (consider BASICS doctors)

● ensure sitrep. is comprehensive and updated regularly (at least every 15 minutes)

● liaise with fire and rescue officer regarding plan of medical care and medical priority of extrication. Request their advice concerning rescue options and timings

● liaise with incoming officers, medical support and clinical support paramedics

● form a rescue plan. Remember communication and teamwork will lead to the quickest, safest rescue.

Management of the trapped patient

● maintain airway whilst immobilising cervical spine – continue immobilisation throughout rescue

● ensure adequate ventilation and oxygenation via a non-rebreathing mask

● establish wherever possible, 2 IV sites with large bore cannula. Secure IV sites with suitable splints and crepe bandage. If difficulty is found, leave a “virgin site” for medical intervention

● commence IV with warm crystalloid solution 250ml IV. If necessary give further crystalloid to maintain a radial pulse and reassess

● use analgesia with care (see Appendix 2). If in ANY doubt, await medical direction

● in prolonged entrapment with any signs of hypovolaemia – consider with the medial support at scene ordering O Rh-ve blood to the scene, and warm prior to use. Also send labelled specimens for type specific blood cross matching. Liaise with medical support and receiving Hospital regarding this action.
APPENDIX 2

Special Circumstances in Trauma

Analgesia in Trauma

- TIME CRITICAL patients may require analgesia en route to hospital. morphine or nalbuphine IV should be considered unless these drugs are contraindicated by the patient’s condition

- in NON-TIME CRITICAL patients, if pain is severe, Entonox should be administered for trial of effect, for at least five minutes before considering the administration of intravenous analgesia. (see Entonox, morphine and nalbuphine guidelines)

Additional Information

Airway and Cervical Spine Control

- whilst securing the airway, the head and cervical spine must be firmly manually immobilised. Once the airway is secure, immobilise the cervical spine with a correctly sized semi-rigid collar, applied directly to skin. Prior to applying the collar, inspect the neck and neck veins. Maintain in-line immobilisation until secured onto spinal board

- there is some evidence that would suggest a risk of increasing intra-cranial pressure following the application of a semi-rigid collar. When the patient is secured with head immobilisation, and four body straps onto the long board it may be prudent to at least loosen the velcro ties on the semi-rigid collar, but ensure immobilisation is maintained. This is particularly relevant to the head injured patient

- in a patient who is thrashing around violently headblocks may be counterproductive. This assessment is a clinical judgement that can only be made at the time.

Breathing

- the assessment of “adequate ventilation” described in this guideline requires assessment of ventilatory rate and depth

- minute volume depends on the RATE and DEPTH of ventilation and is the measure of the air exchanged per minute, being the result of tidal volume x breaths per minute. It requires to be around 7000 ml/min (7 litres / minute) to provide adequate ventilation

- if either RATE or DEPTH of ventilation is inadequate, then minute volume falls and ventilation will be inadequate

- the major danger in trauma patients is hypoventilation, with falling oxygenation (Hypoxia) and rising carbon dioxide levels (Hypercapnia). Remember, this may occur in obviously low respiratory rates, coupled with poor respiratory effort

- hypoventilation also occurs with rapid respiratory rates, where these are combined with poor respiratory effort. For example, if the patient has a tidal volume of only 150 ml, they will not be overcoming the dead space, nor moving enough oxygen in, or carbon dioxide out, per breath even with respiratory rates in excess of 30/minute

- the patient may appear to be hyperventilating, but is not, and will shortly get into major difficulties, as a result of hypoxia and CO2 retention

- assist ventilations by enhancing each breath with high concentrations of O2 from a bag, mask and reservoir device to achieve a normal rate of 12-20 bpm. Oxygen at a rate of 10-15 lpm must be provided into the oxygen reservoir. If assisted ventilation is not provided, the patient will deteriorate rapidly.

Normal Respiratory Rates:

<table>
<thead>
<tr>
<th>AGE</th>
<th>RATE BPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADULT</td>
<td>12 – 20</td>
</tr>
<tr>
<td>5 – 12 YRS</td>
<td>20 – 25</td>
</tr>
<tr>
<td>1 – 5 YRS</td>
<td>25 – 30</td>
</tr>
<tr>
<td>0 – 12 MTHS</td>
<td>30 – 40</td>
</tr>
</tbody>
</table>

Circulation Fluid Therapy

- current international research has show little evidence to support the use of Pre-Hospital IV infusion routinely in trauma patients. In cases of penetrating chest and abdominal injuries and aortic aneurysm dissection, an actual decrease in survival has been associated with pre-hospital fluid administration. This clashes with previously held views that IV infusion was both essential and life saving in trauma. The logic however, is that after severe haemorrhage, blood pressure drops, blood loss slows right down and fragile clots begin to form
• if IV fluids are given excessively, these fragile clots will be displaced and re-bleeding occurs. As a rule therefore, **IV infusions should be commenced en route to hospital**, and only sufficient fluid given to maintain a systolic BP of 80-90mmHg, – equivalent to the return and maintenance of a radial pulse. i.e. if SBP is already 90mmHg, commence fluid, but at a keep vein open (TKVO) rate, and **keep reassessing**

• however, in cases where there is delay in reaching hospital, IV fluid therapy may be of more benefit

• the emphasis therefore is on obtaining IV access while making a more considered judgement on the need to commence IV infusion. In cases of penetrating trauma IV access should be obtained en route to hospital but fluids should be withheld unless absolutely necessary

• **en route to hospital (or in situ if trapped) patients with compromised circulation, or potential circulatory problems as a result of their injuries, should have one or two large bore (14 or 16 G) IV lines sited in large veins in the arms e.g. antecubital fossa**

• 250ml IV of crystalloid solution should be given, and the effects assessed on the circulatory system, before further fluids are given. The aim is to reduce tachycardia and other features of hypovolaemia, whilst maintaining a **systolic BP of around 80 – 90mmHg**

• in the non-trapped patient, only one limb should be used for IV access attempts, and an intact site must be left for hospital IV access (unless two IV lines are required and can be achieved)

• in minor trauma, IV access is most often NOT indicated unless parenteral analgesia is indicated.

**Disability**

• **The Glasgow Coma Scale** – This scale is the accepted international standard for measuring neurological status. AVPU provides us in the Primary Survey with a snapshot view of the level of consciousness. In the Secondary Survey, assessing the Glasgow Coma Scale provides a more precise picture. It assesses the responses of the eyes, motor response and verbal response. **Coma is defined as a Glasgow Coma Scale score of <8.**

**Scene Photography**

• the value of scene photography may be helpful. A photograph of the scene may be useful for the A&E staff to appreciate the mechanism or severity of injury. If photographs are taken remember that these form part of the confidential patient record and must be treated as such.
INTRODUCTION

Head Injury is the commonest cause of death in trauma. It may be an isolated major injury or part of a pattern of multiple-trauma. Impaired levels of consciousness, even in a head injury without serious brain injury, makes the patient especially vulnerable, as both airway and therefore, breathing, are at much increased risk.

The major threat to a head injured patient is a combination of hypoxia and hypercarbia. This may result from airway obstruction or inadequate ventilation due, for example, to chest trauma, resulting in impaired oxygenation and rising carbon dioxide levels. Hypovolaemia from associated fractures and internal injuries will also reduce oxygen transport in the bloodstream. Hypotension (systolic blood pressure < 90mmHg) has been shown to reduce survival in cases of severe head trauma.

Whilst there is little than can be done for the primary head injury, it is vital to provide impeccable care of the airway, breathing and circulation to reduce hypoxia, as part of the overall care of the patient with head injuries and to prevent secondary damage.

HISTORY

The mechanism of injury is vital to understand, in order to appreciate the forces involved in causing the injury. The wearing of a seat belt, bloodstains on the steering wheel or dashboard, and the presence of bulls-eye indentation on the windscreen, are important clues in RTA scenarios.

The identification of the types of weapons used in assaults, and any history of alcohol consumption by the casualty, are important aspects of the history.

A history of any change in the level of consciousness since the injury is of vital importance. For example, the patient who was initially unconscious, subsequently regained consciousness, but is now becoming increasingly drowsy, immediately makes one suspicious of the presence of an extradural haemorrhage.

Any history of memory loss of events before and after injury, and inability to move limbs normally must be recorded.

Similarly, symptoms suggestive of spinal cord injury must be sought and any relevant past medical history noted. A history of epilepsy or diabetes, especially hypoglycaemic attacks, may be relevant, especially if the patient has been seen to fit. Intake of alcohol or drugs should also be noted.

ASSESSMENT

Assess ABCD's.

Specifically assess level of consciousness with AVPU and note pupillary reactions. Look for and note spontaneous limb movements.

Evaluate whether patient is TIME CRITICAL or NON-TIME CRITICAL following criteria as per Trauma Emergencies Guideline.

If patient has any TIME CRITICAL features, correct A and B problems on scene, LOAD ON TO LONGBOARD and transport to Nearest Suitable Receiving Hospital, with a hospital alert message en route.

En route continue patient MANAGEMENT (see below).

In NON-TIME CRITICAL patients, perform a more thorough patient assessment with a brief Secondary Survey.

Specifically Assess for:

- adequate breathing and ventilation – respiratory rate and volume, equality of air entry and SaO2 (>95%)
- evidence of brain matter coming from a wound, indicative of a compound compressed skull fracture
- Evidence of blood or CSF from the nose, mouth or ears.
- evidence of scalp and facial trauma, especially suggestive of underlying fractures. Battle sign (bruising over the mastoid process behind the ear) and “raoon eyes” (periorbital bruising) should be noted, as these may indicate basal skull fracture. These are, however, mainly late signs of these injuries
- carefully assess for the presence of associated spinal cord injury, which should be assumed in all but the most minor of head injuries
- assess sensory and motor function in all four limbs
- consider the importance of any medication the patient may be taking, for example, a patient on warfarin or other anticoagulant therapy has a higher risk of developing intracranial bleeding following minor head injury.
MANAGEMENT OF HEAD TRAUMA

Aims

The aims of the initial management of head injuries are:

1. To deliver oxygen to the brain. Oxygen delivery depends on:
   - the amount of oxygen in the blood which is reflected by the partial pressure of oxygen (\(pO_2\))
   - the cerebral perfusion pressure (CPP). This is the mean arterial pressure (MAP) minus the intracranial pressure (ICP).
2. To avoid cervical spine injury.
3. To obtain the baseline observations and history which will be essential for subsequent patient management.
4. To take the right patient to the right hospital at the right time.

The ATLS and PHTLS systems describe the management of major injuries in two stages. The first stage is a primary survey based on a system of ABCD, emphasising that the priorities are:

- airway with cervical spine control
- breathing and oxygenation
- circulation
- Disability.

This is then followed by a secondary survey during which a more detailed history can be taken and a fuller examination performed. It is acknowledged that much of this is done simultaneously.

The prehospital management of head injuries will be discussed under the same headings.

Airway with cervical spine control

Airway care with cervical spine control is a single concept but, for convenience, the two components are discussed separately below.

The decreased level of consciousness which frequently results from a head injury may cause airway problems and head injuries are commonly associated with other problems such as facial fractures, epistaxis and vomiting which, themselves, cause or worsen airway obstruction. The avoidance of airway obstruction is the first priority in the care of all injured patients but it is particularly important in patients with head injuries as hypoxia has a greater deleterious effect in head injured patients than in those with other injuries. Hypoxia causes damage not just because of the lowered oxygen concentration but also because it raises the ICP and consequently reduces the CPP. Hypoxia is associated with a worse prognosis in patients with a head injury. Airway obstruction also causes hypercarbia which raises the ICP even more than does hypoxia.

If there are problems in maintaining a clear airway, the following manoeuvres and airway adjuncts should be employed:

- **Jaw thrust.** Do not use head tilt and chin lift as this may cause injury to the spinal cord if the patient has an associated cervical spine injury.
- **Suction.** Suction should be confined to the visible pharynx.
- **Oropharyngeal airway.** This helps to maintain an airway in the unconscious patient but it can provoke vomiting and cause a rise in ICP. However airway protection is the first priority and an oropharyngeal airway should be used in an unconscious patient who will tolerate it.
- **Nasopharyngeal airway.** If an oropharyngeal airway is not tolerated or is impossible to insert (e.g. due to trismus) and the airway is compromised, a nasopharyngeal airway should be inserted. This is better tolerated than an oropharyngeal airway but it, too, is not without complications. In particular it can cause epistaxis which may cause airway problems. In general terms nasopharyngeal airways should not be used if there is evidence of a basal skull fracture, a frontal fracture or a fracture of the middle third of the face: however airway care is the first priority and a nasopharyngeal airway may be used if it is impossible to maintain the airway using other manoeuvres.
- **Other manoeuvres** e.g. manual reduction of a displaced facial fracture may be appropriate in specific cases.

If a patent airway cannot be maintained with simple manoeuvres, tracheal intubation (without moving the neck) needs to be considered.

If a patient is so deeply unconscious from a head injury that they will tolerate a tracheal tube without sedation, their prognosis is generally thought to be very poor. However this may not be so if they are intoxicated. Even in a deeply unconscious patient, the insertion of a tracheal tube without sedation may lead to a rise in ICP and so such patients should, ideally, be sedated before being intubated. However paramedics do not currently have the skills to do this. Intubation
without sedation requires balancing the risks of aspiration against the harm caused by a rise in ICP. However if a clear airway cannot be achieved by simple procedures, it seems likely that the benefits of tracheal intubation will outweigh any rise in ICP.

A less deeply unconscious patient will not tolerate a tracheal tube. Paramedics with their current training may be unable to maintain a clear airway in such patients. In some areas it may be possible to call on the services of a doctor trained in rapid sequence intubation (RSI) to attend the scene of the accident to intubate the patient but unless the patient is trapped or is a long way from hospital, skilled medical help will usually be obtained faster by transporting the patient straight to hospital while maintaining good basic airway care. In areas where such skilled help is available, it must be summoned early. The fact that we cannot guarantee that all head injured patients will be managed by a person who has the training to maintain a clear airway, must be acknowledged as less than ideal.

These guidelines on maintaining a clear airway by paramedics with their current training are summarised in Fig 1.

HOW TO MAINTAIN A CLEAR AIRWAY IN PATIENTS UNABLE TO TOLERATE A TRACHEAL TUBE.

In hospital practice, head injured patients requiring airway protection undergo RSI. This is outside the skills of current paramedics. A possible alternative would be the provision of a surgical airway in such patients. This, too, has been performed by paramedics in the USA. However while this may be lifesaving in the patient with severe airway obstruction, it is not a routine procedure to be done in all patients with severe head injuries. It, too, is not without complications and training a significant number of paramedics in this technique and maintaining their skills is likely to be impossible – as for RSI. Those able to perform a surgical airway (suitably trained doctors and some paramedics with advanced training) are likely to be capable of RSI and will not often need to use the technique.

Laryngeal mask airway (LMA)

The LMA might be very useful but, at present, its role in patients with head injury, is uncertain. While it may have a role in the cardiac arrest situation, there is probably a greater risk of aspiration in injured patients and the LMA does not provide the same protection from aspiration as does an ETT. Sedation is required unless the patient is deeply unconscious and this is currently beyond the skills of paramedics.

Cervical spine protection

Cervical spine injury is commonly associated with a blunt head injury. Patients may not be able to complain of pain in the neck if they have a decreased level of consciousness; if they are intoxicated or under the influence of drugs or if they have other painful injuries which distract them. All patients with a decreased level of consciousness should have cervical spine immobilisation. This has been discussed in a previous publication from JRCALC and so is not further discussed other than to emphasise that a badly fitting cervical collar may obstruct the airway and cervical collars may cause a rise in ICP. A collar should be used for extracting a patient but once an unconscious patient is immobilised on a spinal board and has had head restraints applied, the collar should be loosened and possibly removed.

Breathing

The importance of avoiding hypoxia has been discussed. All patients should receive a high concentration of inspired oxygen and should ideally have a pulse oximeter applied. However it is appreciated that continuous pulse oximetry may not be easy in the prehospital environment and may be impossible if the patient is cold and has peripheral vasoconstriction or is combative. Remediable causes of hypoxia (e.g. pneumothorax) should be treated. If a patient has breathing difficulties and remains hypoxic (shown by a low SaO2) despite a high concentration of inspired oxygen and if the treating clinician has the skills, consideration should be given to RSI and ventilation as discussed above. If a patient is ventilated qualitative or quantitative capnography should be employed.

Circulation

It is important to maintain the CPP above 70mm Hg in patients with head injuries and to do this, it is vital to maintain the blood pressure. Hypotension has been shown to worsen the outcome in patients with head injuries.

Cerebral perfusion pressure = mean arterial blood pressure – intracranial pressure (CPP = MAP – ICP).

The MAP is the diastolic BP plus a third the difference between the systolic BP and the diastolic BP. Thus if the BP is 120/80mm Hg, the MAP = 80 + (120 – 80)/3 = 93.3mm Hg.
It is not possible to measure the CPP or ICP in theprehospital situation. The normal ICP is <10mm Hg and this is commonly raised in head injury. To maintain the CPP above 70mm Hg requires a MAP of at least 90mm Hg and thus a systolic BP of approximately 120mm Hg. It must be recognised that hypotension is not caused by an isolated closed head injury and so if a head injured patient is found to be hypotensive, this is usually caused by another injury, usually blood loss. External haemorrhage must be controlled by direct pressure but there is no evidence that the benefits of IV fluids given prehospital justify the additional on scene time and delay in getting a patient to definitive care. If there is severe haemorrhage and hypotension, IV cannulation and fluid replacement should be done in the ambulance en route to the hospital. Hypertonic saline may be of benefit but its role is still uncertain and more research is needed.

Disability
This refers to an assessment of the neurological status of the patient and a mini-neurological examination should be done when the patient is first seen as this forms a baseline against which improvement or deterioration in the clinical state can be measured. This may be very important in making management decisions. It must be done before the patient is anaesthetised. This mini-neurological examination consists of:

Conscious level
Change in the conscious level is the most sensitive indicator of deterioration or improvement and so measurement of conscious level is the most important part of the mini-neurological examination. Two measures of conscious level are in common use – the AVPU scale and the Glasgow Coma Scale (GCS) see fig 1. While the AVPU scale is the easier to use, we believe that the GCS should be used as this is more sensitive to detect changes in conscious level and it is one of the components of the Revised Trauma Score which is widely used for trauma audit. While the sum of the three components of the GCS can be added to give the Glasgow coma score, it is better to describe the response in words (e.g. “eyes: open to pain, verbal: inappropriate words, motor: localises to pain”). This avoids having to remember the number assigned to each response making it easier to use in the prehospital environment when a chart may not be available. It also avoids ambiguity and the difficulties which occur when one is unable to assign a number e.g. the patient with so much swelling that they cannot open their eyes. We recommend that the GCS is displayed on a chart in every emergency ambulance.

Problems with interpreting the GCS are shown in appendix 1.

Pupils
These should be:
- round
- equal in size
- both should constrict equally if a light is shone into one eye

Abnormalities should be noted

Motor power
In the patient who is obeying commands, compare muscle power between the two sides and between the arms and the legs. In the uncooperative patient, spontaneous movements should be observed and the reaction to a painful stimulus compared between the two sides. In the absence of local limb injury, this indicates focal brain injury due to egg head injury or stroke.

A patient with good power in the arms but none in the legs probably has a spinal cord injury with paraplegia. If a patient responds to a painful stimulus to the head but not to one applied to the arms or legs, they may have a tetraplegia.

SECONDARY SURVEY
Apart from the clinical state of the patient, it is also important to obtain any other information which the hospital will be unable to obtain.

The hospital will want to know the history of the event. If the patient is fully conscious or accompanied by somebody who is able to give an account of what happened, there may be little need to collect any history for the hospital. If the patient has a decreased level of consciousness, the type of information the hospital will want to know is:

- what happened and how did it happen (i.e. the mechanism of injury with as much detail as possible). It is particularly important to try to determine whether there was any preceding “collapse” e.g. did the patient fall and then lose consciousness or did they lose consciousness and then fall
- who the patient is
- when, where and why the accident occurred
- conscious level immediately after the accident
● what happened next e.g. has the patient walked since the accident, what first aid was provided, how the clinical state changed between the accident and the ambulance arriving e.g. if the patient is unconscious, has there been a lucid interval in which the patient talked?

● any past medical history

● medication

● known allergies

● next of kin.

**GETTING THE RIGHT PATIENT TO THE RIGHT HOSPITAL AT THE RIGHT TIME**

Patients with significant head injuries are usually treated in neurosurgical units. If a patient has an intracranial haematoma, it is essential that it is evacuated as quickly as possible as early evacuation leads to a substantially better prognosis. Evacuation of a haematoma may be performed more rapidly if a patient is taken directly to a hospital with a neurosurgical unit. This arrangement also avoids an interhospital transfer. However, as noted above, the first priority is to avoid hypoxia, hypercarbia and hypotension. If a patient has airway problems or breathing difficulties which cannot be corrected in the ambulance, and either hypotension or the presence of other injuries which might be expected to cause shock, they should usually be taken to the nearest A&E department equipped to take patients with major injuries. If the only significant injury is a head injury, there is no evidence of breathing difficulties and the patient is cardiovascularly stable, it will often (depending on geography) be better to take the patient directly to a hospital with a neurosurgical unit.

All ambulance services should draw up guidelines with local neurosurgical and A&E departments on where patients with head injuries should be taken.

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**Table 1. Glasgow Coma Score**

<table>
<thead>
<tr>
<th>Eye opening:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneously</td>
<td>4 (eyes are open when patient is at rest)</td>
</tr>
<tr>
<td>To speech</td>
<td>3 (eyes open when you talk to patient)</td>
</tr>
<tr>
<td>To pain</td>
<td>2 (eyes open if you inflict a painful stimulus)</td>
</tr>
<tr>
<td>None</td>
<td>1 (both eyes remain closed all the time, even to a painful stimulus)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Verbal response:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientated</td>
<td>5 (patient knows who they are, where they are, the time/date etc.)</td>
</tr>
<tr>
<td>Confused conversation</td>
<td>4 (patient is talking but is confused and disorientated e.g. does not know where they are or the time and date)</td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3 (patient says only one or two words which are inappropriate e.g. continually repeating swear words or a relatives name when you are trying to help)</td>
</tr>
<tr>
<td>Incomprehensible sounds</td>
<td>2 (patient grunts or groans)</td>
</tr>
<tr>
<td>None</td>
<td>1 (the patient makes no attempt to vocalise)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obeyes commands</td>
<td>6 (the patient responds to instructions e.g. “open your eyes” or “lift up your arm”)</td>
</tr>
<tr>
<td>Localises to pain</td>
<td>5 (the patient can move an arm to localise a painful stimulus applied to the head or neck and try to remove it)</td>
</tr>
<tr>
<td>Withdraws from pain</td>
<td>4 (patient pulls away from a painful stimulus)</td>
</tr>
<tr>
<td>Abnormal flexion</td>
<td>3 (when a painful stimulus is applied to a finger tip, the patient bends the elbow slowly in a spastic way but this is not a purposeful withdrawal)</td>
</tr>
<tr>
<td>Extends to painful stimuli</td>
<td>2 (if a painful stimulus is applied to a limb, the patient extends the limb) This is sometimes accompanied by internal rotation of the shoulders and extension of the wrist and fingers. This is known as decerebrate rigidity.</td>
</tr>
<tr>
<td>No response</td>
<td>1 (there is no response to a painful stimulus)</td>
</tr>
</tbody>
</table>
CONVULSIONS

Convulsions are very common following a head injury. It is important to differentiate between a convulsion occurring within seconds of the impact which is of little significance and a convulsion which follows after a longer interval which may indicate post traumatic epilepsy. Convulsions after a head injury should be treated in the same way as convulsions of non-traumatic origin. In particular it is important to avoid hypoxia.

At present there is no evidence to support the use of steroids or mannitol in the prehospital care of head injured patients.
APPENDIX 1 PROBLEMS WITH ASSESSING CONSCIOUS LEVEL AND THE PUPILS

There may be circumstances which make it difficult to apply the GCS.

Eye Opening
If the patient is in deep coma, flaccid eye muscles will show no response to stimulation, and yet the eyes may remain open if you draw the lids back. This is very different from the spontaneous opening of the aroused patient. Record it as “no response”.

If there is severe swelling of the eyelids after facial injury, the patient may be unable to open their eyes. In these cases report “eyes closed due to swelling”.

Verbal Responses
Small children cannot be accurately assessed on the verbal component of the standard GCS. Table 2 shows a modification of the verbal score of the GCS for infants and young children.

Table 2 Verbal Score of the Glasgow Coma Scale for infants and small children.

<table>
<thead>
<tr>
<th>Verbal</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate words or social smile, fixes on, and follows objects</td>
<td>5</td>
</tr>
<tr>
<td>Cries but consolable</td>
<td>4</td>
</tr>
<tr>
<td>Persistently irritable</td>
<td>3</td>
</tr>
<tr>
<td>Restless and agitated</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

There may be problems with assessment if patients are severely deaf or if they do not have fluent English.

The patient’s verbal response may be impaired as a result of a single local lesion of the speech area in the dominant hemisphere. Record this as you normally would but add a note explaining the effects of the injury.

Patients will not be able to give verbal responses if they have a tracheostomy or if a tracheal tube is in place. This can be reported in words.

Motor Responses
The GCS measures the motor response in the upper limb.

A patient will not move a paralysed limb and so if you consider that the patient may be paralysed from a neck injury, you can test pain sensation in the head by squeezing an ear lobe or pressing on the upper orbital rim (bony ridge just above the eye). A patient may not be able to move a fractured limb.

Make sure you record the best response. If the two sides of the body show different responses (e.g. the left arm flexes to pain whereas the right arm has no response), use the better of the two sides to calculate the GCS as this will be the most accurate indication of the extent of general depression of brain function. However note the difference between the two sides as this is important.

Problems with examining the pupils:
There are many causes of pupillary abnormalities including:

- eye injury
- severe swelling preventing sight of the pupils
- blindness and other eye diseases
- use of eye drops to either dilate the pupils or to constrict them (e.g. in glaucoma)
- use of opiate drugs (constrict the pupils)
- pre-existing pupillary abnormalities.

But always assume that any pupillary abnormality is caused by the head injury until proved otherwise.
Jaw thrust and pharyngeal suction

Oropharyngeal airway

Nasopharyngeal airway

Will patient tolerate a tracheal tube?

Can skilled medical help be obtained faster than it would take to reach hospital?

Tracheal intubation

Summon Medical Team

Full basic airway care and transport to hospital

Relative contraindication if frontal or basal skull fracture or middle third facial fracture

Note
Each step presumes that the preceding step has failed to produce a clear airway.
APPENDIX 2

Subcommittee members

Dr. P J F Baskett
Prof. D Chamberlain – ex officio
Dr. T Clarke – ex officio
Mr. S Davies
Dr. J Fisher
Mr. D Gentleman
Dr. H R Guly – Chairman
Prof. D Yates

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INTRODUCTION

Full spinal protection is mandatory if there is a possibility of neck or back injury or SCI.

Spinal Cord Injury (SCI) most commonly affects young and fit people and will continue to affect them to a varying degree for the rest of their lives.

In the extreme, SCI may prove immediately fatal where the upper cervical cord is damaged, paralysing the diaphragm and respiratory muscles.

Partial cord damage, however, may solely affect individual sensory or motor nerve tracts producing I varying long-term disability. It is important to note that there is an increasing percentage of cases where the cord damage is only partial and some considerable recovery is possible, providing the condition is recognised and managed appropriately.

The spinal cord runs in the spinal canal down to the level of the second lumbar vertebra in adults.

In the upper neck around the level of C1/C2, there is a relatively large amount of space round the cord. In the thoracic area, the cord is wide, and the spinal canal relatively narrow. [Injury, therefore, in the C1/C2 area may well spare the cord, if subsequent immobilisation is adequate, but in the thoracic area spinal injury is likely to completely disrupt and damage the cord itself.]

HISTORY

It is vital to understand the mechanism of injury, in order to appreciate the forces involved in causing the injury.

The injury mechanisms that may induce SCI, need to be sought when taking a history. They include hyperflexion, hyperextension, rotation and compression and combinations of all the above.

Injury most frequently occurs at junctions within the spinal column of mobile and fixed sections of the spine. Hence fractures are more commonly seen in the lower cervical vertebrae where the cervical and thoracic spine meets (C5, 6,7/T1 area) and the thoraco-lumbar junction (T12/L1). 10-15% of patients with one identified spinal fracture will be found to have another at another level.

Road traffic accidents, falls and sporting injuries are the most common causes of SCI. As a group, motorcyclists occupy more Spinal Injury Unit beds than any other group involved in RTAs.

Roll over RTAs and the non-wearing of seat belts, causing head to vehicle body contact, again make SCI more likely. Pedestrians struck by vehicles are also more likely to suffer SCI.

Ejection from a vehicle increases the risk of injury significantly.

Certain sporting accidents, especially diving into shallow water, horse riding, rugby, gymnastics and trampolining have a higher than average risk of SCI.

Rapid deceleration injury such as gliding and light aircraft accidents also increases the risk of SCI.

ASSESSMENT

Assess ABCD’s, controlling the spine whilst performing this.

Evaluate whether the patient is TIME CRITICAL/POTENTIALLY TIME CRITICAL or NON-TIME CRITICAL following criteria as per Trauma Emergencies Guideline.

If patient is TIME CRITICAL/POTENTIALLY TIME CRITICAL features, control the airway, immobilise the spine AND GO TO nearest suitable receiving hospital, with a hospital alert message.

En route – continue patient MANAGEMENT (see below)

If patient is a non-time critical patient, perform a more thorough assessment with a brief secondary survey.

Specifically assess:

Assess breathing adequacy – respiratory rate and volume (adult respiratory rate 12 – 20bpm) Equality of air entry and SaO₂ (>95%).

● specific signs of SCI

● the patient may complain of neck or back pain, loss of sensation or movement in the limbs or even a burning, or electric shock sensation in the trunk or limbs

● rapidly assess in the conscious patient, sensory and motor function to estimate the level of the cord injury (See Chart.)
if the injury is above the sixth thoracic vertebra the sympathetic nervous system may be interrupted, resulting in bradycardia and hypotension. This combination may sometimes be differentiated from hypovolaemic shock by the absence of tachycardia but often the two types of shock are both present. This is known as neurogenic shock.

Spinal shock is a state of complete loss of motor function and often sensory function found sometimes after SCI. This immediate reaction may go on for some considerable time, and some recovery may well be possible.

Partial spinal cord injury

- these injuries are increasing as a proportion of SCIs. They are harder to spot but have a vastly better prognosis. Because they are harder to spot, they are therefore easier to miss
- careful handling is therefore essential in this group of patients. Presume the neck and back are injured and institute immobilisation
- patients complaining of partial muscle weakness with loss of pain and temperature sensation, may well have an injury affecting only the anterior portion of the cord, and will have some movement and sensory ability left in the limbs
- some patients may experience weakness of the upper limbs with normal power in the lower limbs, and this is particularly common in elderly patients who damage the central area of the cord.

Penetrating injury may damage one side of the cord, causing a loss of muscle power on the affected side, and loss of pain and temperature feeling on the other side of the body.

Finally, injury to the posterior part of the cord can result in loss of vibration sense and position awareness, causing unsteadiness and inability to stand up without any associated obvious muscle weakness or loss of power.

The Unconscious Patient

It is not possible to fully assess the integrity of the spinal cord in the unconscious patient. The following signs may help:

- diaphragmatic or abdominal breathing
- hypotension (BP often <80-90mmHg) with bradycardia
- warm peripheries or vasodilatation in presence of low blood pressure
- flaccid (floppy) muscles with absent reflexes
- priapism – partial or full erection of the penis.

Presume spinal injury in all unconscious patients with a possible history of trauma.
Abdominal and Chest signs

- during the secondary survey, remember that abdominal and chest signs may be unreliable in the presence of SCI.

**MANAGEMENT**

Follow Trauma Emergencies Guideline, remembering to:

- ensure ABCD’s and immobilise the whole spine. Beware of inducing bradycardia with airway manoeuvres. [Consider atropine 0.5 – 1.0mg IV, with high flow O₂, to correct arrhythmia if necessary.]

- ensure high flow oxygen via a non-rebreathing mask with reservoir bag

- obtain IV access, and commence infusion of crystalloid 250ml IV initially if indicated

- immobilise the spine for all extrications and other situations where SCI is possible

- pulse oximetry and ECG monitoring should be used, as this may well assist in recognising hypoxia.

**Specifically consider:**

- Consider assisted ventilation at a rate of 12 – 20 bpm if respiratory rate is <10 or >30, expansion is inadequate or SaO₂ is <92% on 100% O₂.

If Neurogenic shock;

- patients with isolated neurogenic shock may require a small fluid bolus of crystalloid (up to 500 ml IV) to correct hypotension. No further fluid should be given if SCI is the sole injury

- in neurogenic shock, a few degrees of head down tilt may improve the circulation, but remember that in cases of abdominal breathing, this manoeuvre may further worsen respiration and ventilation. This position is also unsuitable for a patient who also has, or may have, a head injury.

Immobilisation of the spine is NOT required if all the following criteria are met in those involved in low/medium risk incidents.

1. no reduced ability to appreciate pain and report tenderness caused by, for example:
   - alcohol or drug impairment
   - other severe painful injury
   - decreased conscious level
2. no central neck pain
3. no bony tenderness along whole length of spine
4. no neurological symptoms or signs and
5. having checked the above factors ask the patient to gently move but stop if they experience any of the above signs or symptoms. If they experience any of these they should be immobilised.

**ADDITIONAL INFORMATION**

If the patient vomits, the whole patient should be rolled (e.g. on the longboard) or the airway immediately cleared with suction. Patients must be adequately secured to safely perform this manoeuvre.

Remember at all costs to maintain a high index of suspicion when approaching any situation where spinal cord injury is possible. Partial cord injury may give rise to quite peculiar symptoms which are tragically easy to mistake for hysteria, or ignore completely.

Patients with injuries to the bony spinal column but no cord injury (i.e. those with no neurological signs) have the most to gain from good spinal care.

To illustrate the potential recovery from partial spinal injury, assessment of these patients has shown that if there is partial sensory function left below the injury at 72 hours, 47% of those patients will be walking at a year. If there is motor (muscular) activity present at 72 hours, 87% of those patients are walking at a year.

Always remember patients with pre-existing spinal disease such as rheumatoid arthritis may sustain SCI after even trivial falls and a high index of suspicion must be maintained.

Especially in falls from a height, SCI may be present at more than one level, which emphasises the need for careful immobilisation. The appropriate use of the long board or vacuum mattress is vital in cases of suspected or actual SCI.

Guidelines from the Faculty of Pre Hospital Care and the Joint Royal Colleges Ambulance Liaison Committee have been published (1998) and the recommended techniques for utilising both long boards and vacuum mattresses are described in appendix 1.

The role of the vacuum mattress is also covered in this guideline. These mattresses are not suitable for extraction but certainly have a role in longer distance transport of actual and potentially spinal injured patients.
APPENDIX 1
JOINT POSITION STATEMENT ON SPINAL IMMobilisation AND EXTRICATION

Faculty of Pre-hospital Care of the Royal College of Surgeons of Edinburgh and the Joint Royal Colleges Ambulance Service Liaison Committee.

1. Introduction

1.1 Since ambulances have become equipped with devices such as semi-rigid collars, long spinal boards, extrication splints and vacuum mattresses, a variety of procedures and protocols have been developed by ambulance services within the UK for extrication and spinal injury handling.

1.2 As there is no uniform agreement on safe procedures, much confusion has occurred within and across ambulance services and other providers of pre-hospital emergency care. There is anecdotal evidence that apparatus may not be being used appropriately or cost effectively. Furthermore, a number of papers have appeared recently in the literature (mainly from north America) which are referenced and detailed later indicating areas of possible harm to patients from some aspects of the use of these devices.

1.3 Accordingly, an expert working group was constituted under the auspices of the Trauma Sub-Committee of the Joint Royal Colleges Ambulance Services Liaison Committee (JCALC) to examine scientific literature, review current practice, and make recommendations and guidelines. A literature search was carried out by one of the authors (Cooke), draft guidelines were prepared, and a consensus meeting was held at the AMBEX annual ambulance Conference and Exhibition in Harrogate in July 1997.

1.4 Subsequently, a meeting of the Faculty of Pre-hospital Care of the Royal College of Surgeons of Edinburgh took place in September 1997 to discuss the issues of the use of collars and spinal boards with papers presented by Allison, Porter, Jones, and Carney. Scientific evidence was evaluated and draft guidelines were agreed.

1.5 This joint position statement is the synthesis of the two activities.

2. Principles of spinal immobilisation

2.1 A collar alone does not immobilise the cervical spine. In circumstances where spinal injury is suspected or may have occurred, the only safe form of immobilization during rescue is the use of a correctly applied semi-rigid collar, together with a backboard, head immobilisation device, or equivalent and tape or strapping to firmly secure the head to the board or appropriate manual immobilisation.1-3

If the neck needs immobilising then the whole of the spine needs immobilising.

2.2 The indications for rigid spinal immobilisation will be given by the history of the accident and evidence from the “injury mechanism”, together with clinical signs and/or symptoms suggesting the possibility of damage to the spine. It should be noted that 50% of patients with spinal cord injury will have other injuries also.

2.3 Spinal immobilisation should always be applied in the following groups of patients:

- where the mechanism of injury raises the possibility of spinal damage (see section 3.4)
- where there is pain or tenderness in the spine
- where there are neurological signs related to spinal injury
- where there is an altered level of consciousness, intoxication, or distracting injuries elsewhere
- where there is known to be pre-existing injury to the spine.

2.4 All ambulance crews should be given mandatory training on the recognition of the mechanism of injury associated with spinal injury plus training on the use of collars and long spinal boards. Ambulance services should look to establish a mechanism so that crews can be given immediate and long term feedback on the outcome of patients that they have taken to the emergency department in order that they can increase their knowledge and focus their judgment on the appropriate uses of such devices in the future. The current use of collars and long spinal boards should be continuously audited. There would be value in a UK wide research study, under the auspices of the Faculty of Pre-Hospital Care and/or JRCALC, on collars and spinal boards.

2.5 In children there is no method demonstrated that, as yet, reliably achieves a neutral position.4 A collar alone is insufficient and a padded board and straps are usually required.5

3. Use of collars

3.1 There is concern over the types of collars in use and the potential for their improper use. The use of a semi-rigid collar in isolation is a cause for concern.
Such devices should be used with head blocks, straps, and the long spinal board. The use of head blocks, body straps, and a long spinal board, together with a semi-rigid collar is mandatory in all unconscious injured patients. Training in the use of collars should be mandatory in UK ambulance services.

3.2 In order to achieve spinal immobilisation, collars should be semi-rigid. There does not appear to be any significant difference between the various commercial brands available at present.\(^3\)\(^\text{6}\) What is of more importance is that care is taken to ensure that the correct size of collar is selected and the collar properly applied. The collar must be applied direct to skin and not over clothing.

3.3 Though there have been studies demonstrating a rise in intracranial pressure associated with the prolonged wearing of collars,\(^7\)\(^\text{8}\) this complication was not deemed to be relevant in pre-hospital care in the circumstances where collars should normally be used.\(^8\) Though a well fitting collar has no effect on the patient’s tidal volume, there is some evidence that an ill fitting collar may be associated with airway obstruction.\(^9\) For both these reasons, and especially in cases of a severe head injury (or a Glasgow coma score of 8 or less), a collar applied at scene should be removed as soon as feasible, for example once the patient has been immobilised on a spinal board.

