

Casualty Care

revision in

Mountain Rescue

8th Edition

(v8.0.n)
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Disclaimer

This book was developed as an aid for the learning and revision of essential skills in preparation for casualty care in mountain rescue examinations and life as a mountain rescue team member. It is not intended as a substitute for any book, training session or other learning process but as a complement to a wide variety of learning materials, literature, and situation.

The information in this book is provided without any representations or warranties, expressed or implied. While every effort has been taken to ensure that the information is up to date and accurate, errors may be present and we do not warrant that the information is complete, accurate, or up to date. Recommendations on processes, procedures and drug prescription do change from time to time and the information in this book should be read with that in mind.

Drugs should only be given to a casualty by a suitably qualified person. Information on manufacturer's instructions should be read and understood before administration. All drug administration should be recorded: administrator, drug, dose, date and time, route, and batch number. If at all possible, this should be witnessed by another qualified person. The drug doses quoted are reasonable for most adults aged 20-60 that are healthy in every other respect. In practice, they should be modified depending on the casualty's age and status and local customs and practice. Confirm drug doses by consulting the latest edition of the Mountain Rescue England & Wales Drug Formulary.

You