3.4 When need a collar not be applied? It should be emphasised that with any suspicion of spinal injury, the default position should be the application of a collar and spinal board and this is essential in dealing with unconscious casualties. Collars, however, are being applied unnecessarily in conscious car occupants after low velocity collisions. Spinal immobilisation may not be required for car occupants when the following circumstances coexist:

(i) The impact was very low velocity.
(ii) There was minimal damage to the car.
(iii) The person is young and normally fit.
(iv) There is no complaint of pain in the neck.
(v) There is no spasm in the neck.
(vi) There is no spinal tenderness.

The default position, where there is any doubt or concern, is to apply full spinal immobilisation.

3.5 In the circumstances of multiple casualties where there may be more casualties than spinal immobilisation equipment immediately available, a triage decision will be required in deciding to apply the available collars and spinal boards to those who might benefit from both. Judgment may need to be exercised whether it is safer to remove a casualty who is incompletely immobilised than to delay the journey pending the arrival of another vehicle.

4. Long spinal boards

4.1 Most of the information on spinal boards has come from the USA and is, largely, anecdotal. There has, as yet, been no randomised controlled trial. Nevertheless, the use of spinal boards certainly has increased the professional image of the ambulance service. Spinal boards make the handling of patients very much easier and their slippery surface facilitates the extrication of patients. The main indication for the long spinal board is for use as a rescue tool both for general rescue but particularly to aid extrication in road traffic accidents. However, there is some evidence that, in motor vehicle entrapment, extrication devices such as the Kendrick extrication device (KED) provide better immobilisation than the long spinal board.\(^10\)\(^\text{11}\)

4.2 There has been a lot of concern expressed about how long a person could safely lie on a spinal board and when and where they should be removed. It is accepted that, in patients who have had injury to the spinal cord, pressure sores could develop as little as 45 minutes after the placement on a spinal board.\(^12\)\(^\text{13}\) There have been suggestions that spinal boards could be padded\(^14\)\(^\text{15}\) but the advantage of comfort and protection from skin damage is outweighed by the disadvantage of efficiency as a rescue tool.

4.3 APPLICATION OF LONG SPINAL BOARD

The following is a description of the safe application of a long spinal board to a patient being extricated from a seated position in a motor vehicle. It is assumed that the roof has been removed and that the vertical method of extrication (see below) is being applied.

(i) In line immobilisation is applied and maintained at all times.
(ii) A correctly sized semi-rigid collar is applied.
(iii) The board should be slid down behind the patient from the head end.
(iv) Blocks and straps are used with the board to secure the head and torso.
(v) Straps are applied to the chest, abdomen, and thighs before the head restraint is applied. The straps should be placed sufficiently firmly to prevent sliding of the body in a vertical direction. However, care should be taken where straps cross the chest that chest wall expansion is not restricted and lung ventilation impaired.\(^16\)\(^\text{17}\)
(vi) Rolls of blanket are applied at the sides to support smaller people.
(vii) The spinal board must be secured to the trolley cot.
4.4 When faced with an upright patient with a possible spinal injury, consideration should be given to the “take down” technique (the standing longboard technique). 

4.5 THE LIMITATIONS OF USE OF LONG SPINAL BOARD

Spinal boards are not ideal if the patient is already supine because a log roll to turn the patient requires four trained people and is not a technique free from risk. An orthopaedic ("scoop") stretcher is preferred for lifting a suspected spinal injured patient who is already on the ground. However, an alternative to the log roll may be considered which entails sliding the board under the patient’s head and sliding him on in the usual way. For transportation of a spinal injured patient, especially over a long distance (see below), a vacuum mattress is preferred.

4.6 FURTHER USES OF THE LONG SPINAL BOARD

(i) It is a good lifting aid.
(ii) It is a good device for extricating and removing patients who are not injured but are in difficult locations.
(iii) It can be used to help ease patients with fractured necks of femurs out of armchairs.
(iv) It can be used for patients in the post-ictal phase.
(v) It can help in the management of cardiac arrest and provides a firm base for closed chest cardiac compression. It may facilitate the extrication of patients in cardiac arrest from upstairs rooms and down stairs, though this use may require additional staff and secure strapping.

Any use of the spinal board must always be evaluated against the benefits of current practice.

5. Vacuum mattress

5.1 The vacuum mattress is particularly useful for inter-hospital transport of spinally injured patients where they can substitute for the long spinal board. Only wide bodied mattresses should be used. They cost about £300. While most ambulance services (2/3 or more) use spinal boards, more than 60% of services are without vacuum mattresses (informal survey of UK ambulance services).

5.2 Vacuum mattresses cannot be used for extrication.

5.3 Vacuum mattresses are vulnerable to damage, particularly from glass at the scene of a road accident. It may be difficult to stow them in a front line ambulance vehicle. Thus, there may be merit in retaining a vacuum mattress in reserve to be used electively or brought out specifically to the scene of a suspected spinal injury.

5.4 As vacuum mattresses are infrequently used there are concerns over training and the retention of skills in their use.

6. Extrication

6.1 The long spinal board is considered a useful device for routine extrication and the apparatus of choice for the extrication of trapped patients. They allow rapid and control-led extrication. At approximately £230 they should be provided in every front line ambulance vehicle.

6.2 The use of spinal boards enables ambulance services to follow the 1994 EC Health and Safety regulations on lifting.

6.3 Ambulance services will need to make special arrangements with their local emergency departments to exchange boards to enable the crews to return to their vehicle operationally ready for the next patient. Additionally, it may be sensible to keep more than one board, strap sets, and head immobiliser on each vehicle.

6.4 Specific training on the long spinal board should be provided by specially trained instructors (to Pre-Hospital Trauma Life Support standard or equivalent) for all who might need to use them. Training should be given in their general use and in three specific areas of extrication from a motor vehicle:

- standard extrication by the rear route through a hatchback tailgate or the rear window (the safest method)
- vertical extrication after the roof has been removed
- side extrication for serious life threatening emergencies only because this may be difficult and can compromise the spine.

All extrications will involve well rehearsed team work with fire and rescue service colleagues.

6.5 ROUTINE EXTRICATION

When there is no immediate risk to life an extrication device should be used and the patient extricated on a spinal board. An extrication device such as a KED is significantly better than a spinal board alone at limiting rotation of the spine. When there is entrapment and any suspicion of serious injury, a trained and accredited pre-hospital doctor should be present wherever possible.
6.6 URGENT EXTRICATION

There is a risk to life but access may be limited. An extrication device should not be used but a spinal board will be employed to facilitate, wherever possible or practicable, smooth extrication through the rear of the vehicle.

6.7 EMERGENCY EXTRICATION

There is an immediate major risk to life (for example vehicle fire or serious airway or breathing problem) and ambulance crews have to be prepared to take risks with the spine in order to preserve life. The side route is acceptable in such circumstances and used with the long spinal board only employing the “rapid extrication technique”, using manual immobilisation while the patient is turned and extrication is undertaken through the side of a vehicle using a spinal board.\footnote{Prinsen RK, Syrotuik DG, Reid DC. Position of the cervical vertebrae during helmet removal and cervical collar application in football and hockey. Clin J Sport Med 1995;5:155–61}

7. Transportation of spinal cases

7.1 Patients can tolerate a 30 minute journey on a long spinal board.\footnote{Chandler DR, Nemejc C, Adkins RH, et al. Emergency cervical-spine immobilisation. Ann Emerg Med 1992;21: 1185–8} The receiving accident and emergency department staff should be alerted immediately as to how long the patient has already been on the board so they can make an appropriate judgment on the timing of its removal. (The duration of time on the spinal board should be recorded on the patient report form.) The spinal board should be removed in hospital as soon as possible.\footnote{Lorenzo RA. A review of spinal immobilisation techniques. J Emerg Med 1996;14:603–13} Ambulance services should make arrangements so that the patient does not need to have immobilisation removed in the accident and emergency department until clinically indicated, for example exchange equipment being available in receiving units.

7.2 If a journey time of greater than 30 minutes is anticipated, the patient should be transferred from the spinal board using an orthopaedic (“scoop”) stretcher to a vacuum mattress.\footnote{Curran C, Dietrich AM, Bowman J, et al. Pediatric cervical-spine immobilization: achieving neutral position? J Trauma 1995;39:729–32}

7.3 If a journey time greater than 30 minutes occurs unexpectedly it is not appropriate to add further delay by transferring the patient to a vacuum mattress. The journey should proceed but the emergency department advised of the length of time the patient has spent on the board.

7.4 If there is a clear paralysing injury to the spinal cord then online medical advice should be sought with regard to the use of the spinal board. Clearly “the horse has already bolted”, as it were, and the benefits of the back board may be limited while the risk of pressure sores may be very high. In these circumstances, the use of a vacuum mattress may be preferred. However, as half the cases of spinal injuries have other serious injuries, an unnecessary delay at scene or in transit should be avoided.

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Contributors

Members of the Spinal Immobilisation Working Group: Dr Keith Allison, immediate care Doctor and specialist registrar, Burns and Plastic Surgery, Selly Oak Hospital, Birmingham; Dr Chris Carney, Chief Executive, Bedfordshire and Hertfordshire Ambulance and Paramedic Service; Dr Matthew Cooke, Consultant and senior lecturer, Emergency Medicine, City Hospital, Birmingham; Mr Peter Driscoll, Consultant and senior lecturer, Emergency Medicine, Hope Hospital, Salford; Mr Alan Jones, Consultant in accident and emergency medicine, Queen Elizabeth Queen Mother Hospital, Margate; Mr Andrew Marsden, Consultant medical director, Scottish Ambulance Service; Mr Robin Middleton, clinical paramedic officer, Royal Berkshire Ambulance Service; Mr Keith Porter, Consultant trauma and orthopaedic surgeon, Selly Oak Hospital, Birmingham; Professor A D Redmond, Professor of emergency medicine, North Staffordshire Hospital (Chairman of the Trauma Working Group); Dr Brian Steggles, General Practitioner; Dr Mike Ward, Consultant anaesthetist, John Radcliffe Hospital, Oxford; Mr Mike Willis, Chief Executive, West Country Ambulance Service; Mr Tony Wilson, Divisional manager, South Yorkshire Ambulance Service.

The Working Group is indebted to Dr Matthew Cooke for undertaking a library search “pre-hospital spinal immobilisation, the evidence”, December 1996 from which most of the supporting references have been obtained.
INTRODUCTION
Thoracic injuries are one of the most common causes of death from trauma, accounting for approximately 25% of such deaths.

Despite the very high percentage of serious thoracic injuries, the vast majority of these patients can be managed in hospital, by chest drainage and resuscitation, and only 10 – 15% require surgical intervention.

In the field, the commonest problem associated with thoracic injury is hypoxia, either from impaired ventilation or secondary to hypovolaemia from massive bleeding into the chest (haemothorax), or major vessel rupture (ruptured thoracic aorta).

HISTORY
The mechanism of injury is an important guide to the likelihood of significant thoracic injury. Injuries to the chest wall arise usually from direct contact, and this may be due to intrusion of wreckage in the RTA situation, or blunt trauma to the chest wall arising from a direct blow. Seat belt injuries come into this category, and may induce fractures of the clavicle, sternum and ribs.

If the force is sufficient, the deformity and damage to the chest wall structures may induce tearing and contusion to the underlying lung and other structures. This may produce a combination of severe pain on breathing (pleuritic pain) and a damaged lung, both of which will significantly reduce the ability to ventilate adequately. This combination is a common cause of hypoxia.

Blunt trauma to the sternum may induce myocardial contusion, which may result in ECG rhythm disturbances.

Penetrating trauma may well damage the heart, lungs and great vessels, both in isolation or combination. It must be remembered that penetrating wounds to the upper abdomen and the neck may well have caused injuries within the chest, remote from the entry wound. Conversely, penetrating wounds to the chest may well involve injury to liver, kidneys and spleen.

The lung may be damaged with bleeding, causing haemothorax or air leak causing pneumothorax. Penetrating or occasionally blunt chest injuries may cause a cardiac wound. Blood can leak into the non-elastic surrounding pericardial sack and build up pressure, to an extent that the heart is incapable of refilling to pump blood into the circulation. This is known as pericardial tamponade and can be rapidly fatal, if not relieved at hospital (see additional information).

Rapid deceleration injury may induce shearing forces sufficient to rupture great vessels such as the aorta.

The major thoracic injuries likely to present as serious problems in the field, will involve either a developing tension pneumothorax, uncontrolled haemorrhage into the chest cavity causing a massive haemothorax, open chest wounds or cardiac tamponade.

ASSESSMENT
Assess ABCD's

Evaluate whether patient is TIME CRITICAL or NON-TIME CRITICAL following criteria as per Trauma Emergencies Guideline.

If patient is TIME CRITICAL, CORRECT A AND B PROBLEMS, LOAD ON TO LONGBOARD and TRANSPORT TO NEAREST SUITABLE RECEIVING HOSPITAL, with a HOSPITAL ALERT MESSAGE en route.

En route – continue patient MANAGEMENT (see below)

In NON-TIME CRITICAL patients: perform a more thorough patient assessment with a brief Secondary Survey.

MANAGEMENT OF THORACIC TRAUMA
Follow Trauma Emergencies Guideline, remembering to:

- ensure ABCs and immobilise cervical spine
- ensure high-flow oxygen via a non-rebreathing mask
- assess breathing adequacy – respiratory rate and volume, equality of air entry and SaO2 (>95%)
- consider assisted ventilation at a rate of 12–20 bpm. if respiratory rate is <10 or >30, expansion is inadequate or SaO2 is <95% on 100% O2 (Exercise caution as any positive pressure ventilation may increase the size of a pneumothorax)
- if required provide IPPV with bag mask and reservoir or mechanical ventilation
obtain IV access and commence crystalloid 250ml IV if indicated, en route to hospital. **Aim to maintain systolic BP at approximately 90mmHg.** In penetrating chest trauma IV access should be obtained but fluids not routinely given unless absolutely necessary.

- pulse oximetry and ECG monitoring MUST BE used as this may well assist in recognising hypoxia.

**Specifically consider:**

- cover open chest wounds with Asherman Chest Seal or adherent non-permeable dressing taped down on three out of four sides to allow some air to escape

- consider Tension Pneumothorax, Flail Segments, Surgical Emphysema, and Cardiac Tamponade. (see Appendix 1 for assessment and treatment of these conditions)

- any impaling objects should be adequately immobilised prior to transportation

- analgesia in the form of Entonox and morphine should only be used with extreme caution in chest-injured patients. There is significant risk of Entonox enlarging a pneumothorax and morphine may induce respiratory depression.
APPENDIX 1
TENSION PNEUMOTHORAX

This is a respiratory emergency and may well require immediate action at the scene or en route to hospital. A tension pneumothorax occurs when a damaged area of lung leaks air out into the chest on each inspiration, but does not permit the air to exit from the chest via the lung on expiration.

This progressively builds up air under tension on the affected side, collapsing that lung and putting increasing pressure on the heart and great vessels and opposite lung. If this air is not released externally, the heart will be unable to fill and the other lung will no longer be able to ventilate, inducing cardiac arrest.

Assessment

- tension pneumothorax may arise spontaneously from blunt or crushing injury to the chest. This will present with increasing breathlessness and extreme respiratory distress (respiratory rate often >30bpm)
- the chest on the affected side may appear to be moving poorly or not at all. The chest wall on the affected side may also appear over expanded. Air entry will be greatly reduced or absent on the affected side and in the absence of shock, the neck veins may become distended. Later on, the trachea and apex beat of the heart may become displaced away from the side of the pneumothorax and cyanosis may appear
- the patient may appear shocked as a result of decreased cardiac output. They are usually tachycardic and hypotensive
- tension pneumothorax, however, is more commonly seen in the pre hospital setting in chest-injured patients who are ventilated. Forcing oxygenated air down into the lungs under positive pressure will progressively expand a small, probably undetected, simple pneumothorax into a tension. This will take some minutes and it may well be several minutes after ventilation has commenced before increasing back pressure is noticed, either by the bag becoming harder to squeeze or the ventilator alarm sounding. Once the airway has been checked, the chest must be viewed to see if both sides are moving and auscultated to ensure air entry is present on both sides. The findings of the chest signs described above will confirm the diagnosis.

MANAGEMENT OF TENSION PNEUMOTHORAX

- tension pneumothorax must be decompressed rapidly by needle thoracocentesis.

OTHER TYPES OF CHEST TRAUMA

Flail Chest

- small flail segments may not be detectable. Large flail segments however, may impair ventilation, considerably as a result of pain. Splinting with a large pad or a hand supporting and immobilising the flail segment helps reduce pain, and improves ventilatory function. Traditionally, the patient has been turned onto the affected side for transportation, but this CANNOT be achieved on a long board. The segment can be immobilised in the boarded patient by manual splinting as described above.

Surgical Emphysema

This produces swelling of the chest wall, neck and face, with a cracking feeling under the fingers when the skin is pressed. This indicates an air leak from within the chest, either from a pneumothorax, ruptured large airway or ruptured larynx

- it requires no specific treatment, but indicates potentially SERIOUS underlying chest trauma. It may be gross causing the patient to swell up.

Cardiac Tamponade

- the heart is enclosed in a tough, non-elastic membrane, the pericardium
- a potential space exists between the pericardium and the heart itself. If a penetrating wound injures the heart, blood may flow under pressure into the pericardial space. As the pericardium cannot expand, a leak of only 20-30 ml of blood can cause compression of the heart, reducing cardiac output and causing tachycardia and hypotension. Further compression reduces cardiac output and cardiac arrest may occur
- signs of hypovolaemic shock, tachycardia and hypotension, accompanied by either blunt or more commonly penetrating chest trauma may be only the initial evidence of cardiac tamponade. Remember upper abdominal and posterior chest stab wounds may well have penetrated the heart
● other signs include engorged and distended neck veins and muffled heart sounds when listened to with a stethoscope (sounds are diminished by the layer of blood between the heart and chest wall). The heart cannot fill because of the pressure in the pericardium, hence the neck veins become engorged

● in cardiac tamponade the compressing blood requires rapid evacuation initially by long needle attached to a syringe, and as rapidly as possible surgically, with an open chest operation

● patients will die in the field if any unnecessary delay occurs in reaching hospital. If tamponade is suspected, remove at once to nearest suitable receiving hospital with ongoing ABC care

● DO NOT waste time at the scene commencing IV lines or infusions with these patients as any delay with threaten their survival.

ADDITIONAL INFORMATION

Chest trauma is treated with difficulty in the field and prolonged treatment before transportation is NOT indicated if significant chest injury is suspected. Penetrating trauma, in particular where lung or cardiac wounds are suspected, must be transported immediately to suitable hospital, with resuscitation en route.

Airway management, oxygenation, assistance with ventilation as required and external haemorrhage control only should be applied in critical chest trauma cases particularly with penetrating injuries. LOAD AND GO TO NEAREST suitable receiving Hospital.

Remember any stab or bullet wound to the chest, abdomen or back may penetrate the heart.

Massive haemothorax frequently presents as profound shock with breathing difficulty and reduced air entry in the lower chest on the affected side. The breathlessness is seldom extreme and shock is the overwhelming finding.

These patients must be managed as TIME CRITICAL, transported rapidly and IV infusions commenced en route.

Often patients with significant chest trauma may insist on sitting upright and this is especially common in patients with diaphragmatic injury who may get extremely breathless when lying down. In this instance a decision will have to be made whether a patient is best managed sitting upright or whether immobilisation on a longboard should be continued.

In the rare incident of gunshot injury to Police personnel using ballistic protection vests, the vest may indeed protect from penetrating injury, but serious underlying blunt trauma, (e.g. pulmonary contusion) may be caused to the thorax. NEVER UNDER ESTIMATE THESE INJURIES.

Remember there is a strong link between serious chest wall injury and thoracic spine injury – maintain a high index of suspicion.

References


INTRODUCTION

Trauma to the abdomen can be extremely difficult to assess even in a hospital setting. In the field, identifying which abdominal structure is injured, is less important than identifying that abdominal trauma itself has occurred.

It is therefore, of major importance to note abnormal signs associated with blood loss, and establish that abdominal injury is the probable cause, rather than being concerned, for example, whether the source of that abdominal bleeding originates from the spleen or liver.

There may be significant intra-abdominal injury with very few, if any, initial indications of this at the time the abdomen is examined by the Paramedic at the scene.

HISTORY

Observe the mechanism of injury

In the RTA situation, look for impact speed and severity of deceleration. Was a seat belt worn? – lap belts are particularly associated with perforated abdominal structures

In cases of stabbing and gunshot wound, what was the length of the weapon, or the type of gun and range?

ASSESSMENT

Assess ABCD’s

Evaluate whether a patient is TIME CRITICAL/POTENTIALLY TIME CRITICAL or NON-TIME CRITICAL following criteria as per Trauma Emergencies Guideline.

If patient is TIME CRITICAL/POTENTIALLY TIME CRITICAL, LOAD ON TO LONGBOARD and GO to Nearest Suitable Receiving Hospital with a Hospital Alert Message.

En route – continue patient MANAGEMENT (see below)

In NON-TIME CRITICAL patients, perform a more thorough patient assessment with a brief secondary survey.

Specifically assess:

● assess both chest and abdomen as many abdominal organs are covered by the lower ribs, and the lower chest margins extend over abdominal structures (e.g. liver and spleen)
● examine abdomen for external wounds, contusions, seat belt abrasions, evisceration (protruding organs)
● assess for tenderness, guarding and rigidity by GENTLE palpation of all four areas (quadrants) of the abdomen.
● consider the potential for pelvic injuries and gently assess lower ribs for evidence of fractures.

Many patients found later to have significant INTRA-ABDOMINAL TRAUMA show little or no evidence of this in the early stage, so do NOT rule out injury if initial examination is normal.

MANAGEMENT OF ABDOMINAL TRAUMA

Follow Trauma Emergencies Guideline, remembering to:

● ensure ABCs and immobilise cervical spine
● ensure high flow O2 therapy
● obtain IV access as needed en route to hospital.

In blunt abdominal trauma, if indicated, commence infusion of crystalloid 250ml IV rapidly. Reassess pulse, BP and perfusion. Continue using 250ml aliquots if required to maintain systolic BP of >90mmHg (presence of a radial pulse).

In patients with penetrating abdominal trauma obtain IV access but do not routinely infuse unless absolutely necessary. Only infuse until a radial pulse is just palpable.

Specifically consider:

● cover exposed bowel with warmed dressings soaked in crystalloid solution
● do NOT attempt to push organs back into the abdomen
● impaling articles, e.g. a knife must be LEFT IN SITU, for removal under direct vision, in the operating theatre
● ensure position of comfort wherever possible, whilst ensuring spinal immobilisation
if pain is severe, patient may self-administer Entonox but be cautious if the injury could also affect the thoracic cavity

in cases of more severe pain morphine (2.5-10mg IV initially) or nalbuphine (e.g. 5-10mg initially) titrated to response by slow IV injection may be administered. REMEMBER that this may mask abdominal signs but the overall welfare and comfort of the patient must be considered when making the decision to use stronger analgesics.

ADDITIONAL INFORMATION

The abdomen is divided within into three anatomical areas:

- abdominal cavity
- pelvis
- retro-peritoneal area

Abdominal Cavity

- the abdominal cavity extends from the pelvis to the diaphragm. It contains the stomach, small intestine, large intestine, liver, gall bladder and spleen

- remember the upper abdominal organs are partly in the lower thorax and lie under the lower ribs. Fractures of lower ribs will endanger upper abdominal structures such as the LIVER and SPLEEN.

Pelvis

- the pelvis contains the bladder, the lower part of the large intestine and in the female the uterus and ovaries. The iliac artery and vein lie over the posterior part of the pelvic ring and may be torn in pelvic fractures, adding to already major bleeding.

Retro-peritoneal Area

- the retroperitoneal area lies against the posterior abdominal wall, and contains the kidneys and ureters, pancreas, abdominal aorta, vena cava, and part of the duodenum

- these structures are attached to the posterior abdominal wall, and are often injured by the shearing forces involved in rapid deceleration.

ABDOMINAL INJURIES

Penetrating

Stab wounds, gunshot wounds and other penetrating injuries.

Stab Wounds

- stab injuries MUST be assumed to have done serious damage until proved otherwise although many isolated stab injuries do ultimately cause little major damage due to the mobility of intra-abdominal structures such as the intestine. Damage to liver, spleen or major blood vessels may, however, cause massive haemorrhage. Mortality from isolated abdominal stab wounds is about 1-2%

- remember that upper abdominal stab wounds may have caused major intra-thoracic damage, if the weapon was directed upwards. Lung, direct cardiac injury, and pericardial tamponade can all result from an upper “abdominal” stab injury

- similarly, chest stabbing injuries, may not only damage lung and heart, but also injure the liver and spleen, if the diaphragm is penetrated.

Gunshot Wounds

- gunshot wounds (GSW) tend to cause more direct than indirect injury, due to the forces involved and the more chaotic paths that bullets may take within the abdomen. The same rules apply to associated intra-thoracic injuries, as in the case of stab wounds

- there is some evidence that excessive fluid replacement in penetrating trauma worsens the outcome, by displacing fragile blood clots from bleeding vessels and causing re-bleeding. Obtaining IV access is clearly important but actual infusion of fluid not. Evidence to date in patients in hypotensive collapse secondary to penetrating injury is to provide immediate airway and breathing care. Arrest external bleeding and remove to hospital without delay.

Blunt

- this is the most common pattern of injury seen and is related to direct low injury to the abdomen. This tends to be the pattern in RTA scenarios, where direct blunt trauma is suffered to the abdomen, associated with direct blows to the abdomen or rapid deceleration.
the spleen, liver and “tethered” structures such as duodenum, small bowel and aorta may be most commonly injured depending on the mechanism of injury and forces applied.

References


INTRODUCTION

There is one fundamental rule to apply to these cases and that is not to let limb injuries, however dramatic in appearance, distract the carer from less visible but life-threatening problems such as airway obstruction, compromised breathing, poor perfusion and spinal injury.

HISTORY

Obtain a history of how the injury was sustained, in particular factors indicating the forces involved.

ASSESSMENT

However dramatic limb injuries appear, ALWAYS exclude the presence of other TIME CRITICAL injuries by using the PRIMARY SURVEY.

Assess ABCD’s

- evaluate whether patient is TIME CRITICAL or NON-TIME CRITICAL following criteria on Trauma Emergencies Guideline

- in TIME CRITICAL patients, evidence suggests that haemorrhage control backboard immobilisation and rigid splinting is sufficient treatment of fractures for rapid evacuation to hospital. If a traction splint can be applied very quickly to a femoral shaft fracture, it will contribute to “circulation” care by considerably reducing further blood loss and pain en route to hospital. However, if application of a traction splint will incur an unacceptable delay, use manual traction or ad hoc splinting e.g. tying the legs together or to the end of the stretcher to apply some traction, remembering that once applied traction must not be released

- LOAD AND GO to Nearest Suitable Receiving Hospital with a hospital alert message / information call

- en route – continue patient MANAGEMENT (see below)

- in NON-TIME CRITICAL patients, perform a more thorough patient assessment and a brief Secondary Survey.

**Specifically assess:**

- assess sites of suspected fractures

- assess all four limbs for injury to long bones and joints as part of secondary survey

- expose suspected fracture sites and assess for swelling, deformity, pain and tenderness on palpation

- assess for intact circulation and nerve function (MSC x 4 – motor, sensation and circulation), distal to the fracture site

- assess age of patient – consider greenstick fractures in children, and fractures of wrist and hip in the elderly

- assess for accompanying illnesses – some cancers can involve bones (e.g. breast, lung and prostate) and result in fractures from minor injuries. Osteoporosis (bone thinning) in elderly females in particular makes fractures more common

- assess for pattern of fractures – fractures of the heel in a fall from a height may be accompanied by pelvic and spinal crush fractures. “dashboard” injury to the knee may be accompanied by a fracture or dislocation of the hip. Humeral fractures from a side impact are associated with chest injuries.

DISLOCATIONS

- these are very painful and are commonly found affecting digits, elbow, shoulder and patella. Occasionally the hip may be dislocated where forces of injury are very high. Dislocations, which threaten the neurovascular status of the limb, must be treated with some urgency, as these require immediate reduction in the A & E department.

AMPUTATIONS

- most frequently involve digits, but can involve part of or whole limbs. Remember the first priority in managing amputated parts is to manage the patient who has sustained the amputation (start with ABCD). They are likely to be in considerable pain and distress so administer IV analgesia as early as possible. Dressings moistened with water for injection or saline should be applied to the stump paying particular attention to haemorrhage control

- management of the amputated part should include the removal of any gross contamination, then covering the part with a damp gauze or dressing, securing in a sealed plastic bag and placing the bag on ice. Re-implantation surgery may be possible so it is important that amputated parts are maintained and transported in the best condition possible. Body parts should not be placed in direct contact with ice as this can cause tissue damage; the aim is to keep the temperature low but not freezing.
PARTIAL AMPUTATIONS

- these may still result in a viable limb, providing there is minimal crushing damage and survival of some vascular and nerve structures. It is important to immobilise the partially amputated limb, either in a splint or on a long spinal board in a position of normal anatomical alignment, and cover with dressings to arrest any obvious haemorrhage.

- pressure alone should be used to arrest haemorrhage if possible, and intravenous fluid therapy (crystalloid) restricted to volumes that will not elevate the systolic blood pressure above 80-90 mmHg, to avoid flushing off fragile clots and causing re-bleeding. It is essential that these patients are removed to a SUITABLE receiving Hospital, ideally with both ORTHOPAEDIC and PLASTIC surgery facilities.

MANAGEMENT OF LIMB TRAUMA

Follow Trauma Emergencies Guideline, remembering to:

- ensure ABCs
- ensure high flow oxygen
- arrest external haemorrhage through direct or indirect pressure and/or by raising the limb above heart level where appropriate
- obtain IV access if indicated
- commence infusion of crystalloid 250ml IV if indicated and infuse sufficient fluid to achieve a SBP of 80-90mmHg (return of radial pulse), to 2,000ml max
- reassess en route.

Specifically consider:

- analgesia if the patient is in pain. There appears to be a general reluctance to administer IV analgesia for limb fractures (including neck of femur fractures), in the pre-hospital environment. Pain relief is an important intervention and should be considered as soon as ABCD’s have been assessed and potentially life-threatening problems corrected
- the patient may self-administer Entonox or, if this is ineffective or the pain is severe, morphine (2.5–10mg IV initially) or nalbuphine (2.5-10mg IV initially) should be given
- in NON-TIME CRITICAL patients, immobilise long bone fractures by appropriate splinting. (See SPLINTAGE below).

Splintage

The principles of splintage involve:

- arrest of external haemorrhage
- support of the injured area
- immobilisation of the joint above and below the fracture
- re-evaluation and recording the circulatory and neurological (motor and sensory) function below the fracture BEFORE and AFTER splintage.

Always

- realign fractures into as close to normal position as possible
- recognise the benefits of vacuum splints, especially if limbs need to be immobilised in an abnormal alignment
- pad rigid splints to conform to anatomy
- remove all jewellery before swelling of the limb occurs
- check for absence or presence of pulses and muscle function distal to injury after splintage
- reassess circulation by checking pulses pre- and post-application of splints. If pulse disappears during splintage then realign limb until pulse returns.

Splinting of Upper Arm

Patient self-splintage is often adequate and can be less painful than attempting to put the limb in a sling.

Fractures of the clavicle and upper limb may be supported in a triangular sling, if this alleviates pain. Vacuum splints may be well suited to immobilising forearm fractures (as well as lower leg fractures).

Splints such as short box splints or vacuum splints may also be useful.
Splinting of Lower Limb

Ankle and tibial fractures, as well as those fractures around the knee, can be immobilised with either box splints or vacuum splints. Box splints may need padding to be effective in providing adequate immobilisation.

Femoral shaft fractures are best managed by traction splintage (see separate section). Isolated fractures of the tibia and fibula should not be immobilised using a traction splint.

Traction Splintage

A traction splint is a device for applying longitudinal traction to the femur, using the pelvis and the ankle as static points. These splints were first used by Hugh Thomas in World War 1 and were seen then to dramatically reduce mortality from open femoral shaft fractures. Blood loss from femoral shaft fractures can be considerable, involving loss of 500 – 2000 ml in volume. If the fracture is open compound, blood loss is increased.

Correct splintage technique using a traction splint will ease pain, reduce haemorrhage and damage to blood vessels and nerves, and also reduce the risk of embolisation to the brain and lungs of fat globules (fat embolus). It also minimises the risk of a closed fracture being converted to a compound one.

By using traction to pull the thigh back from the spherical shape caused by muscle spasm to a cylindrical shape, it compresses bleeding sites and reduces blood loss considerably. As it also reduces bone fragment movement, it lessens the other complications noted above.

Modern devices such as the SAGER, TRAC 3 and DONWAY splints are easy to apply and some now have quantifiable traction, measured on a scale in pounds. The correct amount of traction is best judged by the injured leg being the same length as the injured limb.

Ankle, lower leg, knee or pelvic fractures on the same side as the femoral fracture prevent the use of a traction splint.

It has been suggested that a fracture of the tibia in the same limb as a femoral shaft fracture may be immobilised using a traction splint, with the traction reduced to about 10lbs so as not to over-displace the tibial fracture. However there is little or no evidence to support this treatment so in a patient with a tibial fracture and femoral shaft fracture in the same leg a long box splint or vacuum splint should be used for immobilisation.

Open fractures

Where fractures are open, bone ends should be irrigated with sodium chloride and a sterile dressing applied as soon as practicable. Infection following an open fracture can have serious consequences for the future viability and long-term function of the limb. Any gross displacement from normal alignment must be corrected, and splints applied. It is important to point out any wounds that were the result of open injury to receiving A&E department staff, especially if bony fragments have now receded. Photography, where available, may help to show the extent of bone displacement at scene.

Neck of Femur fractures

These occur most commonly in the elderly population and are one of the most common limb injuries encountered in the pre-hospital environment. Typical presentation includes shortening and external rotation of the leg on the injured side with pain in the hip and referred pain in the knee. The circumstances of the injury must be taken into account – often the elderly person has been on the floor for some time, which increases the possibility of hypothermia, dehydration, pressure sores and chest infection so careful monitoring of vital signs is essential. Immobilisation is best achieved by strapping the injured leg to the normal one with foam padding in between the limbs. Extra padding with blankets and strapping around the hips and pelvis can be used to provide additional support whilst moving the patient. Appropriate analgesia should be given.

ADDITIONAL INFORMATION

Fractures may be closed or open. Comminuted fractures involve shattering of the fracture site into multiple fragments. Nerves and blood vessels are placed at risk from sharp bony fragments, especially in very displaced fractures, hence the need to return fractured limbs to normal alignment as rapidly as possible. Fractures around the elbow and knee are especially likely to injure arteries and nerves.

Another potential complication of limb fractures is compartment syndrome. Increased pressure within muscular compartments of the fractured limb compromise the circulation causing ischaemia with potentially catastrophic consequences for the limb. The five ‘P’s of ischaemia are:
1. **Pain** – out of proportion to the apparent injury, often in the muscle and may not ease with splinting/analgesia.

2. **Pallor** – due to compromised blood flow to limb.

3. **Paresthesias** – changes in sensation and loss of movement.

4. **Pulselessness** (Loss of peripheral pulses) – grave late sign as swelling increases causing complete occlusion of circulation.

5. **Perishing with cold** – the limb is cold to the touch.

If compartment syndrome is suspected management is as previously described but with an increased sense of urgency and hospital alert as patient may require immediate surgery.

In the field, it is frequently impossible to differentiate between ligament sprains and a fracture. Immobilisation must be performed, and **ASSUME a fracture until x-ray or expert medical opinion advises otherwise**.

In non-time critical patients, full splinting with suitable analgesia is essential. In **TIME CRITICAL** patients, however, splintage is often going to be restricted to securing fractured limbs to a longboard, to allow rapid evacuation from the scene for immediate hospital transportation.

**Always** ensure hospital staff are shown any skin wound relating to a fracture and clearly understand the underlying fracture was initially an open one. Remember that by applying traction visible bone ends (open fracture) may disappear.

Pre-treatment Polaroid or digital photography of complicated fracture sites prior to re-alignment and splintage may be helpful in hospital evaluation and re-evaluation of compound fractures in particular. If photographs are taken, remember that these form part of the confidential patient record and patient consent is required. Photography must not delay care.

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INTRODUCTION
Coping with pregnant mothers with major injuries is a rare problem, but demands a rather special approach. Pregnancy produces marked changes from the norm, particularly in the cardiovascular system.

- Cardiac output increases by 20–30% in first ten weeks of pregnancy
- Average heart rate increases by 10 to 15 beats per minute
- Both systolic and diastolic BP falls on average by 10–15mmHg
- As the pregnancy develops, the diaphragm becomes splinted and breathing effort, rate and tidal volume are increased
- Both blood volume (45% increase) and numbers of red cells increase, but not in proportion, so the patient becomes relatively anaemic
- Gastric emptying is delayed, therefore vomiting is more common and the airway is at increased risk.

There are three fundamental rules which must be followed at all times when dealing with the pregnant patient.

- The maternal well-being is essential to the survival of the foetus and thus resuscitation of the mother must always be the priority
- Compression of the inferior vena cava by the foetus is a serious potential complication during pregnancy and suitable positioning or manual displacement must be employed
- Signs of shock appear very late during pregnancy and hypotension is an extremely late sign. Any signs of hypovolaemia during pregnancy are likely to indicate a 35% (class III) blood loss and must be treated aggressively.

HISTORY
Assess the mechanism of injury.

Take a history of the accident and any symptoms

Enquire about stage of the pregnancy, and any problems so far with the pregnancy. Ask the mother if she has her pregnancy record card with her.

Enquire about the movement of the baby felt by the mother (foetal movements) (see Obstetric and Gynaecology Guidelines)

ASSESSMENT
Assess ABCD’s

Specifically assess:

- Assess for foetal movement or abdominal pain in the mother
- Evaluate whether the patient is TIME CRITICAL or NON-TIME CRITICAL following criteria on Trauma Emergencies Guideline
- If patient is TIME CRITICAL, CORRECT A AND B PROBLEMS, LOAD ON TO LONGBOARD and TRANSPORT to NEAREST SUITABLE RECEIVING HOSPITAL with a hospital alert message / information call.

DO NOT MANAGE A PREGNANT FEMALE ON HER BACK ON THE LONGBOARD

In the supine position the enlarged uterus compresses the inferior vena cava this reduces venous return to the heart, causing a further drop in blood pressure.

It is vital therefore to tilt the longboard by propping it up under the right side so tilting the mother to her left.

If this is impossible, the uterus should be manually displaced to the left side.

Provide a hospital alert message.

En route – continue patient MANAGEMENT (see below)

Caution
The “normal” increase in plasma volume, tachycardia, and lowered blood pressure can mask initial signs of hypovolaemic shock until quite significant bleeding has occurred.

As reduced blood volume from haemorrhage will induce maternal hypoxia as well as hypovolaemia, this will in turn cause foetal hypoxia as a result of reduced placental blood flow.

If the mother is dead or arrests en route to hospital, institute adult BLS/ALS guidelines and transport immediately to nearest suitable receiving hospital with hospital alert message to have an Obstetrician on
standby in A&E for emergency caesarean section. (With effective BLS/ALS, the baby MAY survive, and must be given a chance of survival)

In non-time critical patients, perform a more thorough patient Assessment with brief Secondary Survey.

**MANAGEMENT OF TRAUMA IN PREGNANCY**

Follow Trauma Emergencies Guideline, remembering to

- ensure ABCs and immobilise C-spine
- ensure high flow oxygen
- monitor with ECG and pulse oximetry.

**Specifically consider:**

- ensure adequate ventilation and assist or provide IPPV if required
- establish IV access and commence infusion of crystalloid 250ml IV, en route to hospital, in any pregnant patient with the slightest suspicion of blood loss. Treat hypovolaemia aggressively but do not delay transportation.
- reassess vital signs prior to further fluid administration. Aim to maintain a systolic BP of 90mmHg
- do not transport supine on a long board. Tilt the mother to her left side.

**ADDITIONAL INFORMATION**

Remember you are dealing with two patients but, whilst in utero, the health of the baby is totally reliant upon that of the mother.

Remember treating the mother is treating the foetus. Treating the mother effectively is providing the maximum chance of survival for the foetus.

Cardio-respiratory arrest is treated the same as in non-pregnant patients, but “wedge” the longboard to displace the uterus to the left side and ensure adequate CPR.

All pregnant patients involved in a traumatic situation, however trivial, require to be assessed in an A+E department with an obstetric unit.
INTRODUCTION

Burns arise in a number of accident situations, and may have a variety of accompanying injuries or pre-existing medical problems associated with the burn injury. Scalds, flame or thermal burns, chemical and electrical burns will all produce a different burn pattern, and inhalation of smoke or toxic chemicals from the fire may cause serious accompanying complications.

A number of burn cases will also be seriously injured following falls from a height in fires, or injuries sustained as a result of RTAs where a vehicle ignites after an accident.

Explosions will often induce flash burns, and other serious injuries due to the effect of the blast wave or flying debris.

Inhalation of superheated smoke, steam or gases in a fire, will induce major airway swelling and respiratory obstruction. This is especially important in children, where inhalation of steam, even from a kettle has been known to cause fatal airway obstruction.

Preceding long term illness, especially chronic bronchitis and emphysema, will seriously worsen the outcome from airway burns.

Alcoholism commonly increases the risk of accidental burns, especially in smokers.

Remember that a burn injury may be preceded by a medical condition causing a collapse (e.g. elderly patient collapsing against a radiator with a stroke).

HISTORY

What happened?

When did it happen?

Were there any other injuries sustained?

Are any circumstances present that increase the risk of airway burns (Confined space, prolonged exposure)?

Any evidence of co-existing or precipitating medical conditions

ASSESSMENT

Assess ABCD’s

Specifically assess:

Assess airway for signs of burns which include:
- soot in the nasal and mouth cavities
- cough and hoarseness
- coughing up blackened sputum
- difficulty with breathing and swallowing
- blistering around the mouth and tongue
- scorched hair, eyebrows or facial hair.

Assess breathing for rate, depth and any breathing difficulty.

Estimate burns using a method with which you are familiar.

- adopt half burnt/half not burnt approach to give burn area of >50%, 25-50%, 12.5-25%, <12.5% etc or use the Wallace’s Rule of Nines or the Lund and Browder chart
- use all of the burn area, including reddening, do not try to differentiate between levels of burn (1,2,3 degree etc)
- only a rough estimate is required, an accurate measure is not possible in the early stages.

Evaluate whether patient has any TIME CRITICAL features: These may include:

- any major ABCD problems
- any signs of airway burns, soot or oedema around the mouth and nose
- history of hot air of gas inhalation – these patient may initially appear well but can deteriorate very rapidly
- any evidence of circumferential (completely encircling) burns of the chest or neck
- any significant facial burns
- surface area burns >25% in adults (>12.5% in paediatric patients)
- presence of other major injuries.

If any of these features are present, CORRECT A AND B PROBLEMS then initiate TRANSPORT to nearest suitable receiving hospital with a hospital alert message.

En route – continue patient MANAGEMENT (See below).
If patient is non-time critical, perform a more thorough patient assessment with a brief secondary survey.

**BURN TIME** is CRITICAL to note, as is time and volume of ALL infusions, as all subsequent fluid therapy is calculated from the **TIME** of the **BURN** onwards.

In **ELECTRICAL** burns, **entry and exit sites** are important to assess, as is ECG rhythm. The extent of burn damage in electrical burns is often impossible to fully assess at the time of injury.

In **SCALDS**, the **skin contact time** of the burning fluid frequently determines the depth of the burn. Scalds with boiling water are frequently of extremely short duration as the water flows off the skin rapidly. Those resulting from hot fat and other liquids, that remain on the skin for longer, will cause significantly deeper and more serious burns. Also the **time to cold water** is of significant impact and should be included in pre arrival advice from Control.

In **CHEMICAL** burns, it is vital to note the **nature of the chemical** is vital to note. Alkalis in particular may cause deep, penetrating burns, sometimes with little initial discomfort. Certain chemicals such as phenol or hydrofluoric acid can cause poisoning by absorption through the skin.

**CIRCUMFERENTIAL** (Encircling completely a limb or digit) full thickness burns, may be ”limb threatening”, and require early in hospital incision/release of the burn area along the length of the burnt area of the limb (escharotomy).

**MANAGEMENT OF BURNS**

Follow Trauma Emergencies Guideline, remembering to:

- ensure ABCs and immobilise C-spine if any potential for neck trauma
- intubate/assist ventilation if airway or ventilation is impaired
- ensure high flow oxygen.

**Specifically consider:**

If the patient is wheezing as a result of smoke inhalation, nebulisation with salbutamol and an **O2** flow of 6-8 lpm will frequently improve symptoms. It is important, wherever possible, to obtain a peak flow reading both before and after nebulisation, to assess its effect.

After cooling with water, cut off burning, or smouldering clothing, providing it is not adhering to the skin.

Cover the burn area with cling film, which provides a good dressing through which a burn can be reviewed – infection is directly related to the number of times a burn is dressed and then uncovered to be assessed by another person.

Continue to irrigate over the clingfilm whilst ensuring the rest of the patient is warmly wrapped.

Waterjel type dressings should be considered only in minor <12.5% burns due to the potential for hypothermia.

In alkali burns, irrigate with water en route to hospital, as it may take hours of irrigation to neutralise the alkali. This also applies to eyes that require copious and continual irrigation with water or saline.

Chemical burns should **NOT** be wrapped in clingfilm but covered with wet dressings.

If burn area is sufficient, circulation is compromised by accompanying injuries, or **IV** analgesia may be required, obtain **IV** access and commence slow infusion of crystalloid **IV** **EN ROUTE TO HOSPITAL**. (see Additional Information)

Provide analgesia as required with morphine or nalbuphine if the pain is severe. Cooling and application of dressings frequently eases pain, but care must be taken not to “over-cool” the patient as hypothermia is a risk. This is a particular risk in case of children. Entonox is not appropriate in burns if >50% **O2** is required.

Paracetamol suspension (Calpol) 120-500mg by mouth may be useful in small children with scalds.

With burn cases, in addition to the usual clinical report details transmitted via radio, the following information should be transmitted:

- **extent** of burn **area** (serial halving)
- **time** of burn
- **mechanism** of burn
- any indication of **Airway** Burns
- any evidence of burns involving the entire or majority of the circumference of the chest, neck or a limb.
ADDITIONAL INFORMATION

In some areas with specialist burns units direct admission guidelines may be in place.

Fluid Therapy

- secure IV access in an unburnt limb en route to hospital, with largest bore IV cannula possible. Avoid areas where a burned area lies above the IV site, as when the burnt tissue swells, the veins will be compressed and the IV will cease to function.

- where IV access is particularly difficult, leave this until the patient reaches hospital (Do NOT delay to obtain IV access)

- if an area of greater than 25% of the body is affected and the time from injury to hospital is likely to be in excess of an hour then fluid therapy should commence as below

- crystalloid should be used in the following initial doses:
  - Adult 1000ml
  - 5-11 years 500ml
  - <5 years 10mg/kg

- if the burn is complicated by other traumatic injury then standard fluid therapy should take precedence.

Non-Accidental Injury

You must always be mindful of the possibility, ensure all documentation is comprehensive and, where possible, retain samples of clothing etc for the hospital. The role of the Ambulance Service is to report the possibility of NAI to the appropriate agencies, not to confirm that it has taken place.

References

Collis N. Smith G. Fenton OM. Accuracy of burn size estimation and subsequent fluid resuscitation prior to arrival at the Yorkshire Regional Burns Unit. A three year retrospective study. Burns 25(4):345-51, 1999 Jun


Faculty of Pre-hospital Care, Royal College of Surgeons of Edinburgh. Burns care in the pre-hospital phase; a consensus view. Awaiting publication.
INTRODUCTION
There are about 700 deaths by drowning a year in the UK, and many more times that number of near-drowning. A high percentage of these deaths involve children. In the majority of drownings, water enters the lungs, but 10 – 15% of cases involve intense laryngeal spasm with death resulting from asphyxia (so called dry-drowning). The term near drowning applies to survivors of drowning including those resuscitated from cardiac or respiratory arrest resulting from a drowning incident. Hypothermia can also be involved as a cause of death in drowning.

Remember the risk of accompanying Head and C-spine injury in drowning associated with diving accidents.
An increasing number of drowning/near drowning incidents involve alcohol/drugs or fitting.

HISTORY
History is often incomplete at the incident scene, both relating to the incident and the casualty.
Establish the number of patients involved.
Various environments include -: swimming pools, hot tubs, fresh and salt water as well as contaminated liquids.
Try to obtain the time of accident, time of rescue, time of first effective CPR.
Note any duration of IMMERSION and water temperature and type (salt, fresh, contaminated).

ASSESSMENT
Assess ABCD’s
Assess the environment/scene for evidence of trauma, especially to head and neck.
Evaluate whether the patient has any TIME CRITICAL features: These may include:
- Cardiorespiratory Arrest*
- Major ABCD problems
- Major associated injuries

*In cardiorespiratory arrest, follow Adult/Paediatric BLS/ALS guidelines BUT remove to hospital at an earlier point in guideline than normal. If a drowned patient is NOT rapidly responding to resuscitation methods, this may be a result of specific complications such as hypothermia. Continue with BLS to hospital

If any of these features are present, correct A and B problems on scene then commence transport to nearest suitable receiving hospital.

Provide a hospital alert message / Information call.

En route – continue patient management (see below).

If non time critical features are present:
- perform a more thorough patient assessment and a brief secondary survey.

Specifically assess:
- Assess for likely hypothermia.

MANAGEMENT OF NEAR DROWNING
Preserve self-safety of you and other rescuers
NEVER PUT YOURSELF AT RISK.

Follow Trauma Emergencies Guideline

Specifically consider:
- protecting the C-Spine, effect safe rescue and supervise recovery
- defibrillation may be performed as indicated, but remember in SEVERELY HYPOTHERMIC patients (Core temperature <32°C) may not be effective until the patient is re-warmed
- ensure high flow oxygen. Endotracheal intubation may be required and is desirable in order to secure an impaired airway and provide adequate ventilation
- ventilation in a near drowned casualty may be difficult as lung compliance is reduced if water has been inhaled
- positive pressure ventilation must be commenced using mechanical ventilator or bag, valve, mask (BVM), and reservoir with 10-15 lpm of O₂
assisted ventilation may be given with BVM, or mechanical ventilator with CMV/demand setting.

Apply ECG and pulse oximeter.

Establish IV access en route to hospital where possible.

The pulse may be extremely slow if hypothermia is present, and external cardiac compression may be required. Bradycardia often responds to improved ventilation and oxygenation. Drugs such as adrenaline and atropine are less effective in hypothermia, and must not be repeatedly used. These drugs may pool in the static circulation of the drowned casualty, and then, after re-warming and circulation has been restored, act as a dangerous bolus of drug as they are circulated.

Keep patient flat, and do NOT try to tilt to empty fluid from lungs.

Cover to prevent further heat loss.

**ADDITIONAL INFORMATION**

Aspiration of water during drowning is common (around 80%). Tilting to drain this solely empties water from the stomach into the pharynx, risking further airway contamination. The lungs can be ventilated even with large volumes of water inside them.

Airway clearance and ventilation are the first priorities. Adequate ventilation and oxygenation may restore cardiac activity in drowning, so are worthy of major effort.

The recovered patient is in great danger of vomiting. If C-spine injury is not an issue, they should be transported in the recovery position with suction at hand. If C-spine injury is possible, immobilise on a longboard and prepare for side-tilt and suction as required.

Changes in haemodynamics after water immersion make positional hypotension likely and blood pressure fall when the patient is raised vertically from the water. Rescuers must always attempt to maintain the victim flat and avoid vertical removal from water.

Patients recovered from water should be resuscitated and conveyed to hospital unless submergence is >3 hours in adults. Survival from prolonged immersion is well documented.

Alcohol/drugs are likely to induce vomiting, suction equipment and/or postural draining may be necessary if appropriate.

The popularity of “hot tubs” and the incidence of drowning caused by long hair being trapped in the inlets of the tubs may make your incident a rescue, having to cut the hair to release the patient.

**Secondary Drowning**

Secondary drowning occurs usually within 4 hours of near-drowning and can also prove fatal. These cases can present up to 24 hours following immersion. Hence, anyone who is remotely suspected of having nearly drowned, or been rescued from water, however well they appear, MUST BE REMOVED TO HOSPITAL.

The common problems of secondary drowning are:

- ARDS – Acute Respiratory Distress Syndrome
- cerebral oedema
- renal (kidney) failure
- infection
- disturbance of electrolytes, acid-base balance, and lung function, along with hypothermia, are the main problems, and there is little to separate sea from fresh water exposure as a particular issue.

Treatment is aimed at preventing Cardiac Arrest. If this occurs, survival rate decreased from approximately 70-90% to approximately 15%.

**References**


INTRODUCTION
Electrocution often involves 240 volts AC domestic current, and may cause death from cardiac arrhythmia or from respiratory arrest caused by sustained muscle spasm (called tetany) preventing breathing. With domestic electrocution cardiac arrhythmias are likely to occur at the time of electrocution and if none are present on initial ECG they are unlikely to develop later.

Electrocution from higher voltage sources (including the generators used on building sites) may cause cardiac arrhythmias after a period of apparent full recovery

HISTORY

Safety
Obtain a history of the type of electrical shock suffered by the patient, and whether they are still connected to a live supply.

If so, cut off supply, and free patient at once AT NO RISK TO YOURSELF.

Assessment
Assess ABCD’s.

Remember to assess risk of C-spine injury – immobilise as required.
Assess for cardiac arrest or arrhythmias.
Assess for evidence of any airway burn.
Assess whether patient has any TIME CRITICAL features.
- cardiorespiratory arrest
- major ABCD problem
- facial/airway burns
- serious cardiac arrhythmias such as tachyarrhythmias / bradyarrhythmias
- extensive burns
- other accompanying major injuries.

If any of these features are present, Correct A and B problems then initiate TRANSPORT to Nearest Suitable Receiving Hospital with a Hospital Alert Message / Information call.

En route – continue patient MANAGEMENT (see below)

In cardiorespiratory arrest, follow Adult/Child BLS/ALS guidelines. If an electrocuted patient is not responding to resuscitation methods, this may be the result of other complications, such as associated injuries or extensive burns. Transportation to hospital is essential in all cases of electrocution unless injuries are incompatible with life.

If patient is non-time critical, perform a more thorough patient assessment and a brief Secondary Survey.

Specifically assess,

- For other injuries (related to accompanying falls, etc.)
- For burn entry and exit sites, circumferential limb, neck or chest burns.

Management of Electrocution

Follow Trauma Emergencies Guideline, remembering to:

Ensure ABCD’s.

Administer high flow oxygen

Specifically consider:

- continuous ECG monitoring for arrhythmias and attach pulse oximetry
- follow burns guideline where appropriate.

References


INTRODUCTION

It is the recognition of the signs and symptoms of serious illness in a child that is of key importance not seeking a diagnosis.

The most important skill in managing paediatric emergencies is patient assessment. Good assessment skills allow the child with actual or potential life-threatening illness or injury to be rapidly identified and managed.

Early recognition and management of developing respiratory distress or circulatory impairment or changed level of alertness/consciousness in a child, will allow the paramedic to rapidly transport the child to hospital for further urgent assessment and treatment.

Where adults tend to suffer sudden cardiac arrest while fairly well perfused, a child is more likely to have a cardiac arrest because of hypoxia, and is therefore much more difficult to resuscitate.

By the time a child deteriorates to actual cardiac arrest, the outcome is almost universally poor, despite resuscitation. Cardiac arrest in the child is usually caused by hypoxia or hypovolaemia.

Recognition of the seriously ill or injured child involves the identification of a number of key signs affecting the child’s airway, breathing, circulatory or neurological systems.

If these signs are recognised, the child must be considered to be in the life threatening / potentially life-threatening category.

PRIMARY ASSESSMENT

Airway – Assessment of the Airway

Check the airway for obstruction, foreign material or vomit. Position to ensure airway is patent. No blind finger sweeps.

Remember that neutral alignment is the correct positioning for neonates and the very small child, NOT hyperextension

Breathing – Assessment and Recognition of Potential Respiratory Impairment

RESPIRATORY RATE.

Rapid breathing rate (tachypnoea) in a child at rest indicates that increased ventilation is due to either airway, lung, or circulatory / metabolic problems.

INTERCOSTAL AND STERNAL RECESSION

Recession is seen when the child is struggling to breathe effectively. Intercostal and upper abdominal muscles are drawn in with each inspiration.

The degree of intercostal, abdominal or sternal recession indicates the severity of respiratory difficulty. It is more easily observed in infants with a more flexible chest wall. Its presence in older children (>6–7 years of age) suggests severe respiratory problems.

ACCESSORY MUSCLE USE

As in adult life, the sternomastoid muscle may be used as an accessory respiratory muscle when the work of breathing is increased. In infants this may cause the head to bob up and down with each breath.

FLARING OF THE NOSTRILS

This is seen in infants with respiratory distress.

INSPIRATORY OR EXPIRATORY NOISES

Stridor (high pitched inspiratory noise) is a sign of upper respiratory (laryngeal) obstruction.

Wheezing indicates lower smaller airway narrowing and is usually more pronounced on expiration. The volume of the stridor or wheezing is not an indicator of severity.

Grunting is produced by exhalation against a partially closed laryngeal opening (glottis). This is a sign of severe respiratory distress and is characteristically seen in infants.

EFFECTIVENESS OF BREATHING – CHEST EXPANSION AND BREATH SOUNDS.

Assess adequacy of chest expansion on both sides of the chest. Auscultate the chest with a stethoscope. A silent chest is a very dangerous sign, meaning that very little air is going in or out of the chest.

NORMAL RESPIRATORY RATE

<table>
<thead>
<tr>
<th>Age</th>
<th>Respiratory Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 YEAR</td>
<td>30 – 40 bpm</td>
</tr>
<tr>
<td>1 – 2 YEARS</td>
<td>25 – 35 bpm</td>
</tr>
<tr>
<td>2 – 5 YEARS</td>
<td>25 – 30 bpm</td>
</tr>
<tr>
<td>5 – 12 YEARS</td>
<td>20 – 25 bpm</td>
</tr>
<tr>
<td>&gt;12 YEARS</td>
<td>15 – 20 bpm</td>
</tr>
</tbody>
</table>
Pulse oximetry can be used to measure oxygen saturation (readings are less reliable in the presence of shock, hypothermia and some other conditions such as carbon monoxide poisoning)

**Effects of respiratory inadequacy on other systems:**

**Heart Rate** – tachycardia or eventually bradycardia may result from hypoxia

**Bradycardia** is the result of severe or prolonged hypoxia and is a pre-terminal sign.

**Skin Colour** – hypoxia produces vasoconstriction and skin pallor. Cyanosis is a late and pre-terminal sign of hypoxia, when the patient is close to respiratory arrest.

**Mental Status** – The hypoxic child will be agitated and/or drowsy. Drowsiness gradually increases and eventually leads to unconsciousness. Agitation may be less easily identified in infants. As a guide, use parents’ perception of the child’s status, and its reaction to voice and painful stimuli.

**Circulation** – Recognition of Potential Circulatory Failure (Shock)

**HEART RATE**

With circulatory volume loss, the heart rate increases, as a result of an autonomic compensatory response, and to compensate for fluid loss. The rate, particularly in infants, can be very high (up to 220 per minute).

**NORMAL HEART RATES**

<table>
<thead>
<tr>
<th>Age</th>
<th>Heart Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 YEAR</td>
<td>110 – 160 bpm</td>
</tr>
<tr>
<td>1 – 2 YEARS</td>
<td>100 – 150 bpm</td>
</tr>
<tr>
<td>2 – 5 YEARS</td>
<td>95 – 140 bpm</td>
</tr>
<tr>
<td>5 – 12 YEARS</td>
<td>80 – 120 bpm</td>
</tr>
<tr>
<td>&gt;12 YEARS</td>
<td>60 – 100 bpm</td>
</tr>
</tbody>
</table>

**PULSE VOLUME**

Absent peripheral pulses and weak central pulses are serious signs of advanced shock, and indicate that hypotension is already present. In infants and children, blood pressure is maintained until shock is very severe.

**CAPILLARY REFILL**

Apply gentle pressure to the forehead or sternum for 5 seconds and release and observe for capillary refill. A refill time of >2 seconds indicates poor perfusion, although this may be influenced by a number of factors, particularly cold.

**Effects of circulatory inadequacy on other systems**

**Respiratory Rate** – Rapid respiratory rate but without recession, is characteristic of failing circulation in children. This is due to the body trying to compensate for acidosis resulting from circulatory failure.

**Skin** – Mottled, cold, pale skin peripherally indicates poor perfusion.

**Mental Status** – Initially in shock the child will become agitated and, as it progresses, drowsy. The child may ultimately become unconscious as a result of poor cerebral perfusion.

**Disability – Recognition of Potential Central Neurological Failure**

**Level of Consciousness / Alertness**

Use AVPU:

- **A** - alert
- **V** - responds to voice
- **P** - responds to pain
- **U** - unresponsive

Painful stimulus: pinch a digit or pull frontal hair. A child who is unconscious or who only responds to pain has a significant degree of coma.

**Glasgow Coma Scale**

<table>
<thead>
<tr>
<th>Eyes Open:</th>
<th>Score:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneously</td>
<td>4</td>
</tr>
<tr>
<td>To speech</td>
<td>3</td>
</tr>
<tr>
<td>To pain</td>
<td>2</td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Best motor response:</th>
<th>Score:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obey commands</td>
<td>6</td>
</tr>
<tr>
<td>Localises pain</td>
<td>5</td>
</tr>
<tr>
<td>Flexion withdrawal</td>
<td>4</td>
</tr>
<tr>
<td>Abnormal flexion</td>
<td>3</td>
</tr>
<tr>
<td>Abnormal extension</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
</tr>
</tbody>
</table>
Management of the Seriously Ill Child

Any child recognised to have a serious

Airway
Breathing
Circulation
Disability

If a problem is discovered during the above assessment process then the patient must be considered to have a TIME CRITICAL condition.

This child must receive immediate management of airway, breathing and circulation, and be rapidly removed to an appropriate receiving hospital.

Aim to manage A&B at scene and C in transit

Airway management

The child’s airway should be managed in a stepwise manner:

- manual manoeuvres, chin lift/extension, jaw thrust (neutral in neonates) (assuming there is no suspicion of C-spine injury)
- aspiration, removal of any foreign body
- oropharyngeal airway (OP), if no gag reflex
- nasopharyngeal airways
- endotracheal intubation (follow Paediatric ALS guidelines)
- needle cricothyroidotomy.

Take great care when managing the infant and child’s airway manually NOT to accidentally place pressure on the soft tissues under the chin and in front of the neck, as this will actually obstruct the airway or cause damage to the soft tissue.

Breathing management

Ensure adequate oxygenation.

Using 100% O₂ (10-15 lpm) in the seriously ill child is essential and the use of a reservoir bag oxygen mask is ideal, but the child may be distressed by the presence of a mask. Ask the parent to hold the mask. Holding it a little way from the face may be a better option, than not being able to deliver oxygen at all.

If the child is hypoxic, provide 100% O₂ (10-15 lpm) immediately. If there is no improvement after 30-60 seconds consider assisted ventilation.
If ventilation is inadequate in terms of rate or depth, assist ventilation with an appropriate bag mask reservoir device with 100% O₂ (10-15 lpm), to provide a normal rate and depth of ventilation for that child.

Ensure a good mask seal and avoid over-ventilation to prevent gastric distension.

**Circulation Management**

Immediately arrest external haemorrhage.

Do not waste time on the scene attempting to gain IV / IO access or commencing fluid replacement therapy. This should be done en route.

Constantly reassess ABCD’s.

For information on the assessment and management of more specific paediatric situations refer to specific paediatric illness or trauma guidelines.

**Disability management**

The management of any child with changed level of alertness is ensuring an adequate airway, oxygenation, ventilation and circulation to the brain.

After ABC comes DEFG, often used to mean “don’t ever forget glucose”. Any child with a changed level of alertness should have a blood glucose level estimation. If the child is hypoglycaemic, give hypostop, glucagon or 10% glucose IV at 5ml/kg as per the Glycaemic Emergencies guideline.

**SUMMARY: THE MANAGEMENT OF A SERIOUSLY ILL CHILD**

Primary assessment of the child will determine whether the child is time critical or not.

Immediate correction of ABCD’s must commence at the scene and continue en route to hospital without delay.

Children who are found to be seriously ill and therefore time critical MUST BE removed to the nearest suitable receiving hospital without delay with a Hospital Alert Message.

Paediatric drug doses are expressed as mg/kg with an accompanying chart relating age, weight and height to assist you.

This chart MUST be checked prior to ANY paediatric drug administration, no matter how confident the practitioner may be.

**ADDITIONAL INFORMATION**

Remember that the patient history may give you valuable insight into the cause of the current condition. The following may be of great help in your diagnosis:

- relatives, carers of friends with knowledge of the patient’s history
- packets or containers of medication or evidence of administration devices (eg inhalers, spacers etc)
- medic-alert jewellery (bracelets or necklets) which detail the patient’s primary health risk (eg diabetes, anaphylaxis etc) but also list a 24 hour telephone number to obtain a more detailed patient history.

**REFERENCES**


Resuscitation Guidelines 2000 Resuscitation Council (UK).

Pediatric Advanced Life Support American heart Association Dallas Texas 1998.


Maconochie I Capillary refill – it’s enough to make you blush! Prehospital Immediate Care.
INTRODUCTION

Every year about 700 children die as a result of accidents in England and Wales. About half of these children die as a result of road traffic accidents, mainly from head injuries. Fatalities as a result of cycle and pedestrian incidents are most common in children.

Ejection from cars also causes a significant number of deaths and serious injuries.

A third of childhood fatalities occur in the home. Burns and falls are the main cause of death in home accidents.

MOST child deaths are preventable by accident prevention methods.

The principles of paediatric and adult trauma management are very similar. However there are areas of difference, and this guideline is aimed at highlighting those particular areas.

SECTION 1

Basic Trauma Incident Procedure

Safety:
- of yourself, your colleagues, your patient, and others
- fluorescent jackets and safety helmets are mandatory at road traffic accidents, on the public highway, at mass gatherings, on building sites and at any other scene where there is potential danger.

Scene:
- assess – resources required, e.g. more ambulances, Clinical Support Officer, medical support, Officer support, Fire and Police support, helicopter, utilities etc
- triage – if more than one casualty
- operational sitrep. to control: state incident type, request necessary resources, report on casualty numbers, entrapments (see Appendix 1), special hazards, scene access, other relevant factors
- clinical sitrep. to control: using the accepted MIMMS format of “methane”.

Remember a KIND and REASSURING approach is essential in the child, never lie about what is going to happen. THE CHILD MUST TRUST YOU.

Keep the parents and the child together wherever possible and treat them as one.

Stepwise Patient Assessment and management

In ABCDE management, manage problems as they are encountered: i.e. do not move onto assessment of breathing or circulation until airway is secured.

Airway Assessment

Observe mouth, upper airway and nose for air movement, and open airway as required.

Relieve airway obstruction resulting from vomit, blood or foreign material – but NO blind finger sweeps.

At ALL TIMES immobilise C-spine during airway manoeuvres.

In burns check for airway burns, soot in the mouth, lip and nasal oedema.
Stepwise Airway Management

Correct any AIRWAY deficits immediately by:

- positioning jaw thrust, chin lift (neutral in neonates)
- gentle Aspiration
- oropharyngeal airway – insert directly, with down pressure on tongue
- nasopharyngeal airway (use appropriately sized uncuffed ET tube where necessary)
- endotracheal Intubation
- needle cricothyroidotomy.

All techniques require that the individual has received appropriate training.

APPLY A SEMI-RIGID COLLAR WITH IN-LINE IMMOBILISATION (MANUAL OR LONGBOARD ETC) AND APPLY A SMALL PAD UNDER THE SHOULDERS TO PREVENT NECK FLEXION. (The child has a large occipital area at the rear of the skull, this tends to flex the neck forwards when the child is laid on its back. A suitably sized pad under the shoulders prevents this).

- if the child will not tolerate a collar, manual in – line immobilisation should be maintained until patient hand – over at hospital.

BREATHING ASSESSMENT

The chest wall in the child is very elastic and it is not uncommon to have significant intrathoracic injury with little or no apparent external signs of injury to the chest wall.

Assess for skin colour and for any evidence of cyanosis.

Expose the chest and assess adequacy and rate of breathing (see table). Assess both sides of the chest for equal movement and injury such as flail segment. Exclude open chest wounds.

Feel chest wall for equal movement, rib fractures, and any “clunking” of mobile ribs. Feel for skin crackling associated with surgical emphysema, suggestive of an underlying pneumothorax.

Listen, with the stethoscope, for equal air entry on both sides of the chest. Listen on both sides of the chest:

- above the nipples in the mid-clavicular line
- in the mid axilla, under the armpit
- at the rear of the chest, below the shoulder blades

Listen for:

- normal or reduced air entry
- equal air entry on both sides
- wheezing on expiration
- additional crackles and wheezing on inspiration, which may be associated with inhalation of blood or vomit.

Assess for tension pneumothorax (see Thoracic Trauma Guideline and below).

REMEMBER, SUSPECT TENSION PNEUMOTHORAX IF:

- severe and increasing breathlessness
- absent or greatly reduced breath sounds on one side of the chest
- distended neck veins (difficult in children)
- in ventilated patients, increasing resistance to ventilation with reduced or absent air entry on one side of the chest
- tracheal deviation (late sign).

Normal Respiratory Rate

<table>
<thead>
<tr>
<th>Age</th>
<th>Respiratory Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 YEAR</td>
<td>30 – 40 bpm</td>
</tr>
<tr>
<td>1 – 2 YEARS</td>
<td>25 – 35 bpm</td>
</tr>
<tr>
<td>2 – 5 YEARS</td>
<td>25 – 30 bpm</td>
</tr>
<tr>
<td>5 – 12 YEARS</td>
<td>20 – 25 bpm</td>
</tr>
<tr>
<td>&gt;12 YEARS</td>
<td>15 – 20 bpm</td>
</tr>
</tbody>
</table>

Stepwise breathing management

Correct BREATHING deficits immediately by:

- provide adequate OXYGENATION at 10 – 15 lpm, with a reservoir bag and oxygen mask if breathing is adequate
- seal sucking chest wounds (see Thoracic Trauma Guideline)
- provide bag, mask and reservoir ventilation with 100% O₂ (assisted or IPPV) either to ASSIST or RESTART ventilation if it is inadequate or absent.

In the child, NEVER wait until breathing ceases, as cardiac arrest will follow rapidly and be IRREVERSIBLE.

ALWAYS assist ventilation early to provide a normal rate and chest expansion for the child if breathing is in any way inadequate in either rate or effort.

Observe carefully for evidence of tension pneumothorax, and decompress if trained and authorised to do so. See Needle Thoracocentesis (Chest Decompression) Guideline.
CIRCULATION ASSESSMENT
Assess for evidence of external haemorrhage.
Assess skin colour and temperature.
Assess for radial or brachial pulse rate (see table) and volume. Tachycardia with poor pulse volume suggests shock. *Bradycardia in the shocked child is a PRE-TERMINAL SIGN.*
Check capillary refill time (normal <2 secs).
Assess mental state, level of consciousness: agitation, confusion and drowsiness are common in shocked and hypoxic children.

<table>
<thead>
<tr>
<th>Normal Heart Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
</tr>
<tr>
<td>&lt;1 YEAR</td>
</tr>
<tr>
<td>1 – 2 YEARS</td>
</tr>
<tr>
<td>2 – 5 YEARS</td>
</tr>
<tr>
<td>5 – 12 YEARS</td>
</tr>
<tr>
<td>&gt;12 YEARS</td>
</tr>
</tbody>
</table>

Stepwise Circulatory management
Correct CIRCULATORY deficits immediately by:
- arrest of external haemorrhage
- splintage by immobilisation of major fractures on longboard or by rapid application of traction splintage to femoral fractures in older children
- fluid replacement: Obtain IV/IO access where possible, EN ROUTE to hospital with widest possible bore cannula in a large vein e.g. ante-cubital fossa or in the tibia if IO (avoiding a leg which is believed to have a long bone fracture).

If child is trapped or delayed from reaching hospital, commence administration of warmed crystalloid solution, as an IV bolus of up to 20ml/kg body weight (see Paediatric Chart), whilst constantly assessing the physiological response.

Re-assess and infuse further warmed crystalloid solution, up to 20ml/kg, to obtain and retain the presence of a radial or brachial pulse (alternatively in children a capillary refill taken on the sternum or forehead may suffice if pulses are difficult to locate)

Constantly reassess the child en route to hospital.

DISABILITY / LEVEL OF CONSCIOUSNESS ASSESSMENT
Note initial level of consciousness on AVPU Scale and note the time of these observations.

A alert
V responds to voice
P responds to painful stimuli
U unresponsive

If the patient does not score A then the patient considered time critical. A formal GCS en route may be valuable to the receiving hospital.

Assess and note pupil size, equality and response to light.

Observe and note any spontaneous limb movements.

Ask the patient to wiggle their fingers and toes, paying particular note to movements peripheral to any injury site

Measure blood glucose level in any child with a changed level of alertness

Remember confusion or agitation in the child may arise directly from head injury, or secondary to hypoxia from airway impairment, impaired breathing or shock due to blood loss.

Stepwise Disability management
The management of any child with changed level of alertness is ensuring an adequate airway, oxygenation, ventilation and circulation to the brain.

Any child with a changed level of alertness should have a blood glucose level estimation. If the child is hypoglycaemic treat as per “Glycaemic Emergencies” Guideline.

Evaluate
Protect the child from a cold environment during the Primary Survey as children lose heat rapidly. Additionally exposure in a child can also have lasting psychological effects.

EVALUATE patient as TIME CRITICAL or NON-TIME CRITICAL at the end of this rapid PRIMARY SURVEY, on the basis of the following criteria:

Any major ABCD problem.
Any serious injury pattern and/or mechanism of injury factors.
Serious injury pattern:
- possible spinal cord injury
- serious chest trauma
- serious head trauma
- multiple injuries
- penetrating trauma to: head, neck or chest
- serious burns, especially where the airway may be involved or the child has other accompanying injuries.

Mechanism of Injury Factors:
- entrapments
- injuries from falls from a height
- ejection from a vehicle
- death or critical injuries of other occupants in the vehicle.

If a child has any of the above features, treat as time critical.

Prepare longboard with head and body restraints for transportation immediately.

A and B problems will have been corrected as encountered during the primary survey. Rapidly package the patient on the longboard and transport to nearest suitable A&E Department.

Provide a HOSPITAL ALERT MESSAGE / Information call en route, (see hospital alert message guideline).

En route – continue patient MANAGEMENT (see below).

At the hospital, provide a comprehensive verbal handover, and a completed clinical record to the Receiving Hospital Staff.

If child is NON-TIME CRITICAL proceed to SECTION 3 – Secondary Survey. This should take no more than 5-6 minutes and many elements of it may be performed en route to hospital.

SECTION 3
Secondary Survey

The secondary survey will only be performed in non-time critical children. This should be performed wherever possible en route to hospital in the ambulance.

Head
Assess and palpate for bruising, laceration, tenderness and evidence of fractures.

Reassess pupil size and reactivity.

Assess skin colour and temperature.

In burns re-check for AIRWAY burns, soot in the mouth, lip and nasal oedema.

Glasgow Coma Scale.
Assess the neurological status using the Glasgow Coma Scale (see below).

Coma is defined as a Glasgow Coma Scale score of <8.

A modification for children is used to compensate for their less mature level of co-operation and development.

**Glasgow Coma Scale**

<table>
<thead>
<tr>
<th>Eyes Open:</th>
<th>Score:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneously</td>
<td>4</td>
</tr>
<tr>
<td>To speech</td>
<td>3</td>
</tr>
<tr>
<td>To pain</td>
<td>2</td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Best motor response:</th>
<th>Score:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obey commands</td>
<td>6</td>
</tr>
<tr>
<td>Localises pain</td>
<td>5</td>
</tr>
<tr>
<td>Flexion withdrawal</td>
<td>4</td>
</tr>
<tr>
<td>Abnormal flexion</td>
<td>3</td>
</tr>
<tr>
<td>Abnormal extension</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Best verbal response:</th>
<th>Score:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientated</td>
<td>5</td>
</tr>
<tr>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td>Silent</td>
<td>1</td>
</tr>
</tbody>
</table>
Modification of Glasgow Coma Scale for Children <4

<table>
<thead>
<tr>
<th>Best verbal response</th>
<th>Score:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate words or social smiles, fixes on and follows objects</td>
<td>5</td>
</tr>
<tr>
<td>Cries, but is consolable</td>
<td>4</td>
</tr>
<tr>
<td>Persistent irritable</td>
<td>3</td>
</tr>
<tr>
<td>Restless, agitated</td>
<td>2</td>
</tr>
<tr>
<td>Silent</td>
<td>1</td>
</tr>
<tr>
<td>Eyes open: As per Adult Scale</td>
<td></td>
</tr>
<tr>
<td>Motor response: As per Adult Scale</td>
<td></td>
</tr>
</tbody>
</table>

Neck
Assess for any signs of trauma.
Assess larynx, neck veins, carotid pulse, spinal tenderness, trachea for deviation, surgical emphysema.
Collar may need removal whilst in-line immobilisation continues.

Chest
Re-assess the chest and examine in more detail for:
Open wounds, contusions, seat belt marking, flail segment, and re-assess respiratory rate and effort.
Feel for rib fractures, instability and surgical emphysema (skin “crackling”).
Listen for breath sounds in all lung fields, assess for haemothorax (shock, reduced air entry at base of chest) and pneumothorax.

Abdomen
Examine for open wounds, contusions, seat belt marking.
Feel for tenderness in all four quadrants but be aware that many serious abdominal injuries initially present as asymptomatic.

Pelvis
The risk of starting a catastrophic bleed outweighs the benefits of compressing the pelvis to assess for potential fractures. Such injuries should be assumed from the mechanism and other associated pattern injuries.

Lower and upper limbs
Look for wounds and evidence of fractures.
Check for MSC x 4:
M = MOTOR - Test for movement
S = SENSATION - Apply light touch to evaluate sensation
C = CIRCULATION - Assess pulse and skin temperature
\[ x 4 = \text{ALL FOUR LIMBS} \]

Summary of the management of Non-Time Critical Paediatric Trauma
Ensure ABCs.
Ensure adequate oxygenation.
Treat injuries as required.
Apply appropriate patient monitoring, ECG and pulse oximetry.
Obtain IV / IO access / infusion, if required, en route.
Apply appropriate splintage, as required (may need analgesia).
Transport to nearest suitable receiving hospital with an Information Call, if required.
Continually re-assess ABCD’s to ensure no deterioration to critical status.
At the hospital, provide a comprehensive verbal handover, and a completed clinical record to the receiving hospital staff.

ADDITIONAL INFORMATION
Airway and Cervical Spine Control
Whilst securing the airway, the head and neck must be firmly manually immobilised. Once the airway is secure, immobilise the neck with a correctly sized collar, applied direct to skin and maintain in-line immobilisation until secured onto longboard. Pad under the shoulders to compensate for occipital prominence.

Once on a longboard a patient MUST ALWAYS remain accompanied by a staff member equipped with and trained in the use of a suction device.
Breathing

The **major danger** in trauma patients is **hypoventilation**, with falling oxygenation (hypoxia) and rising carbon dioxide levels (hypercapnia). This is directly responsible for secondary brain injury.

Remember this may occur in obvious low respiratory rates, coupled with poor respiratory effort.

Consider assisted ventilation in combatative head injured patients when this can be safely achieved.

In children, **any inadequacy of respiratory rate or effort** must be treated at once by assisted ventilation.

Circulation

**Fluid therapy**

En route to hospital (or in situ if trapped) patients with compromised circulation, or the potential for circulatory problems as a result of their injuries, **should have an IV/IO line of the largest practical bore** sited in the upper limb in a big vein, e.g. ante-cubital fossa (for IV) or in the tibia (for IO). This line must be well secured as it is the child’s IV “lifeline”.

A bolus dose of up to **20ml/kg** of WARMED crystalloid solution should be given, and the effects assessed on the circulatory system, before further fluids are given. The return of a brachial or radial pulse suggests an adequate blood pressure has been achieved. The aim is to reduce tachycardia and other features of hypovolaemia.

In the non-trapped patient, only **one limb** should be used for IV/IO access attempts, and an intact site must be left for hospital and medical IV /IO access. In non-trapped CRITICAL patients, IV access should be obtained **EN ROUTE** to hospital, NOT at the scene.

Hypoglycaemia is common in children who are seriously ill or injured as the child has very limited stores of glucose. Hypoglycaemia should be managed as per the Diabetic Emergencies Guideline.

Disability

The Glasgow Coma Scale is the accepted international standard for measuring neurological state. AVPU provides us in the primary survey with a snapshot view of the level of consciousness. In the secondary survey, assessing the Glasgow Coma Scale can give a more precise picture, where this is more appropriate. It assesses eyes, motor response and verbal response.

Analgesia in Trauma

**CRITICALLY INJURED** children may require analgesia, once their life threatening problems have been resolved. This should be via the IV route where possible, giving morphine 0.05mg/kg or nalbuphine 0.3mg/kg IV.

In **NON-TIME CRITICAL** patients, if pain is severe, Entonox can be administered for a trial of effect for at least 5 – 10 minutes, as long as the child is capable of following the administration instructions. Morphine 0.05mg/kg or nalbuphine 0.3mg/kg IV may be given if Entonox fails to work effectively.

**Paediatric drug doses are expressed as mg/kg with an accompanying chart relating age, weight and height to assist you.**

This chart **MUST** be checked prior to ANY paediatric drug administration, not matter how confident the practitioner may be.
INTRODUCTION
Adult and paediatric resuscitation follow the same guiding principles, but there are fundamental differences when it comes to carrying out these procedures.

Children in need of resuscitation will vary in age, size and weight considerably from the 3kg baby to the 65kg teenager. The methods, types and sizes of equipment will therefore vary, as will the drug doses, depending on these factors.

The causes of death are very different compared to the adult, with some 35% of 5-15 year olds dying of accidental causes, and primary heart disease deaths being extremely rare.

HYPOXIA IS THE COMMONEST CAUSE OF CARDIAC ARREST IN CHILDREN

Blood loss, Sudden Infant Death Syndrome (SIDS), and overwhelming infection are other contributing causes of death in the child.

Identification and correction of Airway, Breathing and Circulatory deficits are the overriding principles of management, as in the adult, but the emotion and apprehension involved tend to be more profound in both children and parents (if present) as well as in all of the health care professionals involved.

Good, up to date assessment and treatment skills help to overcome problems associated with the stress engendered by this particular type of emergency, and allow us to give the seriously ill or traumatised child the best possible chance of survival.

DEFINITION
Infant = <1 year
Child = >1 year – 8 years
Adult = >8 years (or from the presence of puberty)

These age ranges may be adapted for practical purposes depending upon the size of the child – for example a particularly small nine year old may safely be treated in the 1-8 year age range.

ASSESSMENT
Level of Consciousness (LOC) check:

Immobilise head and C-spine, if any evidence of trauma.

Shake gently, assess response based on AVPU.

Airway

Open airway with chin lift/lower jaw support.

Neutral head position in the infant, “sniffing” the breeze position in the child.

Remove any obvious visual obstruction immediately (blind finger sweep contra-indicated).

Breathing

Look, feel, listen for breathing.

Circulation

Check brachial pulse (infant) or carotid pulse (child).

MANAGEMENT OF PAEDIATRIC BASIC LIFE SUPPORT (BLS)

If child is breathing normally

Maintain airway.

Place into the recovery position (protect C-spine, if any evidence of trauma).

Observe closely.

If infant OR child is NOT breathing

Clear airway.

Commence ventilation with up to five attempts to give two effective ventilations (mouth to mouth/nose).

Assess circulation.

If circulation IS present

Continue ventilating until the child starts breathing spontaneously.

Regularly recheck for signs of circulation.

If infant OR child has NO pulse (cardio-respiratory arrest) or profound bradycardia (<60 bpm).

Start with five chest compressions at a rate of 100/min.

Continue resuscitating (combining compressions and ventilations) as per the Resuscitation Table.
ADDITIONAL INFORMATION

Level of consciousness (LOC)

The LOC usually appears down the primary survey list – A, B, C, and then D. In reality a rapid LOC check is made before assessing the airway.

Airway

Lower jaw support is essential to move the child’s relatively large tongue forwards away from the posterior pharynx.

Care must be taken NOT to put finger pressure onto the soft tissues of the floor of the mouth when performing jaw support, as this forces the tongue into the mouth and can obstruct the airway. In very young children it can also damage these vulnerable tissues.

Do NOT over-extend the neck, as this can kink the airway. Use a small piece of padding under the shoulders to attain proper alignment and to compensate for the younger child’s relatively large head (occiput), which can otherwise cause hyperflexion.

Breathing

It is important to ventilate only to the point where the child’s chest is seen to begin to rise. To inflate beyond this point can lead to gastric inflation and subsequent regurgitation and airway compromise. Furthermore, in younger children, irreparable damage to vulnerable lung tissue can result from over-inflation.

Circulation

Infants have relatively short, fat necks that make it difficult to palpate a carotid pulse. It is better, therefore, to feel for the brachial pulse on the inner aspect of the upper arm.

At least ten seconds may need to be spent in assessing a pulse as bradycardias are a common accompaniment to hypoxic episodes in children.

A bradycardia in an infant or a small child is any pulse rate below 60 beats per minute.

If no pulse is palpable, OR if there is a profound bradycardia <60 bpm, then external chest compressions must be commenced to maintain circulation.

RESUSCITATION TABLE

<table>
<thead>
<tr>
<th>Using:</th>
<th>INFANT</th>
<th>CHILD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(&lt;1 yr)</td>
<td>(1 – 8 yrs)</td>
</tr>
<tr>
<td>Two fingers OR two thumbs with hands encircling chest</td>
<td>Heel of hand</td>
<td></td>
</tr>
<tr>
<td>Position</td>
<td>One finger breadth below nipple line</td>
<td>One finger breadth above xiphisternum</td>
</tr>
<tr>
<td>Depth – 1/3rd depression of chest</td>
<td>1.5 – 2.5cm or chest resistance</td>
<td>2.5 – 4.5cm or chest resistance</td>
</tr>
<tr>
<td>Ratio (Vents: Comp) Rate</td>
<td>1 : 5 (100/minute) (20 cycles/min)</td>
<td>1 : 5 (100/minute) (20 cycles/min)</td>
</tr>
</tbody>
</table>
Paediatric Basic Life Support (BLS)

**PAEDIATRIC BASIC LIFE SUPPORT (AGE <8 YEARS)**

- **STIMULATE AND CHECK RESPONSIVENESS**
- **OPEN AIRWAY**
  - Head Tilt, Chin Lift (Jaw Thrust)
- **CHECK BREATHING**
  - Look, Listen, Feel
  - **IF BREATHING, PLACE IN RECOVERY POSITION**
  - **YES**
  - **IF NO CHEST RISE**
    - reposition airway
    - reattempt up to five times
  - **IF NO SUCCESS**
    - treat as for airway obstruction
- **BREATHING**
  - Two effective breaths
- **ACCESS FOR SIGNS OF A CIRCULATION CHECK PULSE**
  - (Ten secs maximum)
  - **None present**
  - **COMPRESS CHEST**
    - Five compressions: one ventilation
    - 100 compressions/minute
  - **CONTINUE RESUSCITATION**

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INTRODUCTION

Children rarely present in cardiac or respiratory arrest. However, when this does occur, ambulance staff are unlikely to feel confident and well informed of all aspects of paediatric resuscitation.

The purpose of this protocol is to highlight the key differences in applying resuscitation skills to children.

Advanced Life Support in children requires at least **TWO** attendants as Basic Life Support must not be interrupted under any circumstances (except to defibrillate).

If cardiac arrest is secondary to a treatable cause e.g. hypovolaemia induced PEA minimal time should be spent on scene to establish IV/IO access to treat the cause as the second crew member can continue BLS throughout this procedure.

**RAPID TRANSPORT TO DEFINITIVE CARE IS THE ONLY INTERVENTION OF PROVEN BENEFIT IN PAEDIATRIC CARDIAC ARREST.**

**DO NOT DELAY ON SCENE.**

**HISTORY**

Establish history of event and injury mechanism if appropriate.
ASYSTOLE

Asystole is the commonest arrest rhythm in children. Usually follows hypoxia, and is often preceded by BRADYCARDIA. Before any drug or advanced procedure is carried out the patient must be receiving continuous CPR.

- Monitor shows Asystole
  - Commence CPR with BVM ventilation

- TRANSPORT EARLY
  - If TWO attendants present continue ALS treatment en route

- Advanced airway techniques (LMA, intubation etc) ONLY if BVM Cannot be maintained effectively.

- IV / IO Access

- Adrenaline (1:10,000) 10 micrograms/kg IV/IO
  - (equivalent to 0.1ml/kg)
  - OR
  - Adrenaline (1:1000) 100 micrograms/kg ET
  - (equivalent to 0.1ml/kg)

- 1:5 CPR for three minutes

- Adrenaline (1:10,000) 10 micrograms/kg IV / IO (equivalent to 0.1ml/kg)
  - OR
  - Adrenaline (1:1000) 100 micrograms/kg ET (0.1ml/kg)
  - Every three minutes
VENTRICULAR FIBRILLATION – VF

(much less common in children than adults)

Monitor Shows VF

(Precordial Thump if indicated)
Defibrillate 2 J/kg (1)
Defibrillate 2J/kg (2)
Defibrillate 4J/kg (3)
Do not defibrillate a child <10 kg without using paediatric paddles

TRANSPORT EARLY

Advanced airway techniques (LMA, intubation etc) ONLY if BVM
Cannot be maintained effectively.
IV/IO Access

Adrenaline (1:10,000) 10 micrograms/kg IV/IO (equivalent to 0.1ml/kg)
OR
Adrenaline (1:1,000) 100 micrograms/ kg ET (equivalent to 0.1ml/kg)

1:5 CPR (1 MIN)

Defibrillate 4 J/kg (4)
Defibrillate 4 J/kg (5)
Defibrillate 4 J/kg (6)
1:5 CPR – (1 min)

Continue defibrillating at 4J/kg

Adrenaline (1:10,000) 10 micrograms/kg IV/IO (equivalent to 0.1ml/kg) OR
Adrenaline (1:1,000) 100 micrograms/kg ET (equivalent to 0.1ml/kg)

Every three minutes

Consider:
Different paddle positions (front and rear)
Hypothermia/drugs etc
PULSELESS ELECTRICAL ACTIVITY (PEA)
The most common cause of PEA in children is profound shock.
Because hypovolaemia is the most common cause in children, BLS, adrenaline and volume replacement is the
basic treatment routine.

Monitor shows PEA

Consider Causes

<table>
<thead>
<tr>
<th>Toxic</th>
<th>Hypoxia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamponade</td>
<td>Hypothermia</td>
</tr>
<tr>
<td>Tension pneumothorax</td>
<td>Hypotension</td>
</tr>
<tr>
<td>Thromboembolic</td>
<td>Hypo / Hyperkalaemia</td>
</tr>
</tbody>
</table>

Examples:

<table>
<thead>
<tr>
<th>Medical</th>
<th>Trauma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug overdose</td>
<td>Hypovolaemia</td>
</tr>
<tr>
<td>Intoxication</td>
<td>Tension pneumothorax</td>
</tr>
<tr>
<td>Electolyte imbalance</td>
<td>Cardiac tamponade</td>
</tr>
</tbody>
</table>

TRANSPORT EARLY

Advanced airway techniques (LMA, intubation etc) ONLY if BVM
Cannot be maintained effectively.

IV/IO Access

Adrenaline (1:10,000) 10 micrograms/kg IV/IO (equivalent to 0.1ml/kg)
OR
Adrenaline (1:1,000) 100 micrograms/kg ET (equivalent to 0.1ml/kg)

Crystalloids 20 ml/kg IV/IO in all PEA arrests
Repeat as required

1:5 CPR – (three mins)

Continue en route. If no response
Continue Adrenaline (1:1,0000) 10 micrograms/kg IV/IO or
Adrenaline (1:1000) 100 micrograms/kg ET
(both equivalent to 0.1ml/kg) every three mins
ALS PROCEDURES IN THE CHILD

Airway management

Aspiration must be performed with soft catheters, and with care not to damage mucous membranes. Aspirate for short periods, applying suction on withdrawal of the catheter.

Oropharyngeal airways, ranging from size 000 in neonates to size 1 in children may be introduced with care. In the older child they should be introduced “upside down” and rotated into position, but in the smaller child slide over the tongue using the laryngoscope blade, the correct way up.

Sizing should be checked from the centre of the lips to the angle of the jaw.

Nasopharyngeal airways are not produced for younger children, in these circumstances an uncuffed ET tube (below size 6), sized appropriately, may be used.

Advanced airway techniques are of no proven benefit in children and should be attempted ONLY where effective BVM cannot be maintained.

LARYNGEAL MASK AIRWAYS / ENDOTRACHEAL INTUBATION

Pre-oxygenate with 100% Oxygen

Laryngeal mask airway should be inserted as per adult procedure.

Intubation may need a small pillow under shoulders.

- introduce blade into vallecula, as in adult
- <8 years, insert uncuffed tube, ventilate and secure
- >8 years, insert cuffed tube, inflate cuff, ventilate and secure
- check tube position (and also after EVERY patient movement).

Catheter mounts are not required with uncut, uncuffed tubes as they contribute significantly to the dead space but should be used in cuffed tubes. Attach to BVM and reservoir (in all children), ParaPAC or PneuPAC (in older children) and ventilate. All BVMs used in paediatric resuscitation should have a blow off valve to prevent high ventilation pressures.

Continually reassess tube position, especially after ANY patient movement.

ENDOTRACHEAL TUBES

(see Paediatric Resuscitation Chart).

ET Tube Sizes

Paediatric internal diameter and length of ET tube formulae:

Age/4 + 4 = ET tube diameter in mm.

Age/2 + 12 = ET tube length in cm (oral).

Pre term 2.5-3.0mm
Newborn 3.0 – 3.5mm
6 months 3.5mm
18 months 4.0mm
3 years 4.5mm
5 years 5.0mm
8 years 6.0mm
10 – 15 years 6.5 – 8.0mm cuffed

DO NOT ATTEMPT TO INTUBATE FOR MORE THAN 30 SECONDS – RE-OXYGENATE AND TRY AGAIN OR USE MORE BASIC METHODS

Needle cricothyroidotomy

This is a final technique, used only where all other methods of airway management have failed e.g. complete airway obstruction known to be with a foreign body that is not removable by other means.

- locate the cricothyroid membrane
- assemble an appropriate size cannula and 5ml syringe
- stabilise the larynx between thumb and index finger
- insert in mid-line at 45° downwards angle
- on penetration, aspirate air, and advance cannula
- secure and connect via T-piece to oxygen supply
- adjust flow starting with 1 litre per year of life (maximum 10 – 15 lpm), and increasing until the chest rises and ventilate for 1 second, with 4 seconds off to allow for expiration. Ensure the chest falls between inflations.

This will only allow 20 – 30 minutes of ventilation before CO₂ build up becomes a problem.
THIS TECHNIQUE MUST ONLY BE USED BY THOSE QUALIFIED IN THIS PROCEDURE AND IN EXTREME EMERGENCIES ONLY.

Ventilation management

Use either an infant or adult BVM and reservoir bag (with 100% O\textsubscript{2}), in all children, or automated ventilator in older children.

Ventilate at:

<table>
<thead>
<tr>
<th>VENTILATION RATES</th>
<th>Neonates &lt;1 month</th>
<th>40-60 bpm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Infants</td>
<td>30 – 40 bpm</td>
</tr>
<tr>
<td></td>
<td>1 – 8 years</td>
<td>20 – 30 bpm</td>
</tr>
<tr>
<td></td>
<td>8 years to adult</td>
<td>16 bpm</td>
</tr>
</tbody>
</table>

Keep assessing adequacy of ventilation and ET tube position. The tube placement MUST be verified after every patient movement, however slight using SaO\textsubscript{2} and ET CO\textsubscript{2} monitoring as well as visual confirmation

Circulation management

Intravenous Access

This is best obtained in the upper limb and the antecubital fossa is the easiest site. Hand veins may be used in small children, but as a secondary route. The long saphenous vein may also be suitable.

Alternatively, if IV access cannot be achieved in either two attempts or 90 seconds obtain intraosseous access.

The endotracheal route may be used but is less effective and should only be considered if no other vascular access is obtainable.

Drugs (in Cardiac Arrest) adrenaline (1:10,000, 1:1,000).

N.B Two strengths of adrenaline (1:1,000 and 1:10,000) are used in paediatric cardiac arrest. Care must be taken to ensure the correct strength of drug is given via the correct route.

Initial and subsequent IV/IO dose is 10 micrograms/kg of 1:10,000 (equivalent to 0.1ml/Kg) e.g. In a 10 kg child, dose = 100 micrograms = 1ml of 1:10,000 adrenaline.

ET doses at 100 micrograms/kg (equivalent to 0.1ml/kg of the more concentrated 1:1,000 solution).

There is no evidence to support the use of high dose adrenaline in paediatric cardiac arrest. Therefore high dose adrenaline should not be routinely given outside of hospital except for cardiac arrest secondary to circulatory collapse (e.g. septicaemia) when second and subsequent doses at 100 micrograms/kg may be considered.
Paediatric Emergencies

BLS Algorithm

Ventilate / Oxygenate

Attach Defibrillator / Monitor

Assess rhythm

VF/VT

Defibrillate as necessary

CPR 1 min

Non VF/VT

Asystole, Pulseless Electrical Activity (PEA)

Adrenaline

CPR three min

During CPR

Attempt / Verify
Tracheal Intubation
IV / IO Access

Check
Electrode / paddle position and contact

Administer
Adrenaline every three minutes

Correct reversible causes
Hypoxia
Hypovolaemia
Hypo / hypokalaemia
Hypothermia
Tension pneumothorax
Tamponade
Toxic / therapeutic disorders
Thromboembolic

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INTRODUCTION
Ambulance staff have little experience or opportunity to practice resuscitation in newborn babies. The application of the following information and principles will allow ambulance staff to deal better with what is always a demanding emergency.

HISTORY
Hypoxia is the commonest cause of cardiac arrest in neonates.

ASSESSMENT
It is vitally important that we understand that recognising when an infant is seriously ill is far more important than reaching an actual diagnosis.

A rapid assessment system for classifying the TIME CRITICAL or NON-TIME CRITICAL state of a neonate follows.

Critical Assessment and management of the newborn infant
Skin colour, heart rate (by auscultation) and respiratory effort are the key indicators that allow us to determine the condition of a newborn baby and whether there is a need for urgent resuscitation.

HEALTHY – Pink skin
- a heart rate of >100 bpm and good respiratory effort
- keep warm, consider cutting the cord, place on mother’s abdomen or at the breast, if requested, and wait for midwife, or transport to hospital.

PRIMARY APNOEA – Blue skin
- this is not an uncommon condition in the newborn
- a heart rate of between 80–100 bpm and apnoeic or gasping breathing
- apply gentle stimulation, if required, together with “blow by” (directing O₂ from therapy tubing over mouth and nose). O₂ therapy may produce spontaneous respiration
- assess after one minute of this treatment
- if no respiration, provide gentle suction, if required, bearing in mind that excessive aspiration may cause bradycardia due to stimulation of the vagal nerve. Assist ventilations with bag mask and reservoir ventilation (with high flow O₂) at 30 bpm
- commence cardiac compression if heart rate drops < 60bpm.

TERMINAL APNOEA – White skin
- heart rate <60 bpm and apnoeic
- these babies will not breathe on their own
- gentle suction, if required, and bag mask and reservoir ventilation (high flow O₂) at 30 bpm.
- commence cardiac compression at 120/minute (three compressions to one ventilation).

FRESH STILL BIRTH – White skin
- heart rate – absent and apnoeic
- full BLS/ALS guideline (see Neonatal BLS)
- ventilate with high flow O₂ at 30-40 bpm, and cardiac compression at 120 bpm.

Good bag, valve mask ventilation skills are essential. Intubation should be considered as a last resort where the airway cannot be maintained through other methods.

Neonates in these last three categories must be considered as TIME CRITICAL, and be transported rapidly to hospital with no interruption to resuscitation, unless the baby responds.

LOAD AND GO to nearest Receiving Hospital.

Provide a hospital pre alert message / information call.

In the NON-TIME CRITICAL neonate, the APGAR scoring system may be used to more fully assess the baby.
Apgar Score
If the baby’s condition is not immediately critical, it can be assessed by using the APGAR score as illustrated. The score is based on the examination of five physical signs and is designed to be used at one and five minutes after birth.

<table>
<thead>
<tr>
<th>Score</th>
<th>Heart Rate</th>
<th>Respirations</th>
<th>Muscle Tone</th>
<th>Reflex Irritability</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Absent</td>
<td>Absent</td>
<td>Limp</td>
<td>No Response</td>
<td>Blue or Pale</td>
</tr>
<tr>
<td>1</td>
<td>Slow (&lt;100/min)</td>
<td>Slow, irregular</td>
<td>Some flexion</td>
<td>Grimace</td>
<td>Pink body with blue extremities</td>
</tr>
<tr>
<td>2</td>
<td>&gt;100/min</td>
<td>Good, crying</td>
<td>Active motion</td>
<td>Cough or sneeze</td>
<td>Completely pink</td>
</tr>
</tbody>
</table>

**1 Minute** | **5 Minutes**

<table>
<thead>
<tr>
<th>Heart Rate</th>
<th>Respiratory Effort</th>
<th>Muscle Tone</th>
<th>Reflex Irritability</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Urgent requirement for interventions and treatment should not be delayed by use of the APGAR score.**

Neonatal BLS
In ABCD management, manage deficits as they are encountered: i.e. do not move onto rectification of Breathing or Circulation until Airway is secured.

**Airway**
Maintain neutral airway alignment.

LOOK, LISTEN, FEEL for breathing.

Remove any obstruction carefully with fingers (not finger sweeps), Magill’s forceps and/or gentle suction for a short period.

Look for evidence of Meconium; immediately suction gently if necessary (see Appendix 1).

**Breathing**
While maintaining an open airway, using the methods described above, seal the baby’s mouth and nose and commence ventilation with a bag mask reservoir ventilation with 100% O₂.

Give five initial ventilations. (See Additional Information)

If the chest does not rise, return to Airway and check again that airway manoeuvres are applied correctly.

If ventilation still does not result in chest movement, resort to appropriate action. (Follow the paediatric choking guideline)

**Circulation**
Check for pulse at the brachial artery in the medial (inner) aspect of the antecubital fossa.

An inadequate circulation is manifested by an absence of a pulse for ten seconds, or by a rate of <60 bpm. In either case, cardiac compressions must be commenced.

The newborn baby must be placed on a firm surface on its back.

Two fingers are used to compress the sternum, one fingerbreadth below the nipple line, to a depth of approximately 1.5 to 2.5cm.

If a second rescuer is ventilating the baby, an alternative method is to encircle the baby’s chest with both hands while compressing the sternum with both thumbs at the correct site.
A ratio of 1:3 (ventilations to compressions) should be maintained, for a cycle of approximately 40 minute. This equates to 120 compressions/minute to compensate for a baby’s normally faster heart rate.

Basic life support should be continued for one minute before other interventions or transport to hospital is considered.

ADDITIONAL INFORMATION

**Airway**
A baby’s head should not be tilted beyond neutral alignment, as the ‘sniffing position’ will kink and block the airway.

When using the chin lift, remember not to grip too hard as this will damage vulnerable soft tissue.

To achieve the jaw thrust in a newborn, place two or three fingers under the angle of the mandible on either side, and lift the jaw upwards.

Finger sweeps are contra-indicated in babies as they can cause more damage to the soft palate and result in an even more severe airway problem, or they can drive an obstruction even further down with the same result.

**Breathing**
Ventilate only until the point where you can observe the chest beginning to rise; any greater pressure can cause damage to immature lung tissue.

Administer slow ventilation (1-1.5 seconds) in order to reduce the risk of gastric distension and regurgitation.

**Circulation**
A baby’s neck is short and fat, making it difficult to feel a pulse in the usual site. Aside from the brachial artery, it is also possible to use the femoral artery as an alternative.

APPENDIX 1

**Special Circumstances in caring for the Newborn**

**Temperature Control in Newborns**
The newborn baby will lose body heat very rapidly, so it is important to dry them and wrap them in a warm blanket as soon as possible.

Failure to do this will result in the baby using increased oxygen, and placing it unnecessarily at risk of becoming hypoxic (remember, hypoxia is the commonest cause of cardiac arrest in children)

**Dealing with Meconium Aspiration**
Meconium is a greenish liquid that may be present in the baby’s pharynx and lower airways at birth. It is caused through the baby becoming hypoxic in the womb resulting in gut vessel vasoconstriction, increased peristalsis and sphincter relaxation. The intestinal liquid (meconium) becomes mixed in the amniotic fluid.

Meconium is a sign of pre-delivery hypoxia and when seen is a warning that some level of resuscitation may be required. It is highly irritating to the airways and must be removed.

Gentle suctioning must be employed immediately to remove as much meconium as possible, and the Midwife or Hospital advised of its presence.
Dry the baby, remove any wet cloth and cover

Initial Assessment at Birth
Start the clock or note the time
Assess: COLOUR, TONE, BREATHING, HEART RATE

If not breathing ...

Control the airway
Head in the neutral position

Support the breathing
If not breathing – FIVE INFLATION BREATHS (EACH 2-3 seconds duration)
Confirm a response:- increase in HEART RATE or visible CHEST MOVEMENT

If there is no response
Double check head position and apply JAW THRUST
Five inflation breaths
Confirm a response:- increase in HEART RATE or visible CHEST MOVEMENT

If there is still no response
use a second person (if available) to help with airway control and repeat inflation breaths
Inspect the oropharynx under direct vision (is suction needed?) and repeat inflation breaths
Insert an oropharyngeal (Guedel) airway and repeat inflation breaths
Confirm a response:- increase in HEART RATE or VISIBLE CHEST MOVEMENT

When the chest is moving
Continue the ventilation breaths if no spontaneous breathing

Check the heart rate
If the heart rate is not detectable or slow (less than around 60 bpm and NOT increasing)

Start chest compressions
First confirm chest movement – if chest not moving return to airway
Three chest compressions to one breath for 30 seconds (rate 120/min)

Reassess Heart Rate
If improving – stop chest compressions, continue ventilation if not breathing
If heart rate still slow, continue ventilation and chest compressions
Consider venous access and drugs at this stage

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INTRODUCTION
A brief aide-memoir is essential and is easy to use if the child’s:

**WEIGHT, HEIGHT or AGE** are known.

As drug doses, defibrillation energy and fluid administration, are all based on weight (sometimes banded into age ranges where this is safe), calculating this in the field can be vital.

Weight provides the most accurate measure for calculating drug dosages and allows for the particularly large or small child of any given age.

If height or age are known, the following charts allow an estimation of key resuscitation data, in addition to other relevant information.

A patient may receive the full adult dose when their weight is greater than 40 kg. This generally approximates to age 12 although this may vary and an accurate weight is the preferred measure where possible.

Irrespective of the confidence of the practitioner **ALL** paediatric drug dosages MUST be checked against an appropriate aide memoire prior to administration.

All dosages given are INITIAL doses. The following drugs may require a repeat dose in accordance with the appropriate drug schedule:

- diazepam PR (repeat once after five minutes if necessary)
- adrenaline IV (every three minutes during resuscitation)
- adrenaline IM (every five minutes during anaphylaxis if patient continues to deteriorate)
- glucose 10% (in older children titrate up to maximum dose stated)
- morphine (repeat to a maximum of 0.2mg/kg)
- nalbuphine (repeat once after 10 minutes if necessary)
- naloxone (second dose at 0.1mg/kg – 10 times first dose – if necessary)
- salbutamol
- crystalloids (repeat once if necessary or, in older children, to maximum dose stated).

**NB** Where a SINGLE dose of rectal diazepam has been administered and IV access subsequently gained a SINGLE dose of IV diazemuls may be substituted for the second dose of rectal diazepam if required.

**All other drugs are single doses only**
### Paediatric Emergencies

#### Paediatric Drugs Dosages (mg)

<table>
<thead>
<tr>
<th>Age range (approximate)</th>
<th>Crystalloids</th>
<th>Hydrocortisone</th>
<th>Morphine</th>
<th>Nebuline</th>
<th>Nalbuphine</th>
<th>Naloxone</th>
<th>Atropine</th>
<th>Benzylpenicillin</th>
<th>Dexamethasone (IV)</th>
<th>Diazepam (IV)</th>
<th>Adrenaline (IV)</th>
<th>Glucose 10%</th>
<th>Defibrillation (1+2)</th>
<th>Defibrillation (subsequent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1/12</td>
<td>Up to 20ml/kg</td>
<td>70</td>
<td>15</td>
<td>0.05mg/kg</td>
<td>0.5</td>
<td>0.04</td>
<td>0.07</td>
<td>0.15mg/kg</td>
<td>300</td>
<td>1</td>
<td>0.07</td>
<td>0.05</td>
<td>0.2J/kg</td>
<td>20J/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>20</td>
<td>0.05mg/kg</td>
<td>0.5</td>
<td>0.05</td>
<td>0.1</td>
<td>0.15mg/kg</td>
<td>300</td>
<td>1</td>
<td>0.1</td>
<td>0.05</td>
<td>20J/kg</td>
<td>40J/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>140</td>
<td>20</td>
<td>0.1mg/kg</td>
<td>1.5</td>
<td>0.07</td>
<td>0.2</td>
<td>0.25mg/kg</td>
<td>600</td>
<td>1.5</td>
<td>0.2</td>
<td>0.12</td>
<td>10J/kg</td>
<td>20J/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200</td>
<td>30</td>
<td>0.1mg/kg</td>
<td>1.5</td>
<td>0.07</td>
<td>0.25</td>
<td>0.1mg/kg</td>
<td>600</td>
<td>1.5</td>
<td>0.1</td>
<td>0.12</td>
<td>10J/kg</td>
<td>20J/kg</td>
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<tr>
<td></td>
<td></td>
<td>260</td>
<td>40</td>
<td>0.3mg/kg</td>
<td>3</td>
<td>0.13</td>
<td>0.5</td>
<td>0.333mg/kg</td>
<td>600</td>
<td>3</td>
<td>0.25</td>
<td>0.25</td>
<td>10J/kg</td>
<td>20J/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>320</td>
<td>50</td>
<td>0.5mg/kg</td>
<td>5</td>
<td>0.13</td>
<td>0.5</td>
<td>0.5mg/kg</td>
<td>600</td>
<td>5</td>
<td>0.5</td>
<td>0.25</td>
<td>10J/kg</td>
<td>20J/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>400</td>
<td>60</td>
<td>0.8mg/kg</td>
<td>8</td>
<td>0.25</td>
<td>0.5</td>
<td>0.8mg/kg</td>
<td>600</td>
<td>8</td>
<td>0.8</td>
<td>0.25</td>
<td>10J/kg</td>
<td>20J/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500</td>
<td>80</td>
<td>1.5mg/kg</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1.5mg/kg</td>
<td>600</td>
<td>10</td>
<td>1</td>
<td>0.4</td>
<td>15J/kg</td>
<td>30J/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200 max</td>
<td>100</td>
<td>1.5mg/kg</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1.5mg/kg</td>
<td>600</td>
<td>10</td>
<td>1</td>
<td>0.4</td>
<td>15J/kg</td>
<td>30J/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1600 max</td>
<td>100</td>
<td>1.5mg/kg</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1.5mg/kg</td>
<td>600</td>
<td>10</td>
<td>1</td>
<td>0.4</td>
<td>15J/kg</td>
<td>30J/kg</td>
</tr>
</tbody>
</table>

### Paediatric Emergencies

- **Length (cm)**
  - Newborn: 50
  - Infant: 65
  - Infant: 75
  - Infant: 85

- **Weight (Kg)**
  - Newborn: 50
  - Infant: 65
  - Infant: 75
  - Infant: 85

- **ETT size (uncuffed)**
  - Newborn: 3
  - Infant: 3
  - Infant: 3.5
  - Infant: 4
  - Infant: 4.5

- **ETT length**
  - Newborn: 10
  - Infant: 10
  - Infant: 12
  - Infant: 13
  - Infant: 14
  - Infant: 15
  - Infant: 16
  - Infant: 17
  - Infant: 18
  - Infant: 18

- **Defibrillation (1+2)**
  - Newborn: 2J/kg
  - Infant: 3J/kg
  - Infant: 4J/kg
  - Infant: 5J/kg

- **Defibrillation (subsequent)**
  - Newborn: 2J/kg
  - Infant: 3J/kg
  - Infant: 4J/kg
  - Infant: 5J/kg
  - Infant: 6J/kg

- **Age range (approximate)**
  1-2
  4-6
  8-10
  12
## PAEDIATRIC DRUGS DOSAGES (by volume – ml)

<table>
<thead>
<tr>
<th>Age range</th>
<th>Initial Dose</th>
<th>Newborn 0-1/12</th>
<th>Infant 2/12</th>
<th>Infant 6/12</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (cm)</td>
<td>50</td>
<td>55</td>
<td>65</td>
<td>75</td>
<td>85</td>
<td>100</td>
<td>115</td>
<td>125</td>
<td>135</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Weight (lb)</td>
<td>8</td>
<td>11</td>
<td>15</td>
<td>22</td>
<td>29</td>
<td>35</td>
<td>44</td>
<td>55</td>
<td>66</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>3.5</td>
<td>5</td>
<td>7.7</td>
<td>10</td>
<td>13</td>
<td>16</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>ETT size (uncuffed)</td>
<td>3</td>
<td>3.5</td>
<td>4.0</td>
<td>4.5</td>
<td>5</td>
<td>5.5</td>
<td>6</td>
<td>6.5</td>
<td>7 cuffed</td>
<td>8 cuffed</td>
<td></td>
</tr>
<tr>
<td>ETT length</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>18-21</td>
<td></td>
</tr>
<tr>
<td>Defib (Shock 1+2)</td>
<td>2J/kg</td>
<td>7</td>
<td>10</td>
<td>20</td>
<td>20</td>
<td>30</td>
<td>30</td>
<td>50</td>
<td>50</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Defib (subsequent)</td>
<td>4J/kg</td>
<td>20</td>
<td>20</td>
<td>30</td>
<td>50</td>
<td>70</td>
<td>70</td>
<td>100</td>
<td>150</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Atropine</td>
<td>0.02mg/kg</td>
<td>0.7</td>
<td>1</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Benzylpenicillin IV (IM)</td>
<td>N/A</td>
<td>5</td>
<td>5 (1)</td>
<td>10 (2)</td>
<td>10 (2)</td>
<td>10 (2)</td>
<td>10 (2)</td>
<td>10 (2)</td>
<td>20 (4)</td>
<td>20 (4)</td>
<td></td>
</tr>
<tr>
<td>Diazemuls</td>
<td>0.3mg/kg</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td>1</td>
<td>1.2</td>
<td>1.5</td>
<td>1.8</td>
<td>2</td>
</tr>
<tr>
<td>Diazepam (PR)</td>
<td>0.3mg/kg</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td>1</td>
<td>1.2</td>
<td>1.5</td>
<td>1.8</td>
<td>2</td>
</tr>
<tr>
<td>5mg/2.5ml</td>
<td>N/A</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10mg/2.5ml</td>
<td>N/A</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Adrenaline (IV)</td>
<td>0.01mg/kg</td>
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(125 max) (150 max) (200 max)
INTRODUCTION
Pre-school children in particular are prone to inhaling a wide variety of foreign objects. Many are relieved prior to the arrival of the Ambulance.

HISTORY
The diagnosis is rarely clear-cut but must be suspected if the child suddenly develops respiratory compromise, especially if associated with coughing, gagging and stridor (noise on inspiration).

Some upper respiratory infections may also cause the symptoms and if the child is known to have a respiratory infection preceding the event, they should be oxygenated and given supportive treatment whilst removing to hospital urgently.

An obstruction that is not compromising ventilation should be left in place and the patient transferred to hospital.

ASSESSMENT
Assess ABCDs.

MANAGEMENT OF THE CHOKE ING CHILD
Treatment must begin immediately:
● open the airway with head tilt/chin tilt and jaw thrust
● if this improves the situation, ventilation is needed with oxygen and removal to hospital.

In infants
Perform up to five back blows with the heel of the hand whilst securely holding the baby in a head down position.

If this fails to relieve the obstruction, turn the baby over and, if small enough, lay him on his back along the rescuer’s thigh, still in a head down position. Perform up to five chest thrusts in the same location as for cardiac compression but at a slower rate. If this clears the obstruction, ventilate with oxygen as required and remove to hospital.

Perform up to five rescue breaths (to achieve two successful ventilations) if no progress is made after five chest thrusts.

If the obstruction is not relieved, the above sequence must be repeated.

Paramedics may introduce a laryngoscope in case a foreign body is visible and can be removed with Magill’s forceps. Great care must be taken not to impact the foreign body further.

The older child – >1 year
Abdominal thrusts / Heimlich manoeuvre may be used as in the adult. It may be performed in the standing position, encircling the child’s upper abdomen and providing abdominal thrusts. It may be performed in the supine position with the heel of one hand placed against the child’s abdomen between the umbilicus and xiphisternum. The second hand is placed above the first, and with both hands thrust sharply upwards into the abdomen with care being taken to direct the thrust in the MID LINE.

The following sequence should be followed:
● five back blows
● five chest thrusts
● check the airway
● attempt to ventilate
● five back blows
● five abdominal thrusts
● check the airway
● attempt to ventilate
● repeat as necessary.

In all cases of childhood choking, the child must be removed after immediate treatment to the NEAREST SUITABLE RECEIVING HOSPITAL.

PROVIDE a hospital alert message / information call.

ADDITIONAL INFORMATION
Abdominal Thrusts are contra-indicated IN INFANTS as they may cause rupture of the liver or diaphragm.

Finger sweeps are also contra-indicated in children, as this may further impact the foreign body.

In the child with upper respiratory obstruction, (stridor and difficulty swallowing saliva) associated with infection, always suspect EPIGLOTTITIS. These children, who are often drooling and have very high temperatures, must be nursed in a position of comfort with high flow oxygen. No attempt must be made to examine the throat, as this may cause the swollen epiglottis to obstruct the airway. It is important not to further distress the patient and cannulation, blood glucose testing should generally be avoided.
Mouth to mouth

Airway opening manoeuvre

Back blows x five

Check mouth

Chest thrusts x five

Abdominal thrusts x five

Alternative cycles except in infants
RECOGNITION OF ABUSE

INTRODUCTION

For the purposes of child protection procedures, a child is anyone under the age of 18. All children deserve the opportunity to achieve their full potential. They should be enabled to be as physically and mentally healthy as possible, receive maximum benefit from educational opportunities, live in a safe environment, experience emotional well-being, feel loved and valued, become competent in looking after themselves, have a positive image of themselves and have opportunities to develop good interpersonal skills and confidence. If they are denied the opportunity to achieve their potential in this way they are at risk, not only of an impoverished childhood, but of experiencing disadvantage and social exclusion in adulthood.1,2,3

Significant Harm

The Children Act (1989) introduced the concept of significant harm as the threshold that justifies compulsory intervention in family life in the best interests of the children.3 The local authority is under a duty to make enquiries, or cause enquiries to be made, where it has reasonable cause to suspect that a child is suffering, or likely to suffer, significant harm.

There are no absolute criteria on which to rely when judging what constitutes significant harm. Consideration of the severity of ill-treatment may include the degree and the extent of physical harm, the duration and frequency of abuse and neglect, the extent of premeditation and the degree of threat and/or coercion.

Some children may be suffering, or at risk of suffering, significant harm, either as a result of a deliberate act, of a failure on the part of a parent or carer to act or to provide proper care, of the child being beyond parental control, or all of these factors. These children need to be made safe from harm, as well as their other needs being met. Children may be abused in a family or in an institutional or community setting; by those known to them or, more rarely, by a stranger. Examples of abuse are:

Physical abuse

Physical abuse may involve hitting, shaking, throwing, poisoning, burning or scalding, suffocating, or otherwise causing physical harm. Physical harm may also be caused when a parent or carer feigns the symptoms of, or deliberately causes ill-health to, a child they are looking after. This situation is commonly described using terms such as ‘fictitious illness by proxy’ or ‘Munchausen syndrome by proxy.’

Emotional abuse

Emotional abuse is the persistent emotional ill-treatment of a child such as to cause severe and persistent adverse effects on the child’s emotional development. It may involve conveying to children that they are worthless or unloved, inadequate, or valued only insofar as they meet the needs of another person. It may feature age or developmentally inappropriate expectations being imposed on children. It may involve causing children frequently to feel frightened or in danger, or the exploitation or corruption of children.

Sexual abuse

Sexual abuse involves forcing or enticing a child or young person to take part in sexual activities, whether or not the child is aware of what is happening. The activities may involve physical contact, including penetrative or non-penetrative acts. They may include non-contact activities, such as involving children in looking at, or in the production of, pornographic material or watching sexual activities, or encouraging children to behave in sexually inappropriate ways.

Neglect

Neglect is the persistent failure to meet a child’s basic physical and/or psychological needs, likely to result in the serious impairment of the child’s health or development. It may involve a parent or carer failing to provide adequate food, shelter and clothing, failing to protect a child from physical harm or danger, or the failure to ensure access to appropriate medical care or treatment. It may also include neglect of, or unresponsiveness to, a child’s basic emotional needs.
Who is vulnerable to abuse?
Although any child can potentially be a victim of abuse, there are some groups of children who may be particularly vulnerable. These include children with learning disabilities, severe physical illnesses or sensory impairments. Sources of stress within families may have a negative impact on a child’s health, development or well-being, either directly or because they affect the capacity of parents to respond to their child’s needs. Sources of stress may include social exclusion, domestic violence, the unstable mental illness of a parent or carer, or drug and alcohol misuse. Parents who appear over-anxious about their child when there is no sign of illness or injury may be a sign of their inability to cope.

Children with special needs
This group of children have particular needs because of a psychological or medical difficulty. For example, deaf or autistic children may demonstrate challenging behaviour, which may or may not be as a result of abuse. Children with special needs are more likely to be abused than children in the general population.

Recognition of child abuse
Non-accidental injury
For an injury to be accidental it should have a clear, credible and acceptable history and the findings should be consistent with the history and with the development and abilities of the child. When looking at injuries in children you should be aware of the possibility of the injury being non-accidental and consider it in every case, even if you promptly dismiss the idea.

Examples of abuse indicators may be:
- any injury in a non-mobile baby
- frequent accidents in unlikely places, e.g. the buttocks, trunk, inner thighs
- soft tissue injuries under clothing
- bruises of the same age on both sides of the body or of varying ages
- small deep burns in unlikely places or repeated burns and scalds, or “glove and stocking” burns
- poor state of clothing, cleanliness and/or nutrition
- late reporting of the injury or delay in seeking help.

When assessing an injured child, you should use your judgement regarding what level of accidental injury would be appropriate for their stage of development. Although stages of development vary (e.g. children may crawl or walk at different ages), injuries can broadly be divided between mobile and non-mobile children.

Non-mobile babies
Any injury in a non-mobile baby must be considered carefully and have a credible explanation if it is to be considered accidental.

Healthy babies do not bruise or break their bones easily. They do not bruise themselves with their fists or toys, bruise themselves by lying against the bars of a cot, or acquire bruises on the feet when they are held for a nappy change.

Bruising on the ears, face, neck, trunk and buttocks is particularly suspect. Petechial spots (tiny blood spots under the skin) which disappear very rapidly, may indicate attempted smothering. A torn frenulum (behind the upper lip) is rarely accidental in babies, and bleeding from the mouth of a baby should always be regarded as suspicious.

Fractures
Fractures in babies are seldom caused by ‘rough handling’ or putting their legs through the bars of the cot. Babies rarely fracture their skull after a fall from a bed or a chair. After a difficult delivery the clavicle (collar bone), humerus or femur may be broken and not noticed until a lump appears about 2-3 weeks later. In this case the baby would require paediatric assessment to confirm any suspicions of non-accidental injury.

Shaking injuries
When small babies are shaken violently their head and limb movements cannot be controlled, and this results in severe brain damage from haemorrhage inside the skull. It may also cause metaphyseal fractures of the limbs as a result of the rotary movement. Finger bruising on the chest may indicate that a baby has been held tightly and shaken.

Burns and scalds
Accidental burns and scalds are fairly common in older babies (over six months). Burns from grabbing hot objects (e.g. hair tongs, irons etc.) are found on the palms of the hands, and not the back of the hands. Scalds caused by pulling over hot liquids are usually on the front of the face, neck, chest and legs, with multiple splash marks.

Mobile babies and toddlers
A torn frenulum at this age may occur when the child falls flat on a carpet while running, but there are usually friction burns of the nose and chin at the same time. Non-accidental fractures are uncommon after the age of two years. Once the child can talk he/she is more able to tell how the injury was sustained.
Bruising
Bruises are collections of blood under the skin or in the tissues. They are a bluish-red in the beginning, then turn purple and brown, and finally to yellow. The exact dating of bruising is difficult as it depends on the individual, the depth of the bruise and the tissues affected.

It is normal for toddlers to have accidental bruises on the shins, elbows and forehead. They usually fall forward, so bruises on the back or buttocks are suspect. They do not bruise both sides of the body at the same time and the bruise cannot be round a curved surface.

Two black eyes may appear 2-3 days after an accidental blow in the middle of the forehead when the bruise begins to resolve. This sign is significant, however, if it occurs without forehead swelling.

Bruising caused by a hand slap leaves a characteristic pattern of ‘stripes’ representing the imprint of fingers. Forceful gripping leaves small round bruises corresponding to the position of the fingertips. ‘Tramline’ bruising is caused by a belt or stick and shows as lines of bruising with a white patch in between. Bites result in small bruises forming part or all of a circle.

Burns and scalds
Burns are caused by the application to the skin of dry heat and the depth of the burn will depend on the temperature of the object and the length of time it is in contact with the skin.

Abusive burns are frequently small and deep, and may show the outline of the object, whereas accidental burns rarely do so because the child will pull away. For example, a burn reflecting the shape of the soleplate of an iron cannot be accidentally caused.

Flame burns are usually less deep, have a less definite outline and may be fan-shaped. Friction burns may look similar to a flame burn and are usually seen on the prominent areas of the body such as the nose and chin, the heels or the shoulders.

Cigarette burns are not common. They are round, deep and have a red flare round a flat brown crust. The burns usually leave a scar and should not be confused with chickenpox scars or impetigo.

Scalds are caused by steam or hot liquids. Accidental scalds may be extensive but show splash marks, unlike the sharp edges of damage done when the child is dunked in hot water (although splash marks may also feature in a non-accidental burn, indicating that the child had tried to escape hot water). The head, face, neck, shoulders and front of the chest are the areas affected when a child pulls over a kettle. If the child turns on the hot water in the bath, the soles of the feet are in contact with the bath and will be less affected than the tops.

Fractures
Children’s bones bend rather than break, and require considerable force to damage them. There are various kinds of fractures, depending on the direction and strength of the force which caused them.

GREENSTICK
The bones bend rather than break. This is a very common accidental injury in children.

TRANSVERSE
The break goes across the bone and occurs when there is a direct blow or a direct force on the end of the bone, e.g. a fall on the hand will break the forearm bones or the lower end of the humerus.

SPIRAL OR OBLIQUE
A fracture line which goes right around the bone or obliquely across it is due to a twisting force, which is often a feature in non-accidental injuries.

METAPHYSEAL
Occur at the extreme ends of the bone and are not seen accidentally. Caused by a strong twisting force.

SKULL FRACTURES
These must be consistent with the history and explanation given, as babies and small children do not fracture their skulls from falls of only a few feet. Complex (branched), depressed or fractures at the back of the skull are suspect.

RIB FRACTURES
These do not occur accidentally, except in a severe crushing injury. Any other cause is highly suspicious of non-accidental injury.
Deliberate poisoning and attempted suffocation

These are very difficult to assess and may need a period of close observation in hospital. Deliberate poisoning, such as might be found in a case of a child in whom illness is fabricated or induced by carers with parenting responsibilities (Munchausen syndrome by proxy), may be suspected when a child has repeated puzzling illnesses, usually of sudden onset. The signs include unusual drowsiness, apnoeic attacks, vomiting, diarrhoea and fits.

Older children and adolescents

If the injury is accidental, older children will give a very clear and detailed account of how it happened. The detail will be missing if they have been told what to say.

Overdosing and other self-harm injuries must be taken seriously in this age-group, as they may indicate sexual or other abuse (such as exploitation).

Neglect

Neglect is more difficult to recognise and define than physical abuse, but its effects can be life-long. When a child is neglected this means his or her basic needs are not met. Neglect comprises both lack of physical care and supervision and a failure to encourage the child in terms of their emotional, physical and educational development. Impairment of growth, intelligence, physical ability and life-expectancy are only a few of the effects of neglect in childhood.

A neglected or abused infant may show signs of poor attachment. They may lack the sense of security to explore, and appear unhappy and whining. There may be little sign of attachment behaviour, and the child may move aimlessly round a room or creep quietly into corners.

In pre-school and school-age children, indicators of neglect include poor attention span, aggressive behaviour and poor co-operative play. Indiscriminate friendly behaviour to unknown adults is often a feature of children who are deprived of emotional affection. Other signs include repetitive rocking or other self-stimulating behaviour. Personal hygiene may be poor because of physical neglect, and this may lead to rejection by peers.

Emotional abuse

Emotional damage occurs as a result of all forms of abuse, but emotional abuse alone can be difficult to recognise as the child may be physically well cared-for and the home in good condition. Some factors which may indicate emotional abuse are:

- if the child is constantly denigrated before others
- if the child is constantly given the impression that the parents are disappointed in them
- if the child is blamed for things that go wrong or is told they may be unloved / sent away
- if the parent does not offer any love or attention, e.g. leaves them alone for a long time
- if the parent is obsessive about cleanliness, tidiness etc.
- if the parent has unrealistic expectations of the child, e.g. educational achievement / toilet training
- if the child is either bullying others or being bullied him / herself.

Children can be at risk of emotional abuse because of the circumstances of adults in their immediate surroundings, e.g. if there is an atmosphere of domestic violence, adults with mental health problems or a history of drug or alcohol abuse. It cannot be assumed that a child is safe in a care setting, as children in this environment can be subject to exploitation, e.g. for prostitution.

Sexual abuse

Although some children are abused by strangers, most are abused by someone known to them. Some are abused by other children, including siblings, who may also be at risk of abuse. The majority of abusers are male, although occasionally women abuse children sexually or co-operate with men in the abusing behaviour.

Both girls and boys of all age groups are at risk. The sexual abuse of a child is often planned and chronic. A large proportion of sexually abused children have no physical signs, and it is therefore necessary to be alert to behavioural and emotional factors that may indicate abuse.

Allegation of abuse by the child

Any allegation of abuse by a child is an important indicator and should always be taken seriously. It is important to note that children may only tell a small part of their experience initially. Adult responses can influence how able a child feels to reveal the full extent of the abuse. If abuse is alleged, the adult being told about the abuse must be careful not to ask probing questions.
Physical signs and symptoms
The following symptoms should give cause for concern and further assessment:

- soreness, discharge or unexplained bleeding in the genital area
- chronic urinary and vaginal infections
- bruising, grazes or bites to the genital or breast area
- sexually transmitted diseases
- pregnancy, especially when the identity of the father is vague
- a change in bowel habit, such as soiling or constipation.

Behavioural and emotional indicators
- inappropriate sexual knowledge for the child's age
- overt sexual approaches to other children or adults
- fear of particular people or situations, e.g. bath time or bedtime
- drug and alcohol abuse (older children)
- suicide attempts and self-injury
- running away and fire-setting
- environmental factors and situation of parents (e.g. domestic violence, drug or alcohol abuse, learning disabilities).

Each service will have in place their own operational guidelines and procedures to deal with the reporting of suspected children at risk. You should ensure that you are familiar with local policy and procedure.

REFERENCES


With thanks to Margaret Vander
London Ambulance Service NHS Trust
INTRODUCTION

Dealing with the death of a child may be very distressing and at no time more than when the death has been sudden, unexpected or violent. Nevertheless, the best clinical care may be to provide professional and compassionate advice and support. The decision to not resuscitate, or to cease resuscitation is always difficult and should only be undertaken if all those involved in the child’s care (both professional and family / carers) agree it is the right thing to do. Whilst one may imagine that family would always want resuscitation to be attempted, sometimes this may not be the case. The family may recognise and accept that the child is clearly dead and may be better supported by allowing them to hold and touch the child than to watch resuscitation attempts that they recognise to be futile. As an ambulance professional, part of the care to the child may be to provide best support to the family. Below are some guidelines which are good clinical practice (many also applicable to adults) and should generally be followed, although every death is different and some flexibility may be required.

The ambulance service is not commonly asked to attend the expected death of a child unless the carers suddenly find they want support at the end. These families usually have a great deal of input from the hospital treating the child. Resuscitation attempts may or may not be appropriate if the ambulance service are called under these circumstances, and the ROLE guidelines should be followed. If in doubt, resuscitate. More usually, the deaths to which ambulance personnel are called will be sudden and unexpected and it is with this in mind that these guidelines are written.

Guidelines

1. Think before you speak – chance remarks linger in the memory (eg “I’m sorry he looks so awful”).

2. Always speak about the dead child by his or her (first) name.

3. Do not put children in black body bags. It is known that relatives do not perceive very traumatic sights in the way that unrelated onlookers might and it is important that they are allowed to see touch and hold their loved one.

4. Allow relatives to be with the body and if practical touch or hold the child. Not all relatives will want to – if they do not wish to be with the body, that should be respected too.

5. Always transport the body to the Accident and Emergency department (if there are no legal reasons to leave the body on scene). The body should not be taken to the mortuary or anywhere else. The reason for this is that the paediatricians need to be involved a) to decide if an “Urgent” post mortem is required (sometimes needed in apparent cot death) and also so that they can activate the pathways for notifying the child’s death to certain medical authorities – eg cancelling immunisation recalls etc. Finally, the paediatrician will usually offer follow up to the family to discuss any issues surrounding the death, at a later date. None of this is possible if they have not been involved.

6. Try and ensure the relative has a friend or another relative with them, especially if they are accompanying the child to hospital.

7. If the death is at home, try to think through practical matters like security of the house or that other children may require someone to care for them.

8. Finally, remember that any reaction is “normal”. In particular, try no to be upset if parents / carers are accusatory, angry or blaming. This is most likely just a manifestation of distress.

AFTER A DEATH

The failed resuscitation of a child weighs heavily on most people’s shoulders and it is very important to remember that the vast majority of children who arrest outside hospital will die whoever is there or whatever is done. Such an outcome is almost never the fault of those attempting resuscitation – they will have done their best.

Many, if not most, carers will require some form of debrief. It is usual (and important) to sit down and “have a cup of tea” with others involved in the resuscitation attempt. Some attendants will feel ongoing distress. This is normal but should be recognised and other forms of therapy – from simple support from colleagues to formal counselling – may be required. Most local paediatricians or the medical director of the Ambulance service would be happy to discuss the episode further if required.

With thanks to Dr Fiona Jewkes
**INTRODUCTION**

Any female of childbearing age, unless hysterectomised, MAY be pregnant, and even the slightest doubt must make one consider if any abdominal pain or vaginal bleeding may be pregnancy related.

Pregnancy is timed from the FIRST day of the last period and from that date lasts 40 weeks. The pregnancy is divided into first, second and third trimesters. Each trimester is 13 weeks.

Terms used on shared care ante-natal records i.e. the patient’s personal maternity plan.

- **LMP** = Last menstrual period.
- **EDD** = Estimated date of delivery.

The timing of the pregnancy is written in the notes as 12/40, i.e. 12 weeks has elapsed out of the 40 weeks pregnancy.

- **T** = Term or expected end of pregnancy, therefore T+3 in the notes is three days over the term date.
- **CEPH** = Cephalic (Head).
- **BR** = Breech
- **G** = Gravida, the number of times a woman has been pregnant
- **P** = Parity, the number of times a woman has given birth

**ANATOMICAL AND PHYSIOLOGICAL CHANGES IN PREGNANCY**

There are a multitude of physiological and anatomical changes during pregnancy that may influence the management of the pregnant patient.

These changes include:-

- Cardiac output increases by 20-30% in the first ten weeks of pregnancy.
- The average maternal heart rate increases by 10-15 bpm.
- Both systolic and diastolic BP fall, on average by 10-15 mmHg.

As the fetus enlarges the diaphragm becomes splinted, breathing effort and rate increases and tidal volume is decreased.

Both blood volume and the number of red cells increase, but not in relative proportion, so the patient becomes mildly anaemic.

Due to the increase in blood volume the pregnant patient is able to tolerate greater blood or plasma loss before showing signs of hypovolaemia. This compensation is at the expense of shunting blood away from uterus and placenta and therefore fetus.

**RESUSCITATION OF THE PREGNANT FEMALE – SPECIAL PROBLEMS.**

Gastric emptying is delayed in pregnancy due to the progesterone-like effects of the placental hormones. The acidity of the stomach contents increases. Relaxation of the cardiac sphincter makes regurgitation of the stomach contents more likely. These three factors combined increase both the possibility and severity of aspiration.

Oedema of the larynx and enlargement of the breasts make intubation of the pregnant patient more difficult. Thus, the risks to the airway are markedly increased.

In supine pregnant patients uterine pressure may cause compression of the inferior vena cava thus reducing venous return and lowering cardiac output by up to 40%. This in turn will reduce blood pressure. To improve venous return and cardiac output the patient should be inclined to the left by placing padding below their right side and hip or manually displacing the uterus to the left.

It must be borne in mind that effective resuscitation of the mother will provide effective resuscitation of the fetus and life support techniques should be concentrated on the mother in order to optimise foetal prognosis. Arrhythmias should be treated according to standard guidelines.

Cardiorespiratory arrest in pregnancy is very rarely due to a primary cardiac cause. Common causes of sudden maternal death include pulmonary or amniotic fluid embolus.
INTRODUCTION

The best clinical management for a mother who is experiencing an abnormal delivery is for her to be transported to hospital without delay.

When there is a midwife on scene it is their responsibility to manage the delivery and crews should work under their direction. If the midwife is not present the decision on whether to move the mother should be based on the principle that any situation which deviates from a normal uncomplicated delivery should result in the mother being transported immediately to hospital. In this situation the crew must alert the hospital via Control en route. Crews should make an early assessment of the need for additional assistance from a second crew and ensure that the vehicle is requested as soon as possible.

The most important feature of managing an obstetric incident is a rapid and accurate assessment of the mother to ascertain whether there is anything abnormal taking place.

The following maternal assessment process MUST be followed in order to allow you to decide whether to STAY ON SCENE AND REQUEST A MIDWIFE (if not already present) or TRANSPORT TO HOSPITAL IMMEDIATELY.

In maternity cases where delivery is not imminent and there are no complications (see maternal assessment flowchart) the mother may be transported to the unit into which she is booked. The assessment should be repeated en route and if any complications occur the condition should be treated appropriately and the woman's destination potentially revised. If the mother is booked into a unit that is not within a reasonable distance or travelling time, crews should base their judgements on the maternal assessment and take the mother to the most appropriate unit.

MATERNAL ASSESSMENT

1. What is the main complaint?

The initial step in maternal assessment is to determine why an ambulance has been called. It is therefore useful to determine if any of the following are present:

Show – a bloodstained mucous discharge from the vagina

Waters broken – rupture of the membranes surrounding the baby

Contractions – usually noticed at ten minute intervals becoming more frequent

Intermittent Pain – there is usually pain accompanying contraction of the uterus

Bleeding – there is a possibility of vaginal bleeding before, during and after labour

If ANY of the above are present move on to the next stage of assessment.

If NONE of the above are present and there are no other medical or traumatic conditions the mother should be transported directly to the BOOKED OBSTETRIC UNIT. During transportation it is useful to obtain the following information:

- name
- mother’s date of birth
- age
- hospital registration number
- name of consultant
- history of this pregnancy
- estimated date of delivery (EDD)
- previous obstetric history.

Ask to see the mother's own hospital notes which most women keep with them.

2. Is the mother unwell or injured?

This stage of the assessment is concerned with medical and traumatic conditions that may not be directly associated with pregnancy or labour, and may be due to a pre-existing medical condition or accident. However, it should be remembered that unless the cause is obvious, specific pregnancy related conditions should always be considered.

If the mother presents with an obvious medical or traumatic condition that puts her life in imminent danger, or is having a trauma/epilepsy related seizure, the APPROPRIATE TREATMENT for that condition must be initiated. She must be transported to the NEAREST A&E UNIT preceded by a hospital alert call remembering to inform the hospital that the patient is pregnant.

If the mother is having a seizure that is unrelated to either trauma or epilepsy, refer to section 2 of the 'Managing Complications’ section of this guideline (page 4).

If there are no medical or traumatic conditions present move on to the next stage of assessment.
3. What is the period of gestation?

The period of gestation is important in determining your course of action. A pregnancy is divided into three “trimesters” each of 13 week. It is important to establish the stage in the pregnancy (measured in weeks of duration of the pregnancy). For example, 14/40 on a maternity plan means the mother is 14 weeks into the 40 week duration of pregnancy. The appropriate action for differing lengths of gestation would be

- less than 20 weeks* TRANSPORT TO THE NEAREST A&E DEPT.
- 20-34 weeks* TRANSPORT IMMEDIATELY TO BOOKED OBSTETRIC UNIT (see page 7)
- 35-40 weeks MOVE ON TO NEXT STAGE OF ASSESSMENT.

If the mother is unable to tell you her length of gestation she will usually be able to tell you when the baby is due. Count the number of weeks remaining before that date and subtract this number from 40. This will give you the period of gestation.

*Some hospitals use 18 weeks. Check with Control who will find out about local arrangements.

4. Are there any potential complications?

There are a number of potential complications that warrant IMMEDIATE removal to the NEAREST OBSTETRIC UNIT. These complications are:

- severe vaginal bleeding
- prolapsed cord
- continuous severe abdominal/epigastric pain*
- presentation of part of the baby other than the head (e.g. an arm or leg).

The specific appropriate treatment for the above is given in the section of this protocol headed ‘Managing Complications’. The mother must be removed to the nearest obstetric unit WITHOUT DELAY having first put in a hospital alert call. Commence the appropriate treatment regime as soon as possible.

*Continuous severe abdominal or epigastric pain is not the same as labour pain and may be indicative of internal bleeding, without the presence of external blood loss (a condition known as concealed “placental abruption”).

Potential complications that warrant immediate removal to the BOOKED OBSTETRIC UNIT (unless delivery is actually in progress) are:

- known multiple births
- known breech presentation
- significant previous history of obstetric complications (e.g. eclampsia, rapid labour, BBA).

In cases of known multiples/malpresentation where delivery is actually in progress, or occurs en route, you should initiate the DELIVERY PROCEDURE, i.e.:

- remain on scene
- request a Midwife and second vehicle with paramedic if none present (unless delivery occurs en route)
- prepare for delivery
- in cases of multiple birth / breech presentation refer to the ‘managing complications’ section of this guideline.

If there are none of these complications move on to the next stage of the assessment.

5. Is delivery imminent?

Delivery will be deemed to be imminent if at least TWO of the following are present:

- regular contractions at 1-2 minute intervals
- an urge to push or bear down
- crowning or the top of the baby’s head / breech presentation visible at the vulva.

If either of the first two indications are present a visual inspection must be made to observe if crowning is taking place. Remember that if the mother is from a community that is predominantly Buddhist, Hindu or Muslim it may be important to them that they are only examined by a female crew member. YOU SHOULD RESPECT THE WISHES OF THE MOTHER who may refuse a visual inspection. However, the safety of the mother and baby must always come first. If there is any difficulty in this respect inform Control and ensure details are documented thoroughly.

Once you have used the above criteria to establish that delivery is imminent you should:

- remain on scene
- request a Midwife and second vehicle with paramedic if none present
- prepare for delivery (see Delivery Procedure).
If you are dealing with an uncomplicated imminent birth and no midwife is available or CAC experience any difficulty in locating a midwife, the best course of action is to take the mother to the ambulance and go to the nearest obstetric unit, preceded by a hospital alert call. If the labour is so far advanced that delivery occurs on scene, transport both mother and baby to the nearest obstetric unit once the baby has been born and alert CAC to cancel the second vehicle. If the baby needs resuscitation await the arrival of the second crew who should transport the baby immediately.

6. Re-assessment
In all of the above scenarios it is very important to reassess the mother at regular intervals. Should the situation change, or if complications occur, then appropriate action should be taken immediately and the treatment/transportation regime revised accordingly.

DELIVERY PROCEDURE

First Stage of Labour
Encourage the mother to lie on her side or sit when in transit, whichever position is the more comfortable for her.

Entonox may give relief from pain. Inhalation should be started as soon as the mother feels the contraction, before the pain is fully established.

REMEMBER the risk of supine hypotension and always discourage a pregnant woman from lying flat on her back.

Second Stage of Labour
If you have not moved from the home address because birth is imminent, request Control to arrange for a midwife and second vehicle/paramedic to attend.

If you are en route to hospital and delivery appears imminent, pull in and park safely. Inform Control.

Prepare the trolley bed or delivery area with incontinence pads.

Reassure the mother and tell her what you are doing. Remember to include the woman’s partner if present.

Have a towel ready in which to wrap the baby.

Support the mother in a semi-recumbent (or other comfortable) position with padding under her buttocks. The mother should be discouraged from lying flat on her back because of the risk of supine hypotension.

Encourage her to continue taking Entonox as needed to relieve pain and discomfort.

Open and lay out a maternity pack.

Cover mother with a blanket for warmth and modesty.

Some women may be from ethnic communities in which modesty is highly valued for religious reasons. Childbirth may be viewed as an exclusively female area and it will therefore be extremely distressing for them to be attended by men. Every effort should be made to minimise distress. Where possible, female staff should be in attendance.

As the baby’s head is born, help the mother to avoid pushing by telling her to concentrate on panting or breathing out in little puffs.

Instruct the mother to pant or puff, allowing the head to advance slowly with the contraction. You may consider applying gentle pressure to the top of the baby’s head as it advances through the vaginal entrance.

Check to see if the umbilical cord is around the baby’s neck. If it is, you may gently attempt to loop it over the head. If it is too tight it is better to deliver the rest of the baby with the cord left intact. A tight cord will not prevent the baby delivering.

Quickly and thoroughly dry the baby using a warm towel while you make your initial assessment. Include the head, trunk, axilla and groin.

Remove the now wet towel and wrap the baby in the towelling baby robe.

Wipe the baby’s nose (as if blowing it).

Wipe any fluid out of the mouth with a gauze swab.

Hold the baby as it is born and lift it towards the mother’s abdomen.

Assess the baby’s airway – a crying baby has a clear airway. SUCTION IS NOT USUALLY NECESSARY. If required, use the suction unit on half speed with a CH8 catheter and then only within the oral cavity.
Apply two cord clamps securely one inch apart and about six inches from the umbilicus. Cut the cord between the two clamps.

Ensure the baby remains wrapped and place the baby with its mother in a position where the mother can feed if she wants to and help keep the baby warm (breast feeding will also encourage delivery of the placenta). Reassure the mother and cover her adequately. Await the Midwife and third stage.

If the baby is breathing and the cyanosis is not clearing, enrich the atmosphere near the baby’s face with a light flow of oxygen.

If the baby is not breathing, apply resuscitative measures as per resuscitation guidelines.

If delivery has occurred en route to hospital, you should proceed to the nearest obstetric unit once the baby has been delivered, requesting Control to inform the hospital. In this situation it is not necessary to await delivery of the placenta before continuing with your journey. If complications occur put in a hospital alert call via control.

Third Stage

The expulsion of the placenta and membranes may take 15-20 minutes. It will be accompanied by a gush of blood but this should not exceed 200-300 mls.

Do not pull the cord during delivery of the placenta as this could rupture the cord, making delivery of the placenta difficult and cause excessive bleeding.

Assist the mother in expelling the placenta naturally. The mother may be encouraged to adopt a squatting, upright position to facilitate delivery of the placenta, but only if there has been no delay in delivery of the placenta and NOT IF THERE IS ANY BLEEDING.

Deliver it straight into a bowl or plastic bag and keep the placenta, blood and membrane for inspection by a Doctor or Midwife.

If bleeding continues after delivery of the placenta, palpate the abdomen and feel for the top of the uterus. Massage the uterus with a circular motion. It should be at the level of the umbilicus and should become firm as gentle massage is applied. Consider the need for fluid replacement and/or Paramedic back-up.

If bleeding is severe Paramedics should initiate the syntometrine protocol.

MANAGING COMPLICATIONS

There are several complications which may arise during pregnancy and/or labour. Should you be presented with any of these conditions outlined below you should adopt the following treatment procedures and transport to hospital.

1. Premature Delivery

If the delivery occurs at less than 20 weeks gestation the mother and baby should be transported to the NEAREST A&E DEPARTMENT.

In the case of a mother who is giving birth at 20-34 weeks every effort should be made to transport the mother to the BOOKED OBSTETRIC UNIT (see page 10) without delay as the baby will need specialist care once delivered. The mother should be constantly reassessed en route and the appropriate action taken should the circumstances change.

In the event that birth is so far advanced that transportation is not possible, request a midwife plus a second vehicle and inform Control of the situation.

Once the baby is born, utilise the second vehicle to IMMEDIATELY transport the baby to the NEAREST A&E DEPT. or the NEAREST OBSTETRIC UNIT* depending on local arrangements. The baby should be transported even if the midwife has not yet arrived. Ensure that Control alerts the hospital, giving an ETA and description of the baby’s condition. The mother should then be transported to the OBSTETRIC UNIT of the same hospital as the baby.

Should delivery take place en route assess the baby and take appropriate action. Convey mother and baby to the NEAREST A&E DEPT. or NEAREST OBSTETRIC UNIT* depending on local arrangements. Ensure that control alert the receiving hospital.

* When placing the alert call control will advise you of the local arrangements for units receiving distressed neonates where this is not the obstetric unit.

2. Maternal Seizures

See section OB/GY 4 – Pregnancy Related Hypertension.
3. Prolapsed Cord

This is an EXTREME EMERGENCY that requires immediate intervention, rapid removal and transport. In a mother who presents with a prolapsed cord use two fingers to gently replace the cord in the vagina, handling the cord as little as possible. Use dry padding to prevent further prolapse. This will keep the cord warm and moist and prevent cord spasm.

Occasionally it may not prove possible to replace the cord in the vagina, particularly if a large loop has prolapsed. In these instances keep the cord warm and moist with dry sterile dressings.

Crews should use their professional judgement to determine the best means of removal, ensuring that the safety of the mother is maintained. Ideally the trolley bed should be used, but where necessary and expedient the mother may be helped to walk to the nearest point of access for the trolley bed. Use of the service carrying chair should be avoided if at all possible and if used should be utilised only to convey the mother to the nearest point of access for the trolley bed. Following replacement of the cord or application of the sterile dressings the mother should be positioned on her side with padding placed under her hips to raise the pelvis and reduce pressure on the cord. Entonox should be administered to help prevent the urge to push, which also increases pressure on the cord.

The mother should be transported to the NEAREST OBSTETRIC UNIT preceded by a Hospital Alert Call ensuring that Control alert the hospital giving an ETA and clear advice that the mother has a prolapsed cord.

4. Post Partum Haemorrhage

For ante-partum haemorrhage see OB/GY 4 ‘Haemorrhage during Pregnancy.’

If severe haemorrhage occurs following delivery (post-partum) the following treatment regime should be followed en route if possible:

- uterine massage – palpate the abdomen and feel for the top of the uterus. Massage with a circular motion
- paramedics should initiate the procedure for syntometrine. Non-paramedic crews should not delay transportation by waiting for a paramedic crew to attend
- treatment for shock.

The mother and baby should be transported to the NEAREST OBSTETRIC UNIT immediately. Transportation must be preceded by a Hospital Alert Call via Control. The information passed should include details as to whether the placenta has been delivered or is still in situ. This information will be valuable to the hospital in determining their treatment.

5. Continuous severe abdominal pain / placental abruption

Placental abruption is where an area of the placenta detaches from the uterine wall, and bleeding occurs causing abdominal and/or epigastric pain and signs of hypovolaemic shock.

It is important that you make a thorough assessment for signs of shock. The mother must be removed to the NEAREST OBSTETRIC UNIT WITHOUT DELAY having first put in a Hospital Alert Call. Commence the appropriate treatment regime as soon as possible.

6. Multiple Births – Delayed delivery of second or subsequent baby.

It is now very unusual for a mother expecting a multiple birth to deliver outside of hospital. Unless delivery is actually in progress mothers expecting multiple births should be transported to the BOOKED OBSTETRIC UNIT without delay. The mother should be constantly reassessed en route and the appropriate action taken should the circumstances change.

If delivery is in progress, or occurs en route, proceed according to the delivery procedure. In most instances the normal pattern of delivery will apply for each baby. The procedure for normal delivery and management of the new-born will apply for the first and all subsequent babies.

Once the first baby has been born and assessed you should make arrangements to transport both mother and baby to the NEAREST OBSTETRIC UNIT immediately having put in a hospital alert call. In this situation it is not necessary to await the arrival of the midwife prior to transportation. If the first baby is distressed proceed according to resuscitation guidelines.

If delivery of the second baby occurs en route, park the ambulance and make a request via Control for a SECOND VEHICLE. Once the second baby has been delivered, utilise both vehicles to transport mother and babies to the nearest obstetric unit. If the second baby is distressed proceed according to the resuscitation guidelines.
7. Malpresentation

**BREECH BIRTH**

This is a birth where the feet or buttocks present first during delivery rather than the baby’s head. In the case of a known breech presentation the mother should be transported to the **BOOKED OBSTETRIC UNIT** unless birth is in progress. The mother should be constantly reassessed en route and the appropriate action taken should the circumstances change. If birth is in progress treat as a normal delivery except for the following points:

- if the mother is on the bed or sofa etc., encourage her to move to the edge. This will enable gravity to help deliver the baby. The mother's legs should be supported (this may look like the McRobert’s Position)
- do not touch the baby or the umbilical cord until the body is free of the birth canal and the nape of the neck is visible. The only exception is when the baby’s back rotates to face the floor. Gently hold the baby by it’s pelvis and rotate the baby back towards the front (take care NOT to squeeze the abdomen)
- do not clamp or cut the cord until the **HEAD** is free of the birth canal
- once the body is born gently lift the baby by its feet to facilitate delivery of the head. This should be undertaken as the head is delivering and so as not to extend the baby’s neck. Care should be taken not to pull the baby.

Once the baby is born treat as for a normal delivery. Breech babies are more likely to be covered in meconium and may require suction and resuscitation. If the baby is distressed proceed according to resuscitation guidelines.

**ANY OTHER BODY PART PRESENTING**

If upon inspection a part of the baby is presenting other than the head, buttocks or feet (e.g. one foot or a hand/arm) transport the mother immediately to the **NEAREST OBSTETRIC UNIT**. Transportation must be preceded by a Hospital Alert Call via Control.

8. Shoulder Dystocia

This is delayed delivery of the baby’s shoulders. Do NOT pull, twist or bend the baby’s head. If the shoulders are not delivered within **two** contractions following the birth of the head then whilst semi-recumbent, the mother should be encouraged to bring her knees up towards her chest and outwards (McRobert’s position). Alternatively, the mother should be positioned in an “all-fours” position on her hands and knees. A further attempt can be made to deliver the shoulders in either of these positions. If the shoulders are not delivered following a further **two** contractions the mother should be transported **immediately** to the **NEAREST OBSTETRIC UNIT**. In this situation it is not necessary to await arrival of the midwife. The mother should ideally be removed from scene using the trolley bed. However if necessary the mother may be helped to walk a **short** distance to the nearest point of access for the trolley bed, but crews should be prepared to deliver the baby as it is very likely this will precipitate birth. Once on the **trolley bed and during transportation the mother should be placed on her side with padding placed under her hips to raise the pelvis.** Transportation must be preceded by a hospital alert call via control.
MATERNAL ASSESSMENT

Is the period of gestation below 20 weeks?

NO

Is the mother presenting with an obvious non-pregnancy related emergency (e.g. trauma)?

YES

NEAREST A&E DEPARTMENT

NO

Is the mother presenting with one of the following:
- eclampsia
- severe vaginal bleeding
- prolapsed cord
- continuous severe abdominal pain
- presentation of part other than head or buttocks/feet?

YES

NEAREST OBSTETRIC UNIT

NO

Is the period of gestation 20-34 weeks?

YES

BOOKED OBSTETRIC UNIT

NO

Known multiples? Known breech? Previous history or complications?

NO

BOOKED OBSTETRIC UNIT

YES

Is birth imminent?

NO

BOOKED OBSTETRIC UNIT

Request Midwife and 2nd vehicle/paramedic

YES

Is birth imminent?
DELIVERY FLOWCHART

Is the birth imminent?

- YES
  - Are you still on scene?
    - YES
      - REMAIN ON SCENE AND REQUEST MIDWIFE AND 2nd VEHICLE/PARAMEDIC
    - NO
      - PARK VEHICLE SAFELY
      - PREPARE FOR DELIVERY
      - MANAGE DELIVERY AS PER DELIVERY PROCEDURE
  - NO
    - Are there any complications?
      - YES
        - TRANSPORT TO NEAREST OBSTETRIC UNIT – APPROPRIATE TREATMENT AND ALERT CALL
      - NO
        - IF ON SCENE AWAIT ARRIVAL OF MIDWIFE
          - IF EN ROUTE TRANSPORT TO NEAREST OBSTETRIC UNIT ONCE BABY IS BORN. Request Control to inform obstetric unit

- NO
  - TRANSPORT TO BOOKED OBSTETRIC UNIT
INTRODUCTION

Pregnancy induced hypertension (PIH) is diagnosed when there is a significant rise in blood pressure during pregnancy, occurring after 20 weeks. If there is associated proteinuria, the condition is known as pre-eclampsia, which may occur as early as 20 weeks into the pregnancy but can present after the delivery. It is one of the more dangerous complications of pregnancy as it can be a precursor to eclampsia.

Pre-eclampsia involves an increase in blood pressure (above 140/90), oedema and detection of protein in the patient's urine. It is more common in first pregnancy, multiple pregnancy and in pregnant females <16 years of age or >40 years of age. Patients with a previous history of pre-eclampsia and those with diabetes and renal disease are also more at risk.

Eclampsia is a serious medical emergency. It normally presents later in the third trimester but can occur up to 48 hours after delivery. It is one of the most dangerous complications of pregnancy and occurs in about 1:1,500 deliveries. It is a significant cause of maternal mortality in the UK.

Eclampsia is associated with Grand Mal fitting, severe hypertension and impairment of kidney function. It causes severe complications both in the cardiovascular system and with blood clotting, with disseminated intravascular coagulation (DIC) being a serious complication. The hypoxia caused during a grand mal seizure may lead to significant fetal compromise and even death.

HISTORY

The underlying pathophysiology is not fully understood, but pre-eclampsia is primarily a placental disorder associated with poor placental perfusion and high blood pressure. Pre-eclampsia is usually detected in routine antenatal appointments. The combination of high blood pressure, oedema and protein in the urine is diagnostic and the condition usually leads to admission to hospital and, often, early delivery.

Although the period before an Eclamptic fit may be asymptomatic, the progression of Pre-eclampsia to eclampsia is often accompanied by symptoms such as:-

- epigastric pain – often mistaken for heartburn
- nausea
- vomiting
- headache – severe and frontal
- confusion, visual disturbance, muscle twitching and tremor may also be present.

Fitting, which may be severe and repeated, can develop and blood pressure elevation is characteristic.

ASSESSMENT

Remember that treating and resuscitating the mother is also assisting the baby.

Assess ABCD’s.

Evaluate whether the patient has any TIME CRITICAL features, these include:

- fitting
- confusion
- severe headache severe and frontal
- muscle twitching or tremor.

Eclampsia is a TIME CRITICAL EMERGENCY for both mother and unborn child.

If delivery is NOT in progress transport the mother immediately to the NEAREST OBSTETRIC UNIT preceded by a hospital alert call.

If delivery is in progress call for assistance from a second ambulance and/or paramedic and prepare for delivery, ensuring that the seizure is monitored and managed at all times. Immediately following delivery the mother should be transported to the NEAREST OBSTETRIC UNIT preceded by a hospital alert call.

MANAGEMENT OF IMPENDING ECLAMPSIA

Follow Medical Emergencies Guideline, remembering to:

- ensure ABC’s.
- ensure high flow O₂ therapy
- consider IV access. DO NOT delay removal to hospital to obtain IV access. Cannulate en route wherever possible
- if the patient fits for longer than 2-3 mins, consider administration of diazemuls 10-20mg IV titrated against effect or rectal diazepam 10-20mg.

Unless the patient is a known epileptic or the fit is obviously trauma related, grand mal fits in pregnancy must be managed as eclampsia.
Specifically consider:
- caution with “lights and sirens” as strobe lights and noise may precipitate fits
- remember – NEVER allow a pregnant mother to lie flat on her back. The heavy uterus compresses the abdominal vena cava preventing venous return to the heart, thus dropping cardiac output and blood pressure. This also reduces blood flow and oxygen supply to the foetus. Use a wedge or pillow under the RIGHT buttock and turn her towards her left side.

With thanks to
Anne MacGregor Sister, Ward 210, Simpson’s Memorial Maternity Pavilion.

Yvonne Clah Clinical Manager, Simpson’s Memorial Maternity Pavilion.

Wilma Spencer Senior Midwife, Practice Development, Simpson’s Memorial Maternity Pavilion.

Kirsty Dundas Consultant Obstetrician, Simpson’s Memorial Maternity Pavilion.

Kim Hinshaw Consultant Obstetrician, JRCALC.

Bill O’Neil and the team London Ambulance Service NHS Trust.
INTRODUCTION
Pregnancy related haemorrhage is broadly divided into three types.

Haemorrhage occurring in early pregnancy:
● miscarriage, previously known as spontaneous abortion
● ectopic pregnancy / ruptured ectopic pregnancy.

Haemorrhage occurring in late pregnancy:
● placenta previa
● placental abruption.

Haemorrhage occurring after delivery:
● post partum haemorrhage.

Haemorrhage may be
● revealed – with evident vaginal loss of blood, e.g. placenta previa, miscarriage, and post partum haemorrhage

● concealed, e.g. ruptured ectopic pregnancy, and placental abruption, where bleeding occurs within the abdomen or uterus. This presents with little or no external loss, but pain and signs of hypovolaemic shock. Mothers may appear well as large amounts of blood loss may be concealed

● note – placental abruption may be a combination of revealed and concealed bleeding.

HISTORY
The following should assist with assessing the most common causes of haemorrhage in pregnancy.

Abnormal bleeding in pregnancy
Bleeding in the 1st trimester is likely to be an actual or threatened miscarriage, especially if accompanied by low abdominal pain or backache.

Signs of shock and low abdominal pain and/or shoulder tip pain following one missed menstrual period (equal to 6-8 weeks of pregnancy) is likely to be due to a ruptured ectopic pregnancy, with bleeding into the abdomen.

Bleeding in the 2nd & 3rd trimesters may be due to late miscarriage or premature labour, or possibly placenta previa. This is where the placenta develops low down in the uterus and completely or partially covers the cervical canal. When labour begins, this can cause severe haemorrhage. Most of these cases are picked up on scanning and admitted early for a planned caesarean section, so undiagnosed placenta previa is quite uncommon.

Any vaginal bleeding in late pregnancy or during labour which is accompanied by severe continuous abdominal pain and signs of shock may be due to placental abruption. This is where bleeding occurs between the placenta and the wall of the uterus, detaching an area of the placenta from the uterine wall. It can be associated with severe pregnancy induced hypertension (PIH). Placental abruption causes continuous severe abdominal pain, tightening of the uterus, signs of hypovolaemic shock and puts the baby at immediate risk. There may be some external blood loss, but more commonly the haemorrhage is concealed behind the uterus. Where there is a combination of revealed (external) blood loss and concealed haemorrhage, this can be particularly dangerous, as it can lead to an under-estimation of the amount of total blood lost.

ASSESSMENT
Assess ABCD’s.

Evaluate whether the mother has any TIME CRITICAL features

Specifically assess:
Volume of blood loss is important to assess. Remember a large sanitary towel can absorb about 50 ml of blood, and blood loss will appear greater if mixed with amniotic fluid. Take any blood soaked pads to hospital.

Check for signs of shock. If the mother is tachycardic (pulse >100 bpm), hypotensive (SBP <90 mmHg), with cool sweaty skin, she is clearly shocked and in need of volume replacement. Remember the value in a capillary refill test (CRT). Symptoms of hypovolaemic shock occur very late in otherwise fit, young women, by which stage they are very unwell.

If the baby has been moving prior to this emergency, it is important to ask, “When did you last feel the baby move?” Be particularly tactful, so as not to cause alarm, as anxiety in the mother will only exacerbate the situation.

En route – continue mother MANAGEMENT (see below).
MANAGEMENT OF HAEMORRHAGE IN PREGNANCY

At less than 20 weeks* gestation the mother should be transported immediately to the NEAREST A&E DEPARTMENT. At 20 weeks* gestation or above the mother should be transported immediately to the NEAREST OBSTETRIC UNIT. Transportation must be preceded by a hospital alert call via control.

*Some hospitals use 16 – 18 weeks. Check with Control who will find out about local arrangements.

Follow Medical Emergencies Guideline, remembering to.

Ensure ABC’s.

Ensure high flow O₂ therapy.

Specifically consider:
Establish IV access and commence IV infusion of crystalloid IV in 250ml boluses until systolic BP is maintained at 90mmHg and tachycardia lessens. Do not delay transportation – if necessary gain venous access en route.

In later pregnancy, if the mother is transported on her back, the uterus will compress the abdominal vena cava, causing extreme hypotension and worsening shock. Either manually displace the uterus to the left side of the abdomen, or turn the mother into the left lateral position to avoid this problem.

Provide suitable analgesia, in the form of Entonox if required. Opioids are best avoided, especially in the third trimester of pregnancy.

ADDITIONAL INFORMATION

Ectopic pregnancy occurs when the ovum is fertilised, and implants in the fallopian tube rather than within the uterus. As it develops, often 6-8 weeks into the pregnancy, it ruptures out of the tube, causing extensive intra-abdominal bleeding. It is a major gynaecological emergency.

Post Partum Haemorrhage see OB/GY 2 ‘Birth Imminent’.

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INTRODUCTION
Vaginal bleeding is likely to result in a call for emergency assistance in a number of specific circumstances:
- if the woman is anticipating a normal menstrual period, and bleeds excessively
- if normal or excessive menstrual bleeding is associated with severe abdominal pain
- if vaginal bleeding is associated with pregnancy
- if vaginal bleeding follows gynaecological surgery or colposcopy
- if vaginal bleeding occurs away from a normal period especially if this is excessive
- if vaginal bleeding is associated with cancers of the vagina, cervix and uterus.

The majority of these episodes do not cause compromise to the circulation, but blood loss can be alarming to the woman.

HISTORY
The age of the woman is important, as younger women may be pregnant, and elderly women are more at risk of cancers of the uterus and cervix.

Are there any previous gynaecological or pregnancy related problems?

In women of childbearing age (11-55 years): When was the last period? Was it normal?

Might she be pregnant? If not, ask if she is using oral contraception. Remember contraceptives are not always 100% effective.

If pregnant, what is the period of gestation?

ASSESSMENT
Assess ABCD’s. Evaluate whether the woman has any TIME CRITICAL features. These may include:
- any major ABCD Problem
- any signs of hypovolaemic shock
- if any of these features are present, correct A and B problems on scene then transport to nearest suitable receiving hospital.

Provide a hospital alert message / information call.

En route – continue patient MANAGEMENT (see below).

If woman’s condition is non-time critical, perform a more thorough patient assessment and a brief secondary survey.

Specifically assess:
- lower abdominal tenderness or guarding
- evidence of blood loss, or clots (may be difficult to assess). Count number of soaked tampons, towels etc to pass information on to hospital
- assess temperature – is it raised (pyrexia >37.5°C)?

MANAGEMENT OF VAGINAL BLEEDING
Follow Medical Emergencies Procedure, remembering to.
Ensure ABC’s.

Ensure high flow O2 therapy.

Establish IV access en route to hospital.

Administer crystalloid 250ml IV.

Re-assess pulse rate and blood pressure, give further fluid boluses of 250 ml IV as required to maintain a systolic blood pressure of 90 mmHg (to 2,000 ml max)

Specifically consider:
- ensure position of comfort
- provide analgesia with Entonox. In severe pain not relieved by Entonox, morphine (or nalbuphine) may be used except in the presence of hypotension (systolic blood pressure < 90mmHg)
- take any tissues/clots passed with the bleeding to hospital for assessment if the woman may be pregnant.

ADDITIONAL INFORMATION
Miscarriage can sometimes give rise to significant haemorrhage, and is most commonly seen at between 6-14 weeks of gestation, i.e. 6-14 weeks after the first day of the last menstrual period. Crampy, supra-pubic pain, backache and blood loss, often with clots, characterises miscarriage. Symptoms without obvious external blood loss may indicate cervical shock due to retained miscarriage tissue.

Ectopic pregnancy usually presents earlier, at around 6 week’s gestation, so usually only one period has been missed. Acute lower abdominal pain, slight bleeding or brownish vaginal discharge and signs of blood loss within the abdomen with tachycardia and skin coolness characterise a ruptured ectopic pregnancy.

Bleeding in later pregnancy before delivery is described as antepartum haemorrhage. Bleeding occurring after delivery is denoted as post-partum haemorrhage. (See OB/GY 4 “Haemorrhage During Pregnancy”) Bleeding occurring days after gynaecological surgery may be related to infection within the uterus.
Coping with patients who have been sexually assaulted demands good medical and emotional care from ambulance staff. It also demands an awareness of forensic aspects of these cases.

Take a medical history and brief history of the event, wherever possible.

Assess ABCDs.

Evaluate whether patient is TIME CRITICAL/ POTENTIALLY TIME CRITICAL based on criteria in Trauma Emergencies Guideline.

If any of these features are present, correct A and B problems on scene then transport to nearest suitable receiving hospital.

Provide a hospital alert message / information call.*

*If passing information over the radio, provide details only of injuries present and their management.

En route – continue patient MANAGEMENT (see below).

If patient is non-time critical, perform a more thorough patient assessment with brief secondary survey.

Specifically assess:
Assess for any other accompanying injuries.

MANAGEMENT OF SEXUAL ASSAULT

Follow Trauma Emergencies Guideline, remembering to:
Ensure ABCs.

Specifically consider:
Do NOT judge, or give the appearances of judging the patient, especially on sketchy or initial information. Be kind and considerate, and allow the patient space, and as much choice about options for their treatment as possible. They may well feel worthless, guilty and humiliated, and dominant controlling behaviour will aggravate these feelings.

Trust of a person of the same sex as the assailant may well be lacking. It is essential to be chaperoned at all times and it is appropriate to have a Police Constable of the same sex as the patient accompany the patient in the ambulance.

Encourage the patient to leave the same clothes on as were worn at the time of the assault, and NOT to throw away or destroy any clothing.

Encourage patient not to bathe or wash until forensic investigations have been completed.

Both of these recommendations are vital to conserve evidence for a successful prosecution of the offender, BUT must be conveyed with great tact to the patient who may well, quite understandably, want to shower and change clothing.

Encourage all victims of sexual assault to attend hospital, and inform the Police. Both physical, medical and emotional help are available via the hospital and Police to support them.

Some areas have special arrangements for non injured patients suffering sexual assault to be interviewed and examined in Police or other facilities. Local guidelines should be followed.

In non-time critical patients, contact hospital or Control by land line to pass an INFORMATION message to a SENIOR staff member of receiving hospital. DO NOT transmit any details ON AIR, unless Radio channel is secured.

Complete a clinical record IN GREAT DETAIL but using discretion. Document statements made by the patient and your findings with relevant timings. A police statement may well be needed at a later point.

In this and other complex circumstances it may be appropriate for the crew member to make additional notes beyond those on the CLINICAL RECORD. These notes should be kept on a confidential basis by the crew member in case they are needed in the future.
INTRODUCTION

Death associated with both medical and traumatic conditions often has a common link, that of Hypoxia.

Hypoxia in body tissues is a common outcome that may result from a variety of individual or combined causes. Hypoxia may arise from airway compromise or obstruction, inadequate or absent breathing, or circulatory inadequacy or arrest. Where hypoxia is associated with inadequate ventilation it is often associated with hypercarbia (CO₂ retention).

The management of the airway, adequate oxygenation and ventilation and circulatory support are, therefore, vital to preventing hypoxia.

Remember, in trauma situations, simultaneous control of the cervical spine whilst managing the airway, is critical.

METHOD

Airway management must be rapid and effective. Stepwise airway management employs a series of increasingly complicated manoeuvres to open and maintain the airway, used in stepwise order, the simplest and most rapidly applied first.

MANUAL METHODS OF AIRWAY CONTROL

Head tilt, chin lift, in non traumatic cases.

Trauma chin lift.

Trauma jaw thrust.

Suction/manual clearance.

Recovery position with manual jaw support where appropriate in non-traumatic cases.

AIRWAY ADJUNCTS*

Oropharyngeal airway (OP).

Nasopharyngeal airway (NP).

Laryngeal mask airway (LMA).

Endotracheal intubation (ET).

Needle cricothyrotomy.

*The use of specific adjuncts must be in accordance with individual service’s training procedures and areas of approved practice.

In the primary survey stage, where speed of assessment and management are vital, airway clearance and support by basic methods e.g. by jaw thrust and OP airway insertion, should be performed first. If this proves adequate, the airway should be maintained in this way until it requires formally securing prior to transportation e.g. with an ET tube.

Remember, inserting an OP airway takes seconds, whereas intubation takes some minutes to prepare for and achieve, and is rarely initially indicated or required.

TECHNIQUES

Manual Manoeuvres

Manual methods of airway opening are procedures familiar to all ambulance staff, and will not be repeated in this guideline.

Suctioning

Always insert the suction catheter with suction OFF, extract with suction ON, aspirating as it is withdrawn.

Suction, especially through ET tubes must only be of a few seconds duration, as it extracts, not only the unwanted fluids from the airway, but oxygen as well.

When suctioning an ET tube, use gloves. Pre-oxygenate with 4 – 5 oxygen supplemented ventilations prior to suctioning. Disconnect catheter mount, and insert catheter with suction OFF. Apply suction for no more than 2 – 3 seconds and withdraw slowly. Reconnect catheter mount, and recommence ventilation.

However, if vomit is filling up the airway, suction must continue until the airway is clear.

Oropharyngeal Airway (OP)

Insert an appropriate sized oropharyngeal airway, introduced upwards into the roof of the mouth, and rotated round to pass over the back of the tongue.

In children, insert the airway the correct way up, by depressing the tongue, and slipping the airway over it into position.

Nasopharyngeal Airway (NP)

These airways are sized in accord with the size of the nasal opening often corresponding to the diameter of the patient’s little finger. The airway should be inserted gently after generous lubrication. They are ideal for patients who need an effective airway, but will not tolerate an oropharyngeal device.
The appropriately sized NP airway, should be inserted gently along the floor of the nose into the largest nasal opening, not upwards, with a slight rotating movement. Once inserted it will sit with the flange against the nasal opening. A safety pin should be pinned across the flange of the airway to prevent slippage further into the nose.

If difficulty is found, try a smaller size or use the other nostril. Beware of causing nasal bleeding.

**Endotracheal (ET) Intubation**

Endotracheal intubation is the definitive method of securing the airway in pre-hospital care. Intubation may be very easy in a cardiac arrest case, where the airway reflexes and muscle tone are completely lost, but often impossible in the hypoxic head injured patient, with jaw muscle spasm and an intact, or partially intact gag reflex. These patients will in fact require the administration of pharmacological sedation and paralysis by a skilled Doctor to achieve successful intubation.

**Advantages of intubation**

- Airway is secured.
- Ability to deliver high concentrations of oxygen.
- Ease of ventilation.
- Prevention of gastric distension and aspiration.
- Allows better tracheal suction and airway clearance.
- Allows a second line route for drug administration in cardiac arrest.

**PRECAUTIONS**

Do not use intubation as a primary airway intervention, prior to airway clearance. Use more rapidly placed adjuncts such as an OP airway, and immediate ventilation with O₂. Always pre-oxygenate prior to intubation.

Caution with suspected **C-Spine injuries** – **use manual in-line immobilisation throughout the procedure. Use of a stylet or bougie is recommended.**

Never lever on the teeth or soft tissues with the laryngoscope.

**DO NOT TAKE MORE THAN 15 – 20 SECONDS TO INTUBATE.**

**PROCEDURE**

Assemble all equipment necessary prior to attempt. Check integrity of cuff.

Select tube size and ensure correct length. Insert introducer where utilised, ensuring the tip does not project beyond tube tip.

Assemble laryngoscope and check lamp.

Ensure suction works and is to hand.

Pre-oxygenate with a minimum of four full oxygen-supplemented ventilations.

Position patients head and ensure the neck is immobilised in trauma cases.

Insert blade to right of midline, move to left pushing tongue to left out of view.

Lift blade, identify epiglottis and slide blade tip into vallecula, or beyond in paediatric cases where a straight blade is used.

Raise blade and epiglottis, and insert tube until cuff passes just below cords.

Inflate cuff with air, whilst ventilating, until seal is obtained.

Connect as required to ventilation device with catheter mount.

Inflate lungs and listen bilaterally over axillae and frontal area of chest, to establish bilateral adequate air entry.

Secure tube and maintain checks on adequacy of air entry.

Apply pulse oximeter to monitor for adequate oxygen saturation.

Remember cricoid pressure to assist with visualisation of the larynx and occlusion of the oesophagus may be applied by an assistant. Caution with applying vigorous cricoid pressure in suspected unstable C-spine injuries, as this may increase the risk of displacement of the fracture.
COMPLICATIONS

Oesophageal Intubation

Oesophageal intubation is avoided by direct visual intubation of larynx and auscultation of the chest bilaterally after an intubation attempt. Re-evaluating air entry regularly and after each patient movement will minimise the risk of undetected displacement. Pulse oximetry monitoring may also assist in detecting oesophageal intubation or accidental extubation (see below).

Accidental Extubation

Patient movement is a common cause of displacement of an endotracheal tube.

The use of pulse oximeter monitoring will help, but initial changes may be delayed by the effects of pre-oxygenation. “End tidal CO₂” monitors may help monitor for this complication in the future.

Hypoxia

This results from prolonged attempts at intubation — take no more than 15-20 seconds, whilst attempting intubation. If unsuccessful, cease the attempt, then re-oxygenate prior to a further attempt.

Aspiration and induction of vomiting

If the patient has an intact gag reflex, do not attempt to introduce an ET tube in this situation, and always maintain suction at hand when assessing the airway.

Trauma to soft tissues

Use great care on insertion of the laryngoscope blade and tube.

Increasing C-Spine Injury risk in Trauma Patients

In trauma cases where the neck is “at risk”, it is ESSENTIAL to have the patient’s C-spine manually immobilised during the intubation attempt. Providing the head is manually immobilised, the front piece of the collar may be removed to assist in introducing the tube.

Laryngeal Mask Airway (LMA)

The LMA is being used more frequently as a device for managing failed ET intubation, or managing the airway in cases where intubation is impossible. The LMA comprises an oropharyngeal tube connected to a spoon shaped cuffed mask. This mask, when inflated, seals the LMA in position, and provides effective ventilation combined with some level of protection from aspiration.

Indications for use

The indications for the use of the LMA are similar to those for ET intubation. However, as ultimate airway security is inferior to that obtained with an ET tube in position, its major use is in cases of failed or difficult intubation e.g.

- cardiac arrest following failed intubation.
- trauma where intubation is impossible, or has failed
- in cases where the operator is LMA but not ET intubation trained (Ambulance Technicians are increasingly trained in the use of the LMA).

Advantages of the LMA

Ease of insertion without a laryngoscope, and airway is more secure than simpler adjuncts.

Ability to deliver high concentrations of oxygen.

Ease of ventilation.

Lessens risk of gastric distension and aspiration.

Allows for improved suction and airway clearance.

PRECAUTIONS

Do not use introduction of the LMA as a primary airway intervention, prior to airway clearance. Use more rapidly placed adjuncts such as an OP airway, and immediate ventilation with O₂. Always pre-oxygenate prior to introducing the LMA.

Caution with suspected C-Spine injuries – use manual in-line immobilisation throughout the procedure.

Leaks may occur around the cuff which can lead to gastric distention.

There is a small risk of pulmonary aspiration of gastric contents. This is more of a risk in the pre-hospital environment where the patient may have a full stomach, and is of increased risk where there is not a good seal achieved by the cuff.

Patient movement may dislodge the LMA in a similar fashion to an endotracheal tube. Re-evaluate the airway, especially after patient movement.

Monitor oxygen saturation using a pulse oximeter but be aware that pre-oxygenation prior to introduction of the LMA may maintain oxygen saturation for some minutes after an incorrect LMA insertion.
PROCEDURE
DO NOT TAKE MORE THAN 15 – 20 SECONDS TO INTRODUCE THE LMA.

Assemble all equipment necessary prior to attempt. Check integrity of cuff.

Select correct size mask and lubricate the posterior aspect of the mask.

Ensure suction works and is to hand.

Pre-oxygenate with a minimum of four full oxygen supplemented ventilations.

Position patients head in the neutral position, and ensure the neck is immobilised in trauma cases.

Insert the mask behind the upper incisors with the solid line facing towards the nose.

Slide it backwards along the roof of the mouth until it is deflected into the oropharynx. Continue to slide the LMA backwards until the tip comes to rest in the hypopharynx. The mask should now be sitting above the laryngeal outlet.

Inflate the cuff with air, and note the settling of the mask, manifested by slight upward/outward movement.

Connect as required to ventilation device with catheter mount.

Inflate lungs and listen bilaterally over axillae and frontal area of chest, to establish bilateral adequate air entry.

Secure tube and maintain checks on adequacy of air entry.

COMPLICATIONS
Accidental Displacement
Patient movement is a common cause of displacement of an LMA.

The use of pulse oximeter monitoring will help, but initial changes may be delayed by the effects of pre-oxygenation. “End-tidal CO₂” monitors may help for this complication in the future.

Hypoxia
This results from prolonged attempts at introduction of the LMA – take no more than 15 – 20 seconds, whilst introducing the LMA. Cease the attempt, then re-oxygenate prior to a further attempt.

Aspiration and induction of vomiting
If the patient has an intact gag reflex, do not attempt to introduce the LMA in this situation, and always maintain suction at hand when assessing the airway.

Trauma to soft tissues
Use great care on insertion of the LMA.

Increasing C-Spine Injury risk in Trauma Patients
It is ESSENTIAL, wherever practicable, to have the patients C-spine manually immobilised during the introduction attempt. Providing the head is manually immobilised, the front piece of the collar may be removed to assist in introducing the LMA.

SIZING OF AIRWAY ADJUNCTS
Ambulance Paramedics and Technicians are routinely trained in the sizing of oropharyngeal airways and this will not be covered in this guideline.

Nasopharyngeal airways are sized in terms of internal diameter by eye and comparison with the size of the patient’s nasal opening. The sizing for the length of the nasopharyngeal airway is approximately the distance between the nasal tip and the angle of the jaw or the tragus of the ear.

ET Tube Sizes – Adult
Female 7.0 – 8.0mm
Male 8.5 – 10.0mm

ET Tube Sizes – Paediatric
Approximate size guide – for more detail in children, see Paediatric Resuscitation Tables.

Paediatric Internal diameter and length of ET tube formulae:
Age/4 + 4 = ET tube diameter in mm
Age/2 + 12 = ET tube length in cm (oral)

Pre term 2.5mm 3 yrs 4.5mm
Newborn 3.0 – 3.5mm 5 yrs 5.0mm
6 months 3.5mm 8 yrs 6.0mm
18 months 4.0mm 10 – 15 yrs 6.5 – 8.0mm cuffed

LMA Sizes*
Small adult Size 3
Average adult Size 4
Large adult Size 5

*LMA – is not advised in small children
INTRODUCTION

Paramedics and Technicians are all familiar with applying intermittent positive pressure ventilation (IPPV), where the self-inflating bag, or automatic ventilator is used to take over absent ventilation in the non-breathing patient.

Inadequate, rather than absent ventilation, requires rapid support to the patient’s poor efforts, before the effects of the hypoxia and carbon dioxide (CO2) retention from inadequate lung ventilation become dangerous, and induce cardiac arrest. This is a particular risk in children.

Fatigue associated with acute severe asthma, head injury inducing hypoventilation, and drug induced respiratory depression are typical causes of inadequate ventilation.

If breathing is in any way inadequate in a child, assist ventilation early.

METHOD

Open and clear airway.

Use any airway devices required to maintain airway.

If ventilation is adequate – provide adequate oxygenation.

If ventilation is absent – apply IPPV with self inflating bag, and reservoir with 10 – 15 lpm of O2, or use automatic ventilator.

If ventilation is present, but inadequate in RATE (see table) or DEPTH, apply assisted ventilation with self-inflating bag and mask, with reservoir fitted, and oxygen enrichment at 10 – 15 lpm. Ensure you explain what you are about to do to the patient prior to commencing.

TECHNIQUE

Maintain airway position, apply and seal mask, and gently squeeze bag to provide full lung inflations at normal breathing rate for that patient. Ventilate in time with patient’s breaths to improve inspired volume, and add ventilations where rate is inadequate, to provide a normal rate of breathing (14 – 16 breaths per minute – bpm).

In a deteriorating head injured patient, ensure assisted ventilation is provided with bag, mask, reservoir and O2 at 10-15 lpm at a rate of 14-16bpm. This will minimise hypoxia and help prevent hypercarbia (CO2 retention)

Use patient’s colour, conscious level and pulse oximetry readings to monitor effectiveness of assisted ventilation.

Remember, if pulse oximetry displays a hypoxic reading (<95% below normal, <90% serious hypoxia, <85% critical hypoxia):

- check and clear airway – if no improvement
- provide 100% oxygen via a Non-rebreath Oxygen Mask
- if no improvement assist ventilation (IPPV) with 100% O2.

Remember hypoxia kills patients

Normal Respiratory Rates

<table>
<thead>
<tr>
<th>AGE</th>
<th>RATE BPM</th>
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<tbody>
<tr>
<td>ADULT</td>
<td>12 – 20</td>
</tr>
<tr>
<td>5 – 12 YRS</td>
<td>20 – 25</td>
</tr>
<tr>
<td>2 – 5 YRS</td>
<td>25 – 30</td>
</tr>
<tr>
<td>0 – 12 MTHS</td>
<td>30 – 40</td>
</tr>
</tbody>
</table>

ADDITIONAL INFORMATION

The assessment of “adequate ventilation” described in the guideline requires assessment of ventilatory rate and depth.

Minute volume is a measure of the air exchanged per minute, and requires to be approximately 7000mls per minute to provide adequate ventilation.

Minute volume depends on the RATE and VOLUME (depth) of ventilation.

E.g. During normal ventilation, about 500mls of air are taken in with each breath, this is the “tidal volume”. Around half of this remains in the dead space in the airways, and half enters the alveoli for gas exchange.

If tidal volume = 500mls

Respiratory rate = 14bpm

Minute volume = tidal volume x respiratory rate.

Minute volume = 500 x 14bpm = 7000 mls/minute (7 lpm)
The **Major Danger** in trauma patients is **hypoventilation**, with falling oxygenation (hypoxia) and rising carbon dioxide levels (hypercarbia).

**Remember**, this may occur in obvious low respiratory rates, coupled with poor respiratory effort.

It also occurs in rapid respiratory rates, when combined with poor effort. For example, if the patient is only moving 150 mls into the airways with each breath, they will not be overcoming the dead space, nor moving enough oxygen in or carbon dioxide out per breath.

Although at 30 breaths a minute the patient may appear to be hyperventilating, they are not, and will shortly get into major difficulties as a result of hypoxia and CO\textsubscript{2} retention.

Assisted ventilation must be provided with high concentration O\textsubscript{2} from a bag, mask reservoir device to increase tidal volume and prevent rapid deterioration.
INTRODUCTION
Glucose is an important source of energy in the body and the sole source of energy for the brain.

Blood glucose level testing is widely available using reagent strips and meters. This has now become a practical and quick procedure for pre-hospital use.

DESCRIPTION

Blood Glucose Level Testing – Method of Measurement

REAGENT STRIPS
The majority of these reagent strips, (Glucostix, BM 1-44 strips and Exactech) work by either a colour change or electrolytic reaction proportionate to the amount of glucose in the droplet of blood tested.

The strips that produce a colour change (Glucostix, BM 1-44) have the additional advantage of allowing a reading to be taken visually by comparison of the strip with the colour chart on the pack.

METERS
The meters work by sensing this change in colouration or electrical impulse and converting this to a blood glucose reading on the screen. There are several meters available.

USES
The measurement of capillary blood glucose is of key importance in any case of sudden illness in diabetic patients.

Capillary blood glucose measurement is also a vital part of the assessment of all unconscious patients, and collapses associated with alcohol and drug abuse.

METHOD

Procedure for obtaining a drop of blood from finger.

Choose suitable finger site.

Massage end of finger to warm skin, and congest with blood.

Ensuring that the puncture site is completely dry, prick the side of the finger with a suitable finger-pricking device and squeeze gently to encourage blood to flow.

Apply a large droplet of blood to the test area of the test strip, making sure that the test area is completely covered, but not flooded. Smearing blood unevenly over the reagent pad will give an inaccurate reading.

Specific Glucometers
As meters vary between, and even within services, individual meters are not covered within this Guideline.

COMPLICATIONS

To obtain a good result care must be taken with the measurement procedure and the correct timing sequence followed for each strip/meter.

Inaccurate readings may be obtained if:
- blood is smeared unevenly over the reagent or electronic sensing pad
- inadequate blood is placed on the reagent pad
- conversely flooding the reagent pad with too much blood
- in the case of some meters, incompatibility of the strips with the calibration of the meter.

NORMAL READINGS

The normal blood glucose ranges from 3 – 9mmol/l. It is normally around 5–6mmol/l, however after a meal the blood glucose may transiently rise to >10mmol/l.

HYPOGLYCAEMIA is an abnormally low blood glucose. This is usually <3.0mmol/l but symptoms may be experienced at higher levels especially in the older diabetic patient.

HYPERGLYCAEMIA is an abnormally raised blood glucose level, frequently in excess of 20mmol/l.

ADDITIONAL INFORMATION

Blood glucose level testing meters are usually quite accurate, but the patient’s history and signs and symptoms must be the primary consideration.

If clinically a diabetic patient is hypoglycaemic they should be given oral glucose, glucagon or glucose 10% IV as appropriate in line with the Glycaemic emergencies guideline.

If the blood glucose result clearly conflicts with the signs and symptoms suggestive of hypoglycaemia, do not hesitate to give glucose (either orally or IV) or glucagon as required. Giving glucose when not required will rarely do harm, but leaving hypoglycaemia untreated certainly will.
DESCRIPTION

Method of Measurement

Blood pressure is measured in millimetres of mercury (mmHg) – by means of a sphygmomanometer at the brachial artery in the arm, where the pressure is similar to that in the blood vessels leaving the heart.

Uses

The assessment of blood pressure, if taken together with the determination of the presence or absence of peripheral pulses, the recording of the heart rate, observations of capillary refill and the auscultation of heart sounds, is an integral part of the evaluation of the patient’s cardiovascular status.

METHOD

The patient should be as relaxed as possible, and the procedure should be explained to the patient, wherever possible.

The cuff should be placed firmly and evenly around the upper arm, the centre lying over the brachial artery, the lower end of the cuff just above the band of the elbow.

The cuff is then inflated until the radial or brachial pulse can no longer be felt. This is because the artery has been compressed and the systolic pressure has been exceeded by the pressure in the cuff.

The cuff is then slowly deflated until the radial or brachial pulse reappears, the pressure at which this occurs equals the systolic pressure.

The cuff is then deflated again and the process repeated, this time listening with a stethoscope to the sounds over the brachial artery. As the cuff is deflated, sounds are heard with each heartbeat. The point at which the sounds first appear is the systolic pressure. Deflation is continued and the sounds get louder but then become muffled (known as phase 4) and disappear altogether (known as phase 5). The point at where the sounds disappear correspond more closely to the diastolic pressure (phase 5).

NORMAL READINGS

Blood pressure varies with age, eg. in older people the blood pressure is higher due to the reduced elasticity of the vessels.

However, as a rough guide.

**Diastolic** pressure in the average adult is approximately 70 – 80 mmHg.

**Systolic** pressure in the average adult is approximately 100 mmHg plus age. The systolic pressure can vary, so this is an average guide.

**APPROXIMATE VALUES**

<table>
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<tr>
<th>AGE</th>
<th>BP</th>
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<tr>
<td>20</td>
<td>110/70</td>
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<tr>
<td>45</td>
<td>135/85</td>
</tr>
<tr>
<td>70</td>
<td>160/95</td>
</tr>
</tbody>
</table>

Abnormally high blood pressure is known as hypertension.

Abnormally low blood pressure is known as hypotension.

**COMPLICATIONS**

Nil – in normal measurements.

**ADDITIONAL INFORMATION**

When diastolic pressure remains high for some time, this leads to serious complications. Heart failure may result, first affecting the left side of the heart, but eventually congestive heart failure (combined left and right sided) will supervene.

High blood pressure increases the risk of myocardial infarction (MI) and cerebral thrombosis or haemorrhage leading to stroke.

**Electronic Sphygmomanometers**

The previous method refers to a manual sphygmomanometer. However electronic machines are commonly used and the manufacturers instructions must be followed.

Regular comparison tests should be made with mercury sphygmomanometers for testing the accuracy of the ambulance equipment. These may be compared with any hospital mercury sphygmomanometer. Regular calibration of ambulance and individual’s sphygmomanometers is essential.
GENERAL
CBRN materials are all very different and each present unique difficulties for responders. However chemical and biological agents present four main types of hazard, depending on the physical properties and characteristics of the agent released. These are:-

- contact hazard
- inhalation hazard
- injection hazard
- ingestion hazard.

Contact Hazards
Are created by chemical, biological or radiological agents, which can be absorbed into the skin. These agents can be in solid, liquid or vapour form. Most biological agents do not pose contact hazards, unless the skin is cut or abraded.

Inhalation Hazards
Are created by vapour, aerosols or contaminated dust that can be inhaled into the lungs.

Injection Hazards
Result from chemical, biological or radiological agents being injected – either by the agent moving from the injection site into the blood stream or being injected directly into a vein or artery.

Ingestion Hazards
Result from chemical, biological or radiological agents being ingested into the digestive system.

In addition to these four types of hazards, radiological agents present a significant additional hazard that results from the radiation they emit.

Nuclear hazards, in this context, will be those resulting from a nuclear explosion. These will include extensive blast and fire damage, direct radiation effects and widespread radiological contamination.

PERSONAL SAFETY
- park uphill and upwind
- don Hi-visibility jacket and safety helmet, or PPE if trained in its use
- close all vehicle windows and vents
- switch off air conditioning in vehicle
- obey all cordons and safety advice
- where possible, avoid contact with contaminated casualties.

If you come into contact with affected or contaminated casualties, you must consider yourself contaminated and a casualty! Remain at scene, commence self-decontamination and isolate yourself until given further instructions.

CONSCIOUS CASUALTIES
- reassure them constantly
- minimise handling
- if necessary provide modesty and blankets.

Encourage them to:
- face into the wind
- remove their contaminated clothing
- control any haemorrhage with direct pressure
- assist other casualties
- commence self decontamination.

UNCONSCIOUS CASUALTIES
- check ABC

If breathing present:
- place in recovery position facing the wind.

If not breathing:
- DO NOT attempt mouth to mouth.

To be used when cause is unknown and symptoms are similar.

STEP 1-2-3 (Safety Triggers for Emergency Personnel)

Step 1 – One casualty
Approach using normal procedures.

Step 2 – Two casualties
Approach with caution. Consider all options.

Step 3 – Three or more
Do not approach the scene IF POSSIBLE
- withdraw
- contain
- report
- if contaminated, isolate yourself
- send for specialist help
- (M)ETHANE assessment to be provided as soon as possible.

Do not compromise your safety or that of your colleagues or the public.
**REMEMBER METHANE**

My call sign, or name and appointment. Major Incident, STANDBY or DECLARED.

**Exact Location** – where possible, map reference.

**Type of incident** – e.g. chemical, explosion, RTA.

**Hazards** – present and potential.

**Access** – best routes for access and egress to scene and RVP.

**Number of casualties** – approximate numbers and types of casualties (P1, P2, P3, DEAD and whether contaminates.)

**Emergency Services** – report on services already on site and if further services required.

**CHEMICAL INCIDENTS**

**Managing the Consequences of a Deliberate Chemical Release**

**Characteristics of a Chemical Incident**
- rapid action producing mass casualties
- persistent liquid contact and downwind vapour hazards
- casualties can contaminate first responders
- decontamination will probably be necessary and needs to start quickly
- most effective in confined spaces where there are lots of people.

**Casualties from a Chemical Incident**
- lots of casualties (hundreds) probably at scene
- injury occurs very rapidly (minutes)
- must be treated rapidly if they are to survive
- very few casualties will occur more than two or three days later.

**Decontamination issues**
- most contamination will be on clothing
- skin must be decontaminated rapidly.

**BIOLOGICAL INCIDENTS**

**Managing the consequences of a Deliberate Biological Release**

**Characteristics of a Biological Incident**
- slow action producing mass casualties over time
- could go undetected until people become ill
- potential for epidemic with some diseases
- need for decontamination will depend on agent used
- most effective in confined spaces where there are lots of people.

**Casualties from a Biological Incident**
- unlikely to be any casualties at the scene
- window for treatment in first 12 to 24 hours
- cannot tell who has been exposed
- first casualties will start to appear two to three days later
- it may be very difficult to be sure the incident is over.

**Decontamination Issues**
- washing skin and clothing should be effective.

**RADIOLOGICAL AND NUCLEAR INCIDENTS**

**Managing the Consequences of a Deliberate Radiological Release**

**Characteristics of a Radiological Incident**
- few immediate casualties
- need to monitor those present for contamination
- persistent radiation hazard
- persistent contact and downwind hazards
- casualties can contaminate first responders
- decontamination will be necessary and needs to start quickly.

**Casualties for a Radiological Incident**
- few casualties at scene
- damage is dosage related and cumulative
- casualties will become ill over a period of days to weeks
- casualties will need reassurance.

**Decontamination Issues**
- most contamination on clothing
- skin must be decontaminated rapidly
- need to provide shielding from radiation.
**GLOSSARY OF COUNTER-TERRORISM ABBREVIATIONS/ACRONYMS**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACPO(TAM)</td>
<td>Association of Chief Police Officers (Terrorism and Allied Matters)</td>
</tr>
<tr>
<td>ATO</td>
<td>Ammunition Technical Officer</td>
</tr>
<tr>
<td>ATSAC</td>
<td>ACPO(TAM) Strategic Advice Centre (normally established at Scotland Yard)</td>
</tr>
<tr>
<td>AWE</td>
<td>Atomic Weapons Establishment, Aldermaston</td>
</tr>
<tr>
<td>(CB)IED</td>
<td>(Chemical or Biological) Improvised Explosive Device</td>
</tr>
<tr>
<td>CCC</td>
<td>Civil Contingencies Committee</td>
</tr>
<tr>
<td>CCCG</td>
<td>Chief Constable’s Co-ordinating Group (Strategic Group)</td>
</tr>
<tr>
<td>CMLO</td>
<td>Consequence Management Liaison Officer</td>
</tr>
<tr>
<td>COBR</td>
<td>Cabinet Office Briefing Room(s) (Central Govt co-ordinating group)</td>
</tr>
<tr>
<td>Dstl</td>
<td>Defence, Science &amp; Technology Laboratory, Porton Down – part of the Ministry of Defence</td>
</tr>
<tr>
<td>EHO</td>
<td>Environmental Health Officer</td>
</tr>
<tr>
<td>EOD</td>
<td>Explosives Ordnance Disposal</td>
</tr>
<tr>
<td>FSC</td>
<td>Forward Scientific Controller</td>
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<tr>
<td>FCP</td>
<td>Forward Control Point</td>
</tr>
<tr>
<td>FMC</td>
<td>Forward Military Commander</td>
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<tr>
<td>GLO</td>
<td>Government Liaison Officer</td>
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<tr>
<td>GLT</td>
<td>Government Liaison Team HazMat Hazardous Material</td>
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<tr>
<td>IPE</td>
<td>Individual Protective Equipment</td>
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<td>JHAC</td>
<td>Joint Health Advisory Cell</td>
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<td>JIG</td>
<td>Joint Intelligence Group</td>
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<tr>
<td>JMC</td>
<td>Joint Military Commander</td>
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<tr>
<td>MACA</td>
<td>Military Aid to the Civil Authorities</td>
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<tr>
<td>MACC</td>
<td>Military Aid to the Civil Community</td>
</tr>
<tr>
<td>MACP</td>
<td>Military Aid to Civil Power</td>
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<tr>
<td>MAGD</td>
<td>Military Aid to Govt Departments</td>
</tr>
<tr>
<td>NARO</td>
<td>Nuclear Accident Response Organisation (MoD)</td>
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<tr>
<td>PIC</td>
<td>Police Incident Commander</td>
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<tr>
<td>PMBS</td>
<td>Police Main Base Station</td>
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<td>POLSA</td>
<td>Police Search Adviser</td>
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<td>PPE</td>
<td>Personal Protective Equipment</td>
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<td>SAS</td>
<td>Special Air Squadron</td>
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<td>SBS</td>
<td>Special Boat Squadron</td>
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<tr>
<td>SF</td>
<td>Special Forces</td>
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<tr>
<td>SIO</td>
<td>Senior Investigating Officer</td>
</tr>
<tr>
<td>SMC</td>
<td>Senior Military Commander</td>
</tr>
<tr>
<td>SO13</td>
<td>Met Police Anti-terrorist Squad</td>
</tr>
<tr>
<td>SSA</td>
<td>Senior Scientific Authority</td>
</tr>
<tr>
<td>TAG</td>
<td>Technical Assessment Group, Dstl Chemical and Biological Science</td>
</tr>
<tr>
<td>TRF</td>
<td>Technical Response Force (specialist military/scientific team)</td>
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</tbody>
</table>

With thanks to Mandy Brokenshaw and Dr Adrian Noon
Essex Ambulance Service NHS Trust
INTRODUCTION

There are a number of reasons why clinical records are important.

All forms must be fully, accurately and legibly completed to ensure that they provide clinical details that can be referred to after handover at hospital.

It is a legal document and is the crew and Trust’s record of all the care given to that patient. On this basis it has to be kept for an eight year period, and for life in certain cases such as children or maternity cases in case of legal action or query.

Ambulance trusts also routinely use the clinical information as evidence to change clinical policies and guidelines for the benefit of patients.

Several types of report form are in existence, including forms that provide information about first response, patient assessment and treatment, refusal to accept treatment/travel, recognition of death, these all form a part of the overall clinical record.

PATIENT CARE CONTINUITY

A written clinical report is required to back up a verbal handover, so that key information remains available to hospital staff from the time a patient is admitted to the time they are discharged. Clinical records are often referred to many days after admission.

This report will help convey a picture of the patient’s condition and the relevant circumstances and mechanisms of an incident, something that only Ambulance Personnel will have witnessed.

Without this information mistakes in the later care of the patient can be made where for example, accidental overdoses of opiate drugs have been given and over infusion of IV fluids have occurred, because of missing or incomplete information on Paramedic/Technician treatments on the clinical record.

PROTECTION FROM LITIGATION

If a clinical record is missing, or if it is incomplete, it will lead to the assumption in court that procedures not recorded were, in fact, never performed. In the case of an Ambulance Trust, omissions on clinical records will make the Trust vulnerable to any later claim that a patient was not treated appropriately, or at all, and leave the service and crew vulnerable to litigation.

REMEMBER –
If it is not in the clinical record, it has not been done: poor records, poor defence; no records, no defence.

PERCEPTION OF AMBULANCE PERSONNEL AS PROFESSIONALS

The clinical record is a statement of one’s professional attitude to practice. A well documented and accurate patient record creates the immediate image of a competent and professional Paramedic or Technician in the eyes of the reader.

An incomplete and poorly completed record creates the opposite impression.

AUDIT AND CLINICAL QUALITY IMPROVEMENT

Feedback on clinical performance and compliance with medical guidelines is essential to improve the practice of ambulance paramedics and technicians. Good quality and accurate clinical records allow this feedback from clinical audit and supervisory staff and this forms a part of professional practice for all ambulance staff.

Accurately completed clinical records will help to trace incidents and compare our findings with the A&E department’s final diagnostic conclusions. This is a key part of looking at the care that we give and evaluating the effects on actual patient outcome.

METHOD

Each Trust has its own specific clinical record, although much of the data is common. Specific completion advice and guidance will be issued by individual Trusts.
INTRODUCTION
Clinical waste is defined as any item contaminated with blood or body fluids, human tissue, all sharps and unwanted pharmaceutical products.

SEGREGATION
All clinical waste (other than sharps, see below) must be segregated into yellow clinical waste sacks, and secured with a tie wrap. Knotting to secure clinical waste bags is not acceptable practice. All domestic waste must be placed into black plastic sacks.

STORAGE
Within The Vehicle
Clinical waste that is carried on the vehicle must be properly bagged and secured. It should be removed from the vehicle at the earliest opportunity and placed in a suitable container that is provided for the purpose.

On Station
Clinical waste returned to ambulance stations must be placed in an appropriate container in a secure, designated area. Handling of clinical waste should kept to the minimum level possible. Staff must ensure that the outsides of the sacks or containers do not become contaminated.

PHARMACEUTICAL WASTE
Drugs that have been opened and not used or only part used, should be disposed of as clinical waste. Unopened drugs should be disposed of appropriately.

Under no circumstance should pharmaceuticals be disposed of via the sewerage system.

SHARPS
Used sharps must be handled safely to avoid injury to self and others. The person using the sharp is also responsible for its’ safe and immediate disposal.

Never re-sheath needles, and never attempt to remove scalpels or blades from holders by hand.

Sharps must be disposed of immediately after use. Drop them into the sharps bin using a single-handed technique. Do not hold the bin or ask others to hold it while disposing of the sharp. The bin must be available at the point of clinical use.

Only use the specially provided sharps disposal bins (i.e. conforming to UN 3291 and BS 7320). No other type of disposal container or other method of disposal is legally acceptable.

The lid of the sharps disposal bin should be closed when not in use. The bin must never be filled to more than three-quarters capacity. The locking mechanism must be engaged and a security tag attached prior to final disposal into a clinical waste receptacle.

Incidents where adequate and appropriate measures have not been taken to dispose of sharps, thereby putting others at risk of injury, should be regarded as critical incidents and reported appropriately. This includes disposing of a sharp instrument that has been left with a patient.

Under no circumstances must staff empty sharps from one container to another. Once a sharp has been placed in a sharps bin it remains there.
INTRODUCTION

Over 85% of sudden cardiac death patients are in ventricular fibrillation when they collapse.

The ability to reverse ventricular fibrillation fades from 80% to 0% rapidly. From the start of cardiac arrest the majority of patients will be asystolic within 14 minutes.

The provision of BLS extends the period of VF. However, the only definitive way of reversing this rhythm and successfully resuscitating the patient is by immediate defibrillation.

When a crew of two attend, basic life support (BLS) must be commenced as the defibrillator is prepared as this will prevent further deterioration of the rhythm towards asystole.

In the case of a single operator, once cardiac arrest has been diagnosed, the defibrillator should be attached to the patient, the rhythm assessed and shocks administered immediately, where required. BLS should be commenced in accordance with the appropriate resuscitation guideline.

DESCRIPTION

Defibrillation is the administration of a controlled electric shock. The defibrillator administers the shock through hand held, or hands free adhesive electrodes, which are placed on the chest wall, over the base and apex of the heart.

USES

In cases of cardiac arrest, where patients are found to be in ventricular fibrillation (VF), pulseless ventricular tachycardia (VT) or in asystole where VF cannot be excluded, defibrillation must be performed immediately.

METHOD

Manual Defibrillation

Confirm that the patient is not breathing and has no pulse.

Expose the chest and ensure that it is as dry as possible.

Follow usual safety procedures including removal of GTN patches and metal jewellery.

Apply electrode pads to the chest. One pad should be applied to the right of the sternum below the clavicle, the other over the cardiac apex.

Switch on the defibrillator use paddle “quick look” pick up to assess initial rhythm.

If the rhythm is shockable, leave paddles on the chest, and immediately charge to 200 joules in adults and warn the surrounding members of the public and one’s colleague that you are about to shock the patient. Ensure they STAND CLEAR.

Apply firm pressure with the paddles to the patient's chest via the gel pads and, after a final check that you and others are clear of the patient, state “shocking now, stand clear”, and discharge the paddles by depressing both fire buttons simultaneously.

The ECG will often be flat for some seconds after defibrillation as the electrical system of the heart is “stunned”. A slight pause should be taken therefore before assessing the true outcome rhythm following a defibrillatory shock. If the rhythm remains asystolic connect monitoring electrodes to exclude spurious asystole.

Continue to defibrillate according to the resuscitation guidelines, adjusting the energy levels. After the first three shocks attach the monitoring electrodes.

At the end of the sequence of shocks, remove the paddles and relocate in their holder (if appropriate). Re-assess the rhythm over the next few seconds, along with a check of the carotid pulse. The heart will frequently take some seconds to recover after defibrillation.

Proceed with subsequent shocks as per Adult/Paediatric Resuscitation Guidelines.

On manual defibrillators equipped with “hands free” defibrillation electrodes, the above procedure should be followed with the exception of the requirement to remove the pads at the end of shock sequences.

Automated External Defibrillation (AED)

Confirm that the patient is not breathing and has no pulse.

Expose the chest and ensure that it is as dry as possible.

Follow usual safety procedures including removal of GTN patches and metal jewellery.
Apply electrode pads to the chest, connecting the leads before application. One pad should be applied to the right of the sternum below the clavicle, the other over the cardiac apex.

Switch on the defibrillator and **ANALYSE RHYTHM**.

If no shock is advised, can fine VF be excluded? If not, and you are suitably qualified, engage manual override button and **proceed as manual defibrillation guideline**.

If shock is advised, the machine will automatically charge to 200 joules. When charged, warn the surrounding members of the public and one’s colleague that you are about to shock the patient, and they **MUST STAND CLEAR**.

Ensuring you and all others are clear – press shock button.

Press analyse button again and re-check pulse.

If a further shock is advised, the machine will automatically charge to 200 joules. Again, warn the surrounding members of the public and one’s colleague that you are about to shock the patient, and they **MUST STAND CLEAR**.

Ensuring you and all others are clear – Press shock button.

Press analyse and check pulse.

If a further shock is advised, the machine will automatically charge to 360 joules. Again, warn the surrounding members of the public and one’s colleague that you are about to shock the patient, and they **MUST STAND CLEAR**.

Ensuring you and all others are clear – Press shock button.

Check pulse.

If there is no pulse, perform four full cycles of 15:2 compression/ventilation CPR. This time allows for appropriate interventions for airway care and drug administration.

Again, check pulse and press analyse. If shock is advised, the machine will automatically charge to 360 joules. Warn the surrounding members of the public and one’s colleague that you are about to shock the patient, and they **MUST STAND CLEAR**.

Ensuring you and all others are clear – Press shock button.

Continue to follow Resuscitation Guidelines, as required.

**COMPLICATIONS**

Always ensure that the defibrillator batteries are fully charged.

Always ensure that the pads are compatible with the defibrillator and are in date.

An automatic or semi-automatic defibrillators, do not touch the patient during the **ANALYSE** phase, as this will give erroneous readings.

**REMEMBER** on AEDs and semi-automatic defibrillators the analysis programme can be electronically corrupted by surrounding electro-magnetic and radio signals. (Do not use a cell phone or hand portable radio within two metres of the device).

**AEDs are not suitable for use on paediatric patients.**

BLS must always be initiated immediately using high flow O₂ therapy via BVM or automatic ventilator.

**ADDITIONAL INFORMATION**

It is essential, at a cardiac arrest/ suspected cardiac arrest incident, to carry a defibrillator to the scene (see **Equipment to Scene Guideline**). The second crew member may simultaneously provide basic life support measures (eg. aspiration, OP airway and BVM and reservoir ventilation with 100% O₂) for airway and breathing control, whilst the first crew member concentrates on early defibrillation.

New bi-phasic waveform AEDs are now being introduced utilising more sophisticated technology to deliver more effective shocks with less energy. Bi-phasic technology is likely to displace the current mono-phasic devices as it tailors shocks to each individual patient.
INTRODUCTION

Monitoring the cardiac rhythm with a 3 lead ECG is an additional and useful method of assessing the condition of many patients and is particularly valuable in cases of cardiac arrest and suspected myocardial infarction.

The use of diagnostic 12 lead ECG assessments is now a part of the pre hospital screening of patients with suspected acute myocardial infarction.

DESCRIPTION

3 lead ECG monitoring is a method of recording the electrical activity of the heart on a screen and moving paper strip (trace). Electrodes are connected to the skin usually via 3 leads.

12 lead ECGs require a more sophisticated and sensitive machine found in newer generation defibrillator/monitors. They require a special 12 lead attachment, with self-adhesive electrodes, and the reading is usually interpreted by a built in diagnostic algorithm.

Many machines permit onward transmission of the ECG to a receiving coronary care unit. Taking and interpreting a 12 lead ECG in the field forms part of the essential “speeding up” process to the definitive care, providing early thrombolytic therapy in patients with acute myocardial infarction.

They may also allow more prompt administration of pre hospital thrombolytic therapy in more rural areas.

USES OF 3 LEAD MONITORING

3 lead ECG monitoring is very useful for detecting heart rate and rhythm in medical cases, especially those with chest pain.

The 3 lead trace, has little or no diagnostic value with regard to conditions such as myocardial infarction. Currently, in hospital, a full 12 lead ECG and other diagnostic tests are necessary to confirm or exclude myocardial infarction or ischaemia.

However, the 3 lead trace records leads 1, 2 and 3 and in cases of an inferior MI, this may show ST changes (ST segment elevation) in leads 2 and 3. The absence of ST segment changes in leads 1, 2 and 3 does not rule out the presence of myocardial infarction, as these changes may take some time to appear.

METHOD

Reassure and explain the procedure to the patient.

Wipe and dry the chest using an alcohol swab.

Excessive chest hair may require to be shaved off.

Place three electrodes firmly adherent to the chest in the appropriate location.

Attach ECG leads and switch on, usually to lead II.

Run two ECG strips as a baseline for approximately 10 seconds, using lead II (one for clinical record, one for the hospital).

Run any further strips required to record any abnormal rhythms seen.

Continue patient monitoring en route to hospital.

LEAD POSITIONS

3 Leads

The RA lead (+) is usually positioned to the right of the sternum, below the clavicle.

The LA lead (-) is usually positioned to the left of the sternum, below the clavicle.

The LL lead (ground) is usually positioned over the left lower ribs.

It is preferable to routinely monitor on lead II, as this usually shows both QRS and P waves most clearly.

12 lead Electrocardiography.

The use of 12 lead ECGs will be introduced as a part of the assessment of patients suspected of suffering from acute myocardial infarction. It will require additional training and equipment, and will be implemented as indicated by services. It will not be covered in detail in this guideline.

Myocardial infarction produced “acute changes” on the 12 lead ECG. These include elevation of the ST segment deepening and widening of the “Q” wave and inversion of “T” waves on leads that record the electrical activity of the affected area of the heart. Inferior myocardial infarction shows in leads II, III and aVF. Antero-lateral infarction shows in leads V, V, V, and aVL. Anterior myocardial infarction shows in leads V, V, V.
COMPLICATIONS
Always ensure that all the leads are correctly positioned and attached to the electrodes on the chest, as false readings may occur.

Always ensure the gain adjustment is set correctly to obtain the correct sized trace.

Defibrillatory shocks will often “stun” the heart and a period of electrical inactivity follows the shock. A few seconds wait following shocks prior to drawing conclusions on post-shock rhythm is advised.

ADDITIONAL INFORMATION
In emergencies, the majority of ECG monitors/defibrillators will record through defibrillator paddles or self adhesive defibrillation electrodes. Using paddles in “quick look” mode is fine for rapid rhythm diagnosis, but should rapidly be replaced by 3 lead electrodes after the first sequence of shocks.

The final recording is denoted as a 3 lead electrocardiogram, which is effectively a rhythm strip.
INTRODUCTION

It is essential to arrive by the side of any patient with the equipment appropriate to their needs.

This is a basic professional standard required of all ambulance staff and an expectation of the patient and their relatives.

The Dispatch / Control Centre now gives more accurate pre-arrival information with the introduction of medical priority based dispatch systems. Although this information is a very useful guide, it is always possible that it may be inaccurate, or the patient’s condition has changed significantly since the call was made.

Arrival by the side of the patient without the necessary equipment can seriously threaten their chances of survival. A delay of 1-2 minutes for example, to go back and retrieve a defibrillator from the ambulance, for an unexpected cardiac arrest case, will reduce the patient’s chances of survival by 10-20% if they present in ventricular fibrillation.

To be unprepared for any emergency situation is an unacceptable reflection on any professional as an individual or the health care organisation, such as an Ambulance Service Trust that they work for.

Being properly prepared and equipped allows us to consistently deliver the best possible care to our patients on every occasion, and is a positive expression of our primary concern for the well-being of the patient.

It is a requirement that:
For ALL medical cases, including collapses, shortness of breath, unconsciousness, asthma emergencies, chest pain, fitting, cardiac arrest, etc. a case or bag containing the following equipment MUST be taken to the patient:

Cardiac monitor/defibrillator or AED for IMMEDIATE defibrillation.

First Response equipment including:
- oxygen therapy equipment including adult/paediatric non-rebreath masks
- aspirator
- bag/mask/reservoir
- airway maintenance equipment
- cardiac/emergency drugs and cannulation equipment
- wound dressings
- drugs case.

For ALL TRAUMA INCIDENTS, including RTAs and falls, the following equipment MUST be taken to the patient:

First Response equipment (as above).

In addition a set of cervical collars to assist with the immobilisation of the cervical spine.

The ventilator on the Ambulance can normally be left in the vehicle for immediate connection when the patient is loaded, or it may alternatively be taken to the patient where it may be used to assist with an ongoing resuscitation.

For the remaining medical/surgical and other cases, the first response equipment case or bag should be taken to the patient to provide immediate necessary treatment, e.g. oxygen therapy.

REMEMBER – ALWAYS BE PREPARED FOR THE WORST CASE.
INTRODUCTION

In all time critical cases, pre-alert of the receiving hospital and request of an appropriate team standby is essential.

The hospital alert message will usually be passed by radio, and should ideally be direct from incoming vehicle to receiving clinician or senior nurse. It may be necessary to use an indirect route via the ambulance control, but this is not ideal, and adds to the alerting time.

Messages should be concise, accurate and convey all pertinent points to allow decision making to happen ahead of arrival at hospital.

It is best to use a standard format and plan the message prior to transmission.

HOSPITAL ALERT MESSAGE

These guidelines all utilise in trauma cases a standard assessment of the incident scene and mechanism of injury, primary survey assessment of the patient with immediate interventions, and secondary patient survey as indicated.

In medical cases the patient and event history is followed by primary and secondary survey patient assessments and necessary interventions.

The logical format of an alert message should follow this consistent approach:

Vehicle call sign.
Patient age and sex.
Presenting problem or chief complaint.
Immediate pre event history or injury mechanism.
Airway status and interventions.
Breathing status.
Circulatory status.
Disability – AVPU.
Any specific problems.
Standby requirements.
Estimated arrival time.

It is often abbreviated and remembered using the acronym:

A age
S sex
H history
I injuries or illnesses found or suspected
C current condition
E estimated time and mode of arrival

EXAMPLE 1

102 to DGH A&E unit.
I have a 34 year old female.
Fall from 3 metres – chest injuries.
Known epileptic.
Airway clear and being maintained by patient.
Respiratory rate 36.
Increased respiratory effort.
Breath sounds diminished on left side.
Oxygen saturation 93%.
On oxygen 15 lpm, assisting ventilation.
Pulse rate 120.
Capillary refill 4 seconds.
Cannulating en route.
V on AVPU scale.
Worried about developing pneumothorax.
Request Trauma Team.
ETA ten minutes.

EXAMPLE 2

102 to DGH A&E unit.
I have a 77 yr old male.
Suffering from central chest pain for 20 minutes, not relieved by GTN.
History of angina.
Airway clear.
Respiratory rate 12.
Air entry equal, some crepitations at bases.
On oxygen at 10 lpm.
Pulse 88 regular.
BP 130/90.
ECG rhythm – sinus, no arrhythmias noted.
Have just cannulated and given oral aspirin 300mg.
A on AVPU.
Probable MI.
Can chest pain nurse be in A&E on our arrival?
ETA 12 minutes.

HOSPITAL INFORMATION CALL

There are a number of circumstances where an alert call is not required but an information call is indicated. An abbreviated version of the above format should be used, but clearly prefixed by this being a call for information only.

SUMMARY

Hospital alert and information messages need to follow the procedures adopted for all patient assessments in the field, so we merely report in the same order as we have assessed and treated the patient. It should be concise, but paint an accurate picture for the receiving hospital staff to ensure they are adequately prepared to provide the best patient care on your arrival.
INTRODUCTION
It is essential for the wellbeing of patients, staff and the families of staff that high standards of infection control are practised in the clinical arena.

The following should be read in conjunction with Trust policy and guidance on infection control and the booklet "Infection Control Practices for Ambulance Services" (Infection Control Nurses’ Association April 2001)

"UNIVERSAL PRECAUTIONS"
Universal precautions are designed to help protect the health care worker from becoming infected.

You must apply the safe practices described in this booklet when working with ALL patients, ALL of the time, irrespective of diagnosis. You should:

- **Presume** that all body substances (blood, excreta, secretions etc) contain infective micro-organisms
- **Reduce** the risk of these substances contaminating you by wearing protective clothing (i.e. by placing a barrier between the substance and yourself)
- **Recognise** that skin is a protective barrier, micro-organisms can be washed off. Breaks in the skin, cuts and abrasions can provide an entry point to infective micro-organisms and should be covered with waterproof dressings.

KEY ELEMENTS OF INFECTION CONTROL
Safe working practices will prevent the spread of infection.

Hand washing is recognised to be the most effective method for stopping the spread of infection. Handwashing must be thorough and frequent, using the technique described in the “Clinical Guidelines, Infection Control” booklet, regardless of whether gloves have been worn.

Protective clothing prevents the healthcare worker and their clothing from becoming contaminated with blood or body fluids.

Careful disposal of used sharps and clinical waste is essential to prevent healthcare workers and others such as waste handlers, from acquiring infection.

Maintaining a safe and hygienic environment is essential for the controlling the spread of infection. The procedures described in the “Clinical Guidelines, Infection Control” booklet for decontaminating ambulance vehicles and equipment must be followed.

HAND HYGIENE
Hand hygiene is the single, most effective method of preventing cross-infection. The aim is to render hands socially clean and to remove transient micro-organisms.

When to Wash Your Hands
Before contact with a susceptible site on a patient (e.g. wound).

After any activity where hands may become contaminated.

When visibly dirty.

After you take your gloves off.

After direct patient contact and before contact with the next.

Liquid soap and water should be used for routine hand washing. Antiseptic or anti bacterial soaps are not appropriate and may actually degrade the health of your skin. Wipes and alcohol gel are useful in the absence of water but are not as effective, therefore hands should be washed with soap and water at the earliest opportunity.

Hand Drying
Do not use shared linen towels to dry your hands, use disposable paper towels.

SKIN PROBLEMS
If you are experiencing skin problems, pay particular attention to a good hand care routine. If there is no improvement within two weeks seek further advice from Occupational Health. If you have lesions, cuts or grazes that cannot be adequately covered, contact the Occupational Health Service.

PROTECTIVE CLOTHING
Disposable, protective apron and gloves should be worn whenever there is a risk of contamination with patients body substances.
**Gloves**

**WHEN TO WEAR GLOVES**
Wear gloves when handling blood and body fluids.

Wear gloves when handling chemicals (except petroleum based chemicals).

Gloves should be discarded as clinical waste after use on each individual patient. Unlike human skin, washing or rubbing gloved hands with alcohol gel will not decontaminate them.

Latex should be avoided due to the risk of sensitisation or allergic reaction.

**Aprons**

Plastic aprons should be worn to protect uniforms when there is a risk of contamination from blood or body fluids; when cleaning up spillages or if clothing is likely to become soiled and also to reduce the risk of patient contamination with micro-organisms. Aprons should be disposed of as clinical waste after single patient use.

**Protect Eyes and Mouth**

Eye and mouth protection (goggles, visors, safety glasses) should be worn if there is a risk of body substance splashing into eyes or mouth. In the event of a splash of blood or other body substances into eyes or mouth irrigate immediately with water, report the incident and seek advice from Occupational Health.

*Ordinary paper facemasks are rarely useful and do not act as a barrier to fluid splash.*
INTRODUCTION

Intra-osseous infusion is an alternative method of administering fluids when IV access is difficult or has failed. It is of particular use in children as it can be accomplished more quickly than IV access.

DESCRIPTION

To obtain intra-osseous access a metal cannula is inserted into the medulla of a long bone. Any fluid or drug which would be used in an emergency resuscitation outside of hospital can be administered through an intraosseous infusion.

USES

Volume replacement in hypovolaemia secondary to haemorrhage from trauma or medical causes.

Volume replacement in hypovolaemia resulting from dehydration, e.g. diabetic hyperglycaemic coma.

IO cannula placement for drug administration, or to secure venous access.

METHOD

Explain procedure to patient or parent.

Identify the chosen site which would usually be the tibia. The landmark on the tibia for all age groups is as follows:

- Identify the tibial tuberosity.
- Find a point 2cm distally then 2cm medially.
- Clean the skin.
- Ensure the IO needle and trochar are screwed together.
- Insert the needle at 90 degrees to the surface of the bone (in children slightly angle the needle distally to avoid the epiphyseal plate)
- Advance the needle using a screwing/pushing motion until you feel the needle give as it passes through the cortex of the bone into the medullary cavity
- Withdraw the trochar and attach a 2ml syringe.

Dispose safely of SHARP straight away into sharps container.

Aspirate bone marrow which confirms placement of the needle and can be used for cross-matching and checking blood glucose.

Secure the needle with tape.

Attach the three way tap and IV line.

Administer fluid using a syringe to measure the volume given (resuscitation in children is 20ml/kg body weight)

COMPLICATIONS

In British pre-hospital practice the complication rate is very low.

The complications you can encounter are:

- incorrect placement
- extravasation of fluid
- infection – osteomyelitis.

ADDITIONAL INFORMATION

Do NOT insert IOs distal to any fracture site in the limb or pelvis.

IO access is well suited to the child who is unconscious or has impaired consciousness. It is clearly painful and should not be used in alert children.
INTRODUCTION

IV cannulation is a useful pre-hospital technique which allows the Paramedic to administer both intravenous drugs and/or fluids.

DESCRIPTION

IV cannulation is a procedure whereby a plastic “cannula over needle” device is inserted into a vein. On completion of the procedure the introducing needle is withdrawn, leaving the plastic cannula in place in the vein.

USES

Volume replacement in hypovolaemia secondary to haemorrhage from trauma or medical causes.

Volume replacement in hypovolaemia resulting from dehydration, eg. diabetic hyperglycaemic coma.

IV cannula placement for drug administration, or to secure IV access.

METHOD

Explain procedure to patient where possible whilst applying tourniquet, or BP cuff inflated to about 40-50mmHg. Apply tourniquet early, to avoid wasting time.

Run through IV line, where required, and pre-prepare all equipment, tapes, cannula fixing plaster, syringes, and swabs etc.

Palpate and select vein. Clean skin with a swab and allow to dry.

Apply gentle skin traction and extend limb to “anchor” vein.

Puncture skin either directly over, to the side of, or at a vein Y-junction, and advance till flashback occurs. Insert cannula and remove needle directly or in sheath depending on cannula type. Dispose safely of SHARP straight away into sharps container.

Fix cannula with dressing, and connect IV set or cannula plug, and luer lock securely in place.

Release tourniquet.

Secure THOROUGHLY with 2-3 loops of tape over looped giving set tubing. Apply crepe or cotton bandage, to secure IV in situ, and apply arm splint over ante-cubital fossa if required.

Adjust, giving set flow valve to TKVO (To Keep Vein Open) rate or WIDE OPEN in the case of urgent volume replacement.

Note Time of Infusion commenced and note ALL volumes given.

If the external jugular vein is used in cardiac arrest, aim from head downwards, and insert cannula into the vein half to two thirds the way from the angle of the jaw to the clavicle. Ease the cannula gently into vein, as although the vein distends well, it is “floppy”, and easy to puncture the far vein wall if care is not taken. Use a 2ml syringe attached to the cannula to aspirate blood, as this will help confirm vein entry.

REMEMBER Trauma IVs must be started en route to hospital unless the patient is delayed by distance or entrapment. Do not waste time or veins with difficult IVs. Two attempts are normally reasonable, but do not delay journey to hospital, and leave one virgin IV access site for the A&E staff.

COMPLICATIONS

Immediate

Local haematoma.

Late

Infected IV site.

Phlebitis (vein inflammation) more common if leg veins are used.

ENTRAPMENT

If patient is TRAPPED, call for MEDICAL ASSISTANCE EARLY, and if IV access is difficult, leave the BASICS doctor/medical team some options.

Monitor IV flow rates, and note infusion volumes with care.
NORMAL SIZE
Select APPROPRIATE CANNULA.

Adult Volume Replacement = 14 or 16g or equivalent bore cannula.

Adult Drug Administration = 18 or 20g

Child = 18 to 22g

Rapid flow rate is critical in volume replacement and a large cannula is essential.

ADDITIONAL INFORMATION
Do NOT insert IVs distal to a fracture site in a limb.

Do not insert IVs through damaged or abraded skin, BURNS may be an exception.

In children where IV access proves impossible, IO access should be considered. (see Intraosseous infusion guideline).
INTRODUCTION

Aims of fluid replacement
To restore tissue perfusion and oxygenation.
To correct hypovolaemia.

There are two intravenous fluids commonly used by Ambulance Services for volume replacement. Both are a type of crystalloid solution:

Compound Sodium Lactate – (Hartmanns or Ringers lactate) in 500 or 1000ml bags.

Sodium Chloride (Physiological Saline) 0.9% – in 500 or 1000ml bags.

Hypertonic saline solutions and large molecule starch compounds are currently being evaluated as possible alternatives. Colloids are no longer recommended in pre-hospital care as they have no proven benefit but a higher cost and higher risk of adverse reaction.

METHOD

Assess baseline pulse for presence at the site (eg.radial), pulse rate and volume and assess skin colour and temperature. Assess capillary refill (normal <2 secs) and assess systolic BP on basis of pulse site.

If the patient shows any evidence of very early hypovolaemia, i.e. tachycardia and cool skin, or injuries that will inevitably lead to significant blood loss, intravenous fluids should be considered. Only, however, after adequate airway and breathing resuscitation, and arrest of external haemorrhage, should infusion be considered. Obtaining IV access, and commencing volume replacement should routinely be achieved en route to hospital, and not induce delay at the scene.

Intravenous cannulation and fluid replacement should commence via at least 1 wide (14g – 16g) bore cannula, en route to hospital in all TIME CRITICAL PATIENTS, and wherever possible en route, with non-time critical patients, in those cases where IV access is indicated.

IV fluids should ideally be warmed.

DOSAGE AND ADMINISTRATION

Adults

Administer or commence crystalloid 250ml IV rapid infusion then reassess.

Aim to reduce tachycardia whilst restoring and maintaining a radial pulse (equivalent to a systolic BP of 80-90mmHg). If there is significant improvement, slow to keep vein open (TKVO) rate and reassess regularly.

If no improvement, administer:

A further crystalloid 250ml IV then reassess

If there has been a significant improvement in the patient’s condition after the second administration (radial pulse returned and maintained), slow the infusion down to a TKVO rate and reassess regularly, otherwise continue fluids in 250ml aliquots to 2 litres maximum

Only sodium chloride 0.9% should be considered in patients with diabetic hyperglycaemic ketoacidosis.

Children

Administer up to 20ml/kg, monitoring physiological signs whilst doing so.

If no improvement, administer:

Up to a further 20ml/Kg, then reassess.

ADDITIONAL INFORMATION

The vast majority of patients will be in hospital before the 2 litre maximum has been given. In the case of long journey times or entrapped patients, further fluids may need to be given to patients with severe blood loss. In TRAPPED patients skilled medical presence at the scene is essential at the earliest stage to assist with volume replacement decisions. On-line medical advise should be sought before infusing beyond 2 litres.

Continual reassesssment avoids both UNDER and OVER infusion.
Haemorrhage leads eventually to hypotension and a reduction in blood flow from the damaged vessels. Fragile clots will then form, but will be rapidly dislodged with a further haemorrhage if the BP is raised to over 80 – 90mmHg by too much infused fluid. Aiming to maintain a systolic BP of 80 – 90 mmHg (radial pulse returns) ensures reasonable blood flow to heart, lungs, brain and kidneys, without risking clot disruption and re-bleeding.

Delay in removal to hospital must not be prolonged by cannulating or infusing at the scene in non-trapped patients.

Evidence suggests, in non-trapped patients, or those with journey times of less than 20 minutes, that pre-hospital fluid replacement produces little benefit to patients.

**HYPERGLYCAEMIC KETOACIDOTIC COMA AND PRE-COMA**

**Diabetics**

Diabetic patients whose diabetes is out of control (blood glucose levels often >20mmol/l), are acidotic (as a result of using fats for energy instead of glucose), and who are unwell, are usually very dehydrated. They often present with tachycardia, have a raised temperature and when gently pinched, forearm skin remains tented up for some seconds.

These patients require rehydration urgently and this is best achieved using **0.9% normal saline**. This replaces both fluid and sodium, which are both depleted in this condition. Hartmanns solution should not be used in these cases where 0.9% Normal Saline is available, as it may worsen the acidosis.

Administer **0.9% normal saline** 250ml rapidly IV and reassess pulse, BP and perfusion. If no improvement, give a further 250ml. If improved, slow IV to a TKVO (to keep vein open) rate. Continue to maximum 2 litres infusion.

**PRECAUTIONS**

- Check fluids for **TYPE**
- **PACKAGING INTACT**
- **CLARITY OF FLUID**
- **EXPIRY DATE**

Wherever possible administer WARMED fluids (to body temperature if possible) – except in cases of heat exhaustion/heat stroke.

Note time of infusion commenced and note ALL volumes given accurately.
INTRODUCTION
The longboard is an invaluable extrication and immobilisation tool for pre-hospital use.

DESCRIPTION
A long board may be of wooden or polyethylene construction. Many have X-ray translucent polycarbonate clips for attachment of straps with speedclips.

The board is only a complete unit when equipped with a complete head immobiliser and four body straps. It must never be used without the head immobiliser and at least three body straps.

USES
Extrication of patients from vehicles.

Spinal column immobilisation, where mechanism of injury or assessed injuries, make spinal column injury a possibility.

Whole body immobilisation of patients with major or serious injuries.

Emergency stretcher in cardiac arrest cases and multiple casualty incidents.

Water rescue, with buoyant board.

METHOD
There are five basic long board manoeuvres to be used by ambulance staff.
- rear extrication
- emergency side extrication
- use of Scoop to lift onto Spinal Board
- log roll manoeuvres
- rapid take down

Practical skills have been taught to all staff, and these are further developed during PHTLS training. Specific notes only in the three key areas will therefore, be provided in this procedure.

EXTRICATION
The longboard must be assembled with ALL component parts by the patient, prior to use, and the ambulance trolley withdrawn from the vehicle and placed in easy reach once the casualty has been extricated.

Patients at risk of spinal cord injury must be moved with the head, neck and spinal column in neutral alignment at all times.

Manual head and c-spine control must not be released until body straps are attached and head immobiliser applied.

At all times spinal extrication should be attempted from the rear as a first option to AVOID DANGEROUS ROTATIONAL manoeuvres.

Side extrication should be only used exceptionally, as described above, as it involves rotation forces being applied to the spinal column which are dangerous with unstable spinal injuries.

The patient must be SLID, NOT LIFTED along the board. With head and neck immobilisation, and a controlled slide using grips in both armpits, pelvis, and lower limbs, undertaken with the person controlling the head and C-spine in charge.

The patient must be secured on the board as soon as the slide is completed. Blanket rolls under straps may be used to improve security of the patient on the board.

Apply body straps strictly in order:
- chest
- pelvis
- thighs
- ankles.

Followed immediately by:
- head immobiliser application.

Moving the supine patient
In non-trapped supine patients, an orthopaedic stretcher must be used wherever possible to lift the patient onto a longboard. Manual head and neck immobilisation must be maintained at all times.

A second option is to approach the casualty with the board from the top, sliding it under the head, neck and top of shoulders, and then sliding the patient, in-line up the board as usual. This avoids any rotational manoeuvres. The patient must ONLY BE SLID and NEVER LIFTED on the board.
The final option is a log roll. This is a potentially dangerous manoeuvre in a patient with an unstable spine. It must be coordinated with care by the person immobilising the head and C-spine, and there must be confident control of:

- head and C-spine
- shoulders and chest
- pelvis
- feet, which must be raised in line with the spine during the turn.

**COMPLICATIONS OF SPINAL BOARD USE**

The concern of placing patients on a board for long periods is centred around pressure area problems. In pre-hospital context, this does not present a practical problem, but care to remove debris from under the patient, and keys or other sharp objects in the patient's pockets, should be taken.

**Removal from the longboard should be carried out under direction of the responsible hospital staff after suitable patient assessment.**

**ADDITIONAL INFORMATION**

Padding will often need to be applied under the back of the adult patients head to prevent the head extending backwards from the neutral position, and extending the C-spine.

When using an adult longboard, padding will be needed under the shoulders of children, as the back of their heads (occiput) is more prominent, and this will cause flexion of the C-spine, if they are laid on the board with no under-shoulder padding.

Paediatric spinal boards, where carried, are suitable for 2 – 7 year old children. They are not suitable for extrication when sliding a child out of a wreck.

A traction splint may be easily applied to the patient on the board in case of femoral shaft fractures.

Patient handover, especially emphasising the injury mechanisms, is critically important if Accident and Emergency department staff are to evaluate the patient properly.

Currently vacuum mattresses are not practically useful in extricating patients and in the acute setting with time critical patients. They are very suitable for secondary transfer and developments in the future may make them more applicable to a front line roll.

Cervical collars – there is a clear linkage between the use of semi-rigid cervical collars and an increase in intra-cranial pressure in patients who have sustained head injury. A patient who is fully immobilised on a longboard with full straps and head restraint may safely have the collar released.
INTRODUCTION
In cases where stepped airway care has failed to achieve an airway by all other methods, including endotracheal intubation and, where applicable, LMA insertion, those trained and competent in the technique should consider needle cricothyroidotomy.

DESCRIPTION
Needle cricothyroidotomy and transtracheal jet ventilation involves the insertion of a plastic wide bore IV cannula over needle, through the cricothyroid membrane. The cannula is then connected to a high-pressure O₂ source and O₂ is delivered intermittently under pressure into the trachea.

USES
These will be cases of upper airway obstruction, e.g. epiglottitis, impacted foreign body.

Where the situation is desperate, and all other methods to obtain an airway have failed.

This technique will only rarely be used in pre-hospital care.

METHOD
Maintain ventilation and airway clearance attempts whilst preparing equipment.

Assemble appropriate equipment.

14g cannula with 10ml syringe attached.

Oxygen tubing to firmly connect cannula to flowmeter.

Oxygen cylinder and flowmeter with 10-15 lpm flow.

Y-piece to regulate oxygen flow.

Identify the cricothyroid membrane, in the MIDLINE between the thyroid cartilage (Adam apple) and cricoid cartilage (next prominent cartilage down from the thyroid cartilage).

Insert cannula tip through skin and membrane in one firm push in the mid − line, angled at 45 degrees downwards, until a “give” is felt. Aspirating on the syringe as the cannula is inserted, air will freely enter the syringe as the cannula enters the trachea, confirming tracheal entry.

Using the needle as a support, slide cannula over the needle into the trachea, and secure with tape or cannula dressing. Connect up to wall oxygen and turn up to flow rate of 15 lpm.

In CHILDREN O₂ flow rates should commence at 1 litre/min per year of age to a maximum flow of 10-15 lpm and adjusted until rise and fall of the chest can be seen.

Inflate via Y connector, or occlude cut-out vent for sufficient time to allow chest to inflate, then release for sufficient time to allow exhalation (exhalation phase should take about four times as long as inflation time). This approximates to a one second inflation and four seconds expiration on average.

COMPLICATIONS
Bleeding from wound and cricothyroid membrane. This is quite rare if the midline is adhered to as a puncture site, and requires firm pressure to the site to arrest bleeding.

Surgical emphysema (air leaking into neck tissues) if cannula is placed wrongly into superficial layers, not into trachea. Avoided by correct cannula placement.

In children, a smaller 16g cannula may be used. It is vital to remain in the midline when performing the puncture.

This technique provides high concentrations of oxygen into the alveoli rather than true ventilation. It allows very little outflow of carbon dioxide, as normal inspiration and expiration are not occurring. This causes a gradual build up of carbon dioxide within the lungs and this progressive build up limits the duration of safe use of this technique to 30 minutes.

NORMAL SIZE
Use a 14g-16g cannula.
INTRODUCTION

The need for emergency decompression of the chest is RARE and should only be performed when convincing signs of tension pneumothorax are present. Full A and B care must be applied, including assisted ventilation, prior to considering needle decompression.

Airway clearance and maintenance.

Oxygenation with 100% O₂.

Assisted ventilation with 100% O₂.

If there is no response to these basic measures and the patient is becoming more hypoxic and breathless, then needle thoracocentesis must be considered.

DESCRIPTION

Tension pneumothorax – in a NON ventilated patient

SIGNS

Severe and increasing breathlessness (usually >30bpm).

Decreased or absent breath sounds on one side of chest. Reduced chest movement, or over-expanded chest on affected side.

Distended jugular veins (if not hypovolaemic).

Tachycardia.

Shocked.

Reduced SAO₂ on pulse oximetry (often less than 85%).

Increased resonance over that side of the chest on percussion.

Deviated trachea away from affected side (late sign).

Cyanosed (late sign).

Tension pneumothorax in the intubated and ventilated patient – (MORE common in ventilated patients with chest injury).

SIGNS

In ventilated patients, resistance to ventilation (obstruction alarm on automatic ventilator or increasing resistance of self inflating bag) may be the first indication of a developing tension pneumothorax.

If this is suspected, check airway is clear.

If so re-assess the chest for.

Reduced air entry/ventilation on one side.

Reduced or absent breath sounds on the affected side.

Resonant percussion note on the affected side.

Reduced chest movement, or over-expanded chest on affected side.

If air entry is reduced or absent on the left.

Withdraw tube slightly and reassess to exclude accidental right main bronchus intubation.

Decreased O₂ saturation on pulse oximeter (often <85%) also supports the diagnosis.

Remember there are a number of other reasons why air entry could be reduced on one side after chest trauma, including pulmonary contusion.

METHOD

Ensure airway patency and adequate oxygenation with 100% O₂.

Ensure adequate ventilation.

Expose the chest.

Clean the skin over second intercostal space (just above third rib) in the mid-clavicular line.

Connect a 10ml syringe to a 14g – 16g cannula, and insert fully at 90° to the skin. Withdraw air as you advance, until free flow of air enters syringe. Advance cannula and remove syringe and needle to allow a rush of air out of the chest.

Secure cannula in place with tape. DO NOT refit cannula cap or try to create one – way valves, leave open to the air.

Listen to chest and reassess the patient.
Connect ECG and pulse oximeter if not already in position.

Definitive chest drainage is urgently needed, LOAD AND GO to nearest suitable receiving hospital.

Provide a hospital alert message / information call.

**COMPLICATIONS**

Management of Incorrect Needle Thoracocentesis

Wherever possible, leave cannula in situ. If it becomes dislodged, ensure A&E are informed that thoracocentesis has been performed.

Harm can occur if errors are made, including creating a small pneumothorax, caused by a wrong diagnosis in a small number of cases.

A small pneumothorax will rarely do harm, but if the patient requires surgery and ventilation under anaesthesia, this can be expanded to a tension pneumothorax, with serious danger to the patient.

It is vital therefore to inform the hospital team on arrival that a cannula has been inserted, or leave in situ.

Apply dressing over site if cannula has been removed.

Hospital team will need to assess, X-ray and drain formally if a pneumothorax has been created.

**Management of Blocked Cannula**

Cannula blocks with blood or fluid.

Try briefly to aspirate with syringe. If no improvement, insert a second cannula alongside the first.

**Management of Displaced Cannula**

Cannula displaces.

Re-insert a second cannula and secure well.

**Cannula length**

NB Some of the smaller IV cannulae now manufactured such as the Safelons, are not long enough to enter the plural cavity

**NORMAL SIZES**

- 14g – 16g
- 18g in small child
INTRODUCTION
Oxygen therapy is essential in virtually all cases of serious or potentially serious illness or injury.

DESCRIPTION
Oxygen is delivered to the patient in a variety of flow rates via standard or high concentration, high flow non-rebreathing masks with a reservoir bag. It assists in reversing hypoxia, by raising the concentration of inspired oxygen. Hypoxia will however only improve if respiratory effort or ventilation is adequate. If ventilation is inadequate or absent, assisting or completely taking over the patient's ventilation is essential to reverse hypoxia.

Oxygen is provided in compressed form in portable D-sized and fixed F-sized cylinders. It is also available in liquid form, in a system adapted for ambulance use. It is fed via a regulator and flowmeter to the patient by means of plastic tubing and an oxygen mask or nasal cannula.

METHOD
Oxygen therapy should be applied after considering any relevant co-existing conditions which may influence the actual provision or concentration of oxygen administered. The presence of poisoning with Paraquat is a rare example where withholding oxygen therapy is appropriate (in fact oxygen is contraindicated in such circumstances), and chronic obstructive pulmonary disease (COPD) requires good assessment, diagnosis and clinical decision making before deciding between standard or high flow delivery.

The importance and procedure of O₂ therapy must be explained to the patient.

DOSAGE
Dosage is dependent on the condition being treated, but in the majority of cases where the patient is moderately or seriously ill or injured, 100% high flow oxygen is indicated. In cardiac and respiratory arrest, acute respiratory and cardiac conditions and serious trauma, then the administration of 100% O₂ is vital.

Patients with COPD should receive metered oxygen therapy to maintain oxygen saturation (SaO₂) in the range 90-93%. In cases of serious respiratory distress, cardiac chest pain or major trauma in COPD patients, high flow oxygen may be required. Patients with Paraquat poisoning should not receive O₂ therapy.

ADMINISTRATION
O₂ therapy is administered via a mask and tubing. Masks are either the standard, non-reservoir bag or reservoir bag mask and tubing. Oxygen may also be administered via an automatic ventilator or self inflating bag, mask and reservoir.

High concentration oxygen can be provided through a non-rebreathing mask with a reservoir bag and with an oxygen flow rate sufficient to keep the reservoir bag fully inflated (usually 10-15 litres/min)

Low flow, 24 – 28% oxygen, can be provided at flow rates of 2 litres per minute through a medium concentration, non reservoir bag mask.

Layngectomee patients breathe through a stoma in the neck. A facemask or nasal cannula may be of little or no value. An appropriate method of administration must be considered.

ADDITIONAL INFORMATION
A pulse oximeter should always be used to measure O₂ saturation whenever O₂ is being administered. This is to monitor the effects of O₂ therapy and the effectiveness of the patient's ventilation.

O₂ saturation levels

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>95 – 100 %</td>
<td>Normal</td>
</tr>
<tr>
<td>90 – 95 %</td>
<td>Evidence of hypoxia</td>
</tr>
<tr>
<td>85 – 90 %</td>
<td>Serious hypoxia</td>
</tr>
<tr>
<td>85 % or less</td>
<td>Critical hypoxia</td>
</tr>
</tbody>
</table>

Hypoxic drive is found in COPD patients with chronic lung damage, where as a result of long standing respiratory failure, a higher than normal CO₂ level is retained in the blood stream. This would normally trigger a persistent high respiratory rate to attempt to lower the CO₂ level. To compensate, the body becomes less sensitive to raised CO₂, and begins to react to a lowered O₂ level, to act as a trigger to breathe.

Giving high flow O₂ will raise the O₂ level in the blood stream, and may prevent the natural lowering of O₂ occurring to stimulate breathing. This in turn may cause respiratory depression or respiratory arrest. If this occurs oxygen should be delivered through assisted ventilation or IPPV and the patient removed rapidly to hospital with a hospital alert message.
Patients with acute asthma DO NOT have COPD and require high flow O₂ with a non-rebreathing mask with a reservoir bag and with an oxygen flow rate sufficient to keep the reservoir bag fully inflated before and after nebulisation.

Some elderly patients have a mixture of COPD which causes irreversible bronchospasm and asthma which is reversible. The priority in treating these patients is to ensure adequate oxygenation.

Less seriously ill or injured patients still require O₂ therapy as per individual guidelines.

In cardiac arrest 100% O₂ must be delivered via automatic ventilator or bag/mask/reservoir during ventilation.

In carbon monoxide poisoning administering 100% O₂ increases the speed of elimination of CO from red cells.

SIDE EFFECTS
Non-humidified O₂ is drying and irritating to mucous membranes over a period of time.

CONTRA-INDICATIONS
Paraquat poisoning.
Explosive environments.

NB COPD is NOT a contraindication in the critically ill or injured hypoxic patient but the COPD guidelines should be followed.
**INTRODUCTION**
A peak flow reading assists in the assessment of the breathless patient, allowing measurement of the ability of the patient to breathe out. In patients with constriction of the bronchioles, a reduction in the patient's normal reading indicates the severity of their respiratory problem, e.g. an asthmatic with a normal peak flow of 500 has a severe reduction in peak flow if it is reduced to 250.

There are standard peak flow charts for men and women and the patient’s own reading can be compared to the average reading for their age on the chart, or better still, with the patient’s own peak flow record charts (see Asthma Guidelines).

**DESCRIPTION**
A peak flow meter measures a patient’s maximum expiratory effort – breathing forcibly out.

In pre hospital care, a peak flow reading is very useful to obtain both before and after the administration of nebulised salbutamol. It is a very useful indication of the effectiveness of treatment provided.

**USES**
Peak flow measurement is used to measure the day to day effect of treatment in patients with respiratory illness, by measuring the maximum ability to breathe forcibly out.

It is a simple, rapid measure of the effectiveness of any nebuliser treatment provided.

**METHOD**
Securely attach clean mouthpiece to meter.

Ensure pointer on scale is set at zero.

Instruct the patient to take a maximum deep breath.

Ask patient to seal lips over mouthpiece and forcibly breathe out (as if blowing out a candle).

Note reading on the scale and perform two other readings. The best of the three readings, is the correct peak flow reading, which should be noted on the Clinical record.

**COMPLICATIONS**
Use the SAME meter for all readings as there is some variation in accuracy between meters.

**ADDITIONAL INFORMATION**
Most asthmatics will know how to do a peak flow reading, and their usual reading. However some will not and staff need to be aware of the method and should refer to the chart for expected values.

Peak flow meters are not suitable for young children e.g. less than 5-6 years. The need for a paediatric peak flow meter will limit the availability of this option.

A proportion of children presenting with acute severe asthma will not have undertaken a peak flow measurement beforehand, therefore the value of this measurement in paediatric acute severe asthma may be reduced.

If the patient is breathless, it is tempting to omit a peak flow reading to speed up treatment. Without “before and after” readings, it is impossible to assess the effectiveness of any treatment. Judging improvement on the patient’s assessment, or subjective assessment alone is potentially dangerous.
INTRODUCTION

In 1921, Haldane stated that “Oxygen lack not only stops the machine but wrecks the machinery”.

DESCRIPTION

Pulse oximetry is a simple non-invasive method of measuring the oxygen saturation of the patient’s haemoglobin in arterial blood.

The unit is a compact battery operated unit, in some cases rechargeable from the vehicle 12v supply. The display is either by LED or LCD screen, and comprises:

- Pulse Rate.
- SAO₂ (Oxygen Saturation).
- Signal strength bar or waveform.

METHOD OF MEASUREMENT

A pulse oximeter measures the difference in the absorption of infra-red light (the “red” light produced by the sensor is a combination of red and infra-red light) by oxygenated and non-oxygenated haemoglobin in the small arteries, usually in the fingertip pulp or ear lobe.

It then calculates the percentage of haemoglobin that is oxygenated and displays this as oxygen saturation (SpO₂ or SAO₂) on the screen.

Pulse oximetry also calculates the pulse rate. It is able to do this as it needs to differentiate between haemoglobin in the arteries and veins, otherwise it might estimate the oxyhaemoglobin level in venous rather than arterial blood. To enable this, it can detect the pulsing in an artery, and measures the oxyhaemoglobin in the pulsatile vessel only. The pulses are also counted and a pulse rate is displayed.

Signal strength is calculated and reflects the reliability of the reading. This is displayed as a pulse bar or an arterial waveform (plethysmograph). High deflection or large deflection waves implies a good signal is being received and the result is likely to be reliable.

USES

Any patient with respiratory symptoms, e.g. breathlessness, asthma.

Any cardiac patient to ensure hypoxia is not present.

Any patient with impaired level of consciousness.

Any significantly injured patient, especially chest, head or multiple injuries.

Monitoring these readings will act as an aid to monitoring that both airway patency and ventilation are adequate and working to produce normal oxygenation. In hypoxic patients, airway clearance, high flow oxygen therapy and assisted or IPP ventilation may be needed to improve Sp O₂.

Assessing adequacy of circulation and perfusion of an injured limb.

METHOD

Clean the site with an alcohol swipe.

The machine will perform a self check routine on “start up”.

A patient probe, usually finger probe, or ear lobe clip, is attached from the machine to the patient for spot or continual monitoring. The probe must be shielded from bright light. Rubbing the site to encourage circulation may assist in the case of cold extremities.

ANY PATIENT FOUND EVEN TO BE MILDLY HYPOXIC:

Assess and correct airway deficits.

Assess and correct breathing deficits:

Give high flow O₂ via non-rebreathing mask with a reservoir bag and with an oxygen flow rate sufficient to keep the reservoir bag fully (100%), and assist ventilation or provide IPPV, if no immediate improvement.

Assess and correct circulation deficits:

Arrest haemorrhage, IV infusion if required.
COMPLICATIONS

Nail varnish may cause falsely low readings.

Peripheral shutdown due to vasoconstriction may cause failure to pick up a signal.

Shivering may cause failure to pick up a signal.

Bright overhead lighting may cause over-reading.

Carbon monoxide poisoning (exhaust fumes, blocked heating vents, smoke inhalation) will cause abnormally optimistic readings. (The monitor cannot differentiate between carbon monoxide or oxygen attached to haemoglobin).

Irregular cardiac rhythms may cause failure to detect signal.

NORMAL READINGS

Oxygen saturation of haemoglobin spans a very NARROW NORMAL RANGE.

95 – 100%
Readings of 90 – 95% represents evidence of hypoxia.

Readings of 85 – 90% represents serious hypoxia.

Readings of 85% or less represent critical hypoxia.

The finding of a normal (95 – 100%) reading of an injured or ill patient merely tells us that their haemoglobin is adequately saturated with O₂.

It DOES NOT mean the patient does NOT need O₂ therapy.

The site of the injury or problem, eg. Myocardium being damaged by acute shortage of oxygen, or injured brain tissue, DESPERATELY needs high flow O₂ and this must be given as per the relevant guideline.

ADDITIONAL INFORMATION

Oximeters with a plethysmographic trace have the advantage that if there is a clear arterial waveform present the accuracy of the reading can be viewed as reliable. Similarly, if the pulse bar is extending fully with each pulse beat the reading is more likely to be accurate.
INTRODUCTION
The initial management of the scene may have a considerable bearing on the management and outcome for the patient.

This extends to the start of shift, vehicle and equipment checks, and only finishes with a thorough verbal and written handover of the patient to the Receiving Hospital staff.

THE EMERGENCY CALL
The location and call details are noted and any uncertain location details clarified. Any pre-arrival clinical information and codes from the medical priority based dispatch system should be noted and codes checked in the pocket book. Status codes should be selected and transmitted on the radio or data terminal to record the following times:

- mobile to scene
- srived scene
- departing scene
- arriving hospital
- clear at hospital.

A number of services are now recording “arrived at patient” time using their UHF hand portable radios.

ON ARRIVAL AT SCENE
On approach to the scene, all necessary equipment must be prepared to be taken immediately to the patient (see Equipment to Scene Guideline). The vehicle should be parked safely with protection of the crew the scene and the patient in mind.

Self-safety, patient and public safety and scene safety, are paramount requirements.

In the case of a potential multi-casualty incident, an early ‘quick look’ situation report e.g. ‘bus vs car – bus half full,’ should be sent, immediately after your arrival at scene. This allows additional and appropriate resources to be mobilised early to assist the crew.

In motorway incidents, the vehicle should be parked beyond the wreckage, ready to depart.

High visibility jackets and protective helmets should be worn at all times in road traffic and transportation accidents, and in any hazardous situation.

Protective gloves/goggles must be worn for ALL patient contact procedures and double gloving should be used for high-risk patients (e.g. drug addicts).

When away from the vehicle, the crew must also carry their personal communications and pagers where provided.

ASSESSMENT
Full assessment of the scene (global survey) and resourcing the incident are the next key requirements.

Assess for Hazards
Assess for a request other emergency service attendance requirements:

Further Ambulance Service Resources
Further ambulances, additional paramedic support, clinical support officers, and ambulance officer support may be required. Helicopter, communications support, additional medical stores, or Press Officer support should also be considered.

Medical Support
BASICS, or ‘Flying Squad’ for entrapped patients or multiple casualties.

Fire and Rescue Service
Fire situations, chemical or radiation incidents, electricity/gas-related problems, including carbon monoxide poisoning. Rail incidents, entrappings and assistance with difficult patient access situations may require Fire and Rescue Service support.

Police Service
Road traffic, works and other incidents. Incidents involving violent or possible criminal activity. Incidents requiring access to premises, and all unexpected deaths. Railway and other transport incidents, especially those involving electrified overhead lines.

If this is a Major or potentially Major Incident also consider:

Assess for other support required – Civil Emergency Planning Officer (CEPO), Local Authority if evacuation or Social support is required.

Access and egress routes should be passed to the Dispatch / Control room.
ASSESSMENT OF THE PATIENT

Assess for:
- mechanism of injury
- history of the accident or illness
- total casualties
- types of casualties and severity of injuries.

TRIAGE (IF MULTIPLE CASUALTIES)

Use initial crude sieve: walking or non-walking as non-serious/potentially serious classification.

Assess non-walkers on ABCD basis:

- Any serious ABCD problem, 
  Priority 1 – Red Label, immediate treatment and evacuation.
- No ABCD problem, but potential or actual other serious injury
  Priority 2 – Yellow Label, Urgent but may be delayed treatment and evacuation.
- Walking Wounded,
  Priority 3 – Green Label, Non-urgent, delayed treatment and evacuation.
- Dead – White Label

Remember, walking wounded must be checked carefully to exclude hidden serious injury. Also, triage categories may change. “Apparent critically” patients may improve radically with basic airway care, and conversely, walking wounded patients may deteriorate to a “critical” condition.

In incidents with a number of casualties, use TRIAGE labels with the above priorities for easy recognition of priority patients for crews arriving subsequently.

Update situation to control regularly (at least every 15 minutes).

In larger incidents, two officers will be required, one to perform inter-service liaison and resource the incident, the other to supervise patient care and triage.

If multiple casualties, anticipate a delay in casualty removal, note where exceptional circumstances exist or additional resources are needed.

Ensure Receiving Hospitals are informed and updated, wherever necessary.

INTER-SERVICE LIAISON

If other services are deployed, establish an early ongoing liaison with the police, medical/nursing staff and Fire and Rescue officers.

ENTRAPMENT

Work as a team, in particular with the Medical and Fire and Rescue team, where patients are trapped.

Entrapment may be “relative”, where the patient is relatively uninjured, but prevented from removal by for example a jammed door, or “absolute”, where the patient is seriously injured and trapped by intruding metalwork.

Regularly exchange patient condition reports and extrication options with the Fire Officer, to speed up extrication.

Attempt to work on the patient from within the vehicle away from the areas where the Fire and Rescue team are working. This allows ongoing resuscitation whilst avoiding delays in extrication.

MEDICAL SUPPORT

The presence of an Immediate Care Doctor, suitably trained and equipped in support of the ambulance service at serious incidents is invaluable. The combination of the Doctor’s assessment skills and the paramedic’s practical skills bring great benefit to patient care. Advanced airway care and other techniques can also be bought to the patient. Team working however is essential.

Skilled medical support should be summoned to all “absolute” entrapments. The paramedic, technician and doctor must work in close co-operation to utilise each other’s skills and expertise.
Follow Ambulance Service treatment guidelines, and if these are deviated from by a non-ambulance service medical practitioner, ensure they are aware of this deviation and they are willing to accept responsibility. If unhappy at the proposed deviation, suggest the procedure is undertaken personally by the doctor and note the deviation on the clinical record.

It is advisable, where a doctor who has not been mobilised by Ambulance Control attends an incident, to request some form of identification if they are unfamiliar to the crew.

**PATIENT MANAGEMENT**

It is important that both Paramedics and Ambulance Technicians work throughout as a Team. Clinically, this is essential in, for example, cardiac resuscitation where life-saving minutes can be saved in providing defibrillation by close teamwork. Ten minute scene times can only be achieved, especially in major injury or resuscitation cases, where Paramedics and Ambulance Technicians work rapidly in a pre-arranged and organised way.

Follow Patient Management Guidelines, and when loaded, Transportation and Hospital Alert Guidelines.
INTRODUCTION
The principles of splintage involve:
- Arrest of external haemorrhage.
- Support of an injured / potentially injured area.
- Immobilisation of the joint above and below the fracture.
- Re-evaluation and recording the circulatory and neurological (motor and sensory) function below the fracture BEFORE and AFTER splintage.

Always
Pad rigid splints to conform to anatomy.
Remove all jewellery before swelling of the limb prevents it.
Note absence or presence of pulses sensation and muscle function.
Do not use pneumatic – inflatable splints, as they may compromise circulation and increase pain.

SPLINTING THE UPPER LIMB
Patient self-splintage is often adequate and may be less painful than attempting to put the limb in a sling.
Fractures of the clavicle and upper limb may be supported in a triangular sling, if this alleviates pain.
Vacuum splints, where carried, may be well suited to immobilising displaced forearm fractures in particular.
Short box splints may also be useful.

SPLINTING THE LOWER LIMB
Ankle and tibial fractures, as well as those fractures around the knee are well immobilised with either short or long box splints. These may need padding to be effective at immobilisation. The Frac immobiliser is also suitable.
Femoral shaft fractures are best managed by traction splintage. Isolated fractures of the tibia and fibula do not cause calf muscle spasm and do NOT require traction splintage. Fractures of the tibia in the same limb as a femoral shaft fracture may be immobilised by traction splintage, but the traction reduced to about 10lbs, so as not to over-displace the tibial fracture.

TRACTION SPLINTAGE
When the femur is fractured, thigh muscle spasm causes overriding of the bony fragments. This causes pain, allows for excessive bleeding and puts nerves and blood vessels at risk of injury by these fragments.

Traction, gently applied and maintained, will overcome this spasm and lessen all these hazards as well as relieving pain.
A traction splint is a device for applying longitudinal traction, the pelvis as a static point, and an ankle strap to apply dynamic traction to femur. They were first used by Hugh Thomas in World War 1 and were seen then to dramatically reduce mortality from open femoral shaft fractures.

Modern devices such as the SAGER, DONWAY and TRAC 3 splints are easy to apply and have quantifiable traction, measured on a scale in pounds. As the equipment used varies between Services the application of the traction splint is not covered further in this Guideline. You should ensure that you are familiar with the type of equipment used locally.

CONTRA-INDICATIONS
- Unstable pelvic fracture.
- Fractures involving the knee.
- Displaced ankle fracture, or amputation of the foot.
- Posterior dislocation or displacement of the hip (Often seen with intrusion of the dashboard striking the knee). The hip is held slightly flexed and rotated inwards. It cannot be straightened (extended) and pain is caused on attempting this (puts pressure on sciatic nerve). Check the foot pulses, provide padding under the knee, and immobilise on the longboard).

ADDITIONAL INFORMATION
Fractures may be closed or compound with skin penetration. Comminuted fractures involve shattering of the fracture site into multiple fragments. Nerves and blood vessels are placed at risk from sharp bony fragments, especially in very distorted (distracted) fractures, hence the need to return fractured limbs to normal alignment as rapidly as possible. Fractures around the elbow and knee are especially likely to injure arteries and nerves.
In the field, it is frequently impossible to differentiate between ligament sprains and a fracture. Immobilisation must be performed, and ASSUME a fracture until X-ray or expert medical opinion advises otherwise.

Injuries may be limb threatening, but in the early minutes after trauma, are not life-threatening. In non-time critical patients, full splinting with suitable analgesia is essential. In **TIME CRITICAL** patients, however, splintage is often going to be restricted to securing fractured limbs to a long spinal board, to allow rapid evacuation from scene for immediate hospital transport.

Blood loss from femoral shaft fractures, especially when these are compound, will be considerable, involving the loss of 500-1000ml. If the fracture is compound, blood loss may be doubled. Correct splintage with traction splintage will ease pain, reduce haemorrhage, and reduce the risk of blood vessel, nerve damage and embolisation to the brain and lungs of fat globules (fat embolus). It also minimises the risk of closed fracture being converted to a compound one, with all the serious complications for the patient that this will cause.
INTRODUCTION
At present there are a range of devices available for taking a temperature in the pre-hospital setting. There is some debate as to the accuracy of temperatures taken in this environment. Once a thorough history and clinical examination have been completed it is unlikely that the information gained from thermometry will alter the subsequent care plan. Thermometry is therefore not included as a core requirement and is listed here for the information of those services which choose to adopt it.

Temperature can be taken using the following routes:
- oral
- axillary
- tympanic membrane
- rectal.

In adults and older children, the oral or tympanic membrane (eardrum) route is usually used. The axillary or tympanic membrane route is usually better in babies and small children. The rectal route is impractical for normal pre-hospital use, but is the route of choice in obtaining accurate core temperatures in hypothermia.

DESCRIPTION AND MEASUREMENT METHOD

Oral Electronic Digital Thermometer
Most electronic digital thermometers measure within the range of 32°C – 43°C. With temperatures measured below this range, the screen will register “Lo” (<32°C). Above this range, the screen will register “Hi” (>43°C).

Place the thermometer under the patient’s tongue either to the left of right. Close the patient’s mouth and instruct them to breathe through their nose.

Alternatively, place the thermometer deep into the armpit and ask the patient to clench their arm to their side, or hold the arm with the thermometer clenched yourself, with the co-operation of the patient.

During measurement the temperature will continually flash on and off, whilst the temperature is climbing.

After 3-4 minutes the thermometer will stop flashing and will bleep for four seconds when a reading has been established.

Remove the thermometer and note the reading.

When using AXILLA ROUTE you must add 1°C to get a core temperature reading.

Always note the actual temperature reading and method i.e. axilla or oral when documenting temperature results.

Clean and probe thoroughly with an alcohol wipe and return to case.

The thermometer is powered by a silver oxide battery which last for approximately 1,000 measurements.

Tympanic Membrane Digital Thermometer
The tympanic membrane thermometer measures the temperature of the eardrum, which is a near approximation of the body’s core temperature.

It is a simple, non-invasive technique, and a reading can be achieved in seconds.

A lens filter cover is applied, and the instrument turned on.

The probe is inserted gently into the external ear canal, facing the eardrum.

The “read” button is depressed, and the device is then withdrawn. The reading on the LCD screen is then noted.

USES
Thermometers are very useful for assessing temperature in:
- unwell children, especially after febrile convulsions
- patients with fever, e.g. chest infections, pneumonia
- extremes of temperature (See Complications).

COMPLICATIONS
Oral and axillary temperatures are not accurate for measuring suspected HYPOTHERMIA, where tympanic membrane (unless the ear is full of water) and rectal temperatures are the most suitable. Rectal thermometry is the most accurate, but is seldom practical in the pre-hospital phase, and the patient with suspected hypothermia must be treated appropriately. (see Hypothermia Guideline).
NORMAL READINGS
Celcius only is used to record temperatures clinically.

The normal temperature is 37°C.

Temperatures between 37.5°C and 38°C are mildly elevated.

Temperatures of 38.5°C – 39°C are significantly raised.

Temperatures of 39°C or more are very high.

ADDITIONAL INFORMATION
Unlike oral and tympanic membrane temperatures, axillary temperatures are skin temperatures and need 1°C adding to equate to body core temperature.
INTRODUCTION

The patient must, at all times, be transported to the hospital MOST appropriate to their needs.

This will usually be the nearest District General Hospital (DGH), but may be a more remote specialist unit, or indeed, a smaller “Community” hospital where this is more appropriate, and admission Guidelines have been agreed.

There are a number of factors which enter into the decision-making process for selecting the best destination hospital for a particular patient:

- clinical condition of the patient
- distance to nearest District General Hospital or specialist unit
- any specific patient type exclusions of smaller units, eg. Community hospitals taking minor injury cases only
- any specific admissions policy of a specialist unit, eg. Burns cases.

The prime consideration is the clinical condition and needs of the patient.

CARDIAC ARREST

These cases must be transported to the nearest DGH accident and emergency department with pre-arrival hospital alert message. (See Hospital Alert Message Guideline)

TRAUMA CASES

The majority of trauma cases are simple trauma, and as such, should transported to the nearest DGH accident and emergency department. Minor Injury cases may be transported to Minor Injury Units where pre-agreed admission guidelines exist.

The management of patients with severe trauma is more complex. It has been demonstrated that survival in some time-critical cases is related to the speed of providing expert and definitive surgical care. This demands very rapid scene times, and moving the patient with great speed to the most appropriate hospital facility, for their needs.

BURNS CASES

These cases should all be taken directly to the nearest DGH accident and emergency department for assessment and triage. Often a full picture of the extent of the burn and any other factors such as airway involvement, can only be gained in the Accident Department.

Other factors, such as the location of the burn, rather than the total percentage alone, will be used in assessing the need to transfer to a specialist unit. In cases where concurrent trauma exists, this may be more life threatening than the burn, and is best dealt with at a DGH accident and emergency unit.

In some locations where burns units are near by, specific direct admission arrangements may exist for ambulance services for serious isolated burns cases.

MEDICAL EMERGENCIES –

- e.g. Asthma, Diabetes, Fitting Patients

These cases must be transported directly to the nearest DGH Accident and Emergency Department. Exceptions to this include direct admissions to either a ward or specialist medical admissions unit. If the patients condition is of concern, then a hospital alert message or information call must be sent whilst en route. (see Hospital Alert Message Guideline)

SURGICAL EMERGENCIES –

- e.g. Acute appendicitis, aortic aneurysm, bowel obstruction.

These cases are usually transported at the request of the patient's GP directly to a ward or accident and emergency department. Emergency cases arising from the 999 system must be transported to the nearest DGH accident and emergency department. If the patient's condition is of concern, then a Hospital Alert or Information Message must be sent while en route. (see Hospital Alert Message Guideline)

PAEDIATRIC PATIENTS

Seriously ill children must be taken to the ward of the DGH as arranged by their GP, or to the nearest DGH Accident and Emergency Department if the call arises from the 999 system.

OBSTETRICS – BLEEDING AND FITTING IN PREGNANCY

Bleeding in Early Pregnancy (<12-14 weeks)

Usually bleeding from a miscarriage, and cases of Ectopic Pregnancy are admitted, via their GP directly to the Gynaecological, rather than Obstetric team, or via the accident and emergency department.

Bleeding in Late Pregnancy (>14 weeks)

Patients with bleeding in late pregnancy, such as from placenta previa, go to the Obstetric team, either via a ward or directly to labour ward.
If the patient has not been seen and admitted by their GP, then the crew should contact, the Labour Ward via the Dispatch / Control Centre for advice about the destination for these patients, whilst en route to hospital. Patients with severe bleeding may be need to be taken, without delay, to the accident and emergency department for resuscitation.

Fitting in Pregnancy

In later pregnancy, fitting is a serious complication normally associated with eclampsia. It is managed rather differently than conventional fitting, and contact should be made with Labour Ward to see if they will admit directly. If not, the patient must be removed to the Accident and Emergency Department.

URGENT ADMISSION CASES

These patients must be taken with all necessary care and resuscitation to the ward or unit specified by their GP. Patient's whose medical condition has seriously deteriorated en route, may need to be diverted to the nearest DGH accident and emergency department, and a hospital alert message passed. The GP MUST be informed by Dispatch / Control Centre of this event.

At the hospital, provide a comprehensive verbal handover, and a completed Clinical record to the receiving hospital staff.

DEATH

There is a separate Guideline for dealing with death in the home. (Refer to the Out of Hospital Deaths Guideline)

THE AIR AMBULANCE

The provision of air ambulance support may influence transportation decisions, in terms of the ability to transport the patient to a hospital with specialist services (e.g. Neurosurgery) in addition to other services, in the same time frame as land transportation to a local DGH without these specialist services.

There is benefit in transporting patients to definitive care, but this must be considered in each area, depending on factors such as local helicopter availability, the nature of the service, equipment carried and staffing levels and qualification.

REFUSAL TO TRAVEL

These cases frequently present major patient management problems. Whilst there may be relief that the patient is apparently uninjured and does not require treatment and ambulance transport, it is of great concern that a significant majority of legal cases against ambulance staff and Trusts arise out of cases where injuries are missed in non-transported patients.

Decisions by the crew that the patient does not need to travel for further assessment or treatment have to be fully justified by them. It is vital to document the good clinical reasoning behind the decision and document all assessments and observations that supported that decision.

“Signing the Board” or completing the disclaimer form does not discharge you from your duty of care to the patient and is NO DEFENCE against litigation arising from a missed injury. The patient must be examined for:

Any potential injury with regard to the injury mechanism.

Any apparent injury.

Basic observations noted – Pulse, BP, Respiratory rate and AVPU.

Persuaded after the above of the need to attend hospital in the ambulance.

If patient refuses, despite persuasion, request the patient to sign the disclaimer form, preferably in the presence of a witness to your explanations.

Some services may require further consultation procedures to be followed via the control room before accepting a refusal to travel or a crew decision not to transport.

Document ALL the above, and the recommendation that the patient attend the nearest A&E department or dial 999, if they become unwell.

In cases where the patient flatly refuses, but is clearly badly injured or unwell, the assistance of other agencies, e.g. Police, GP, social worker should be sought.

Providing the above precautions are routinely taken, the crew are unlikely to render themselves vulnerable to criticism of their actions or litigation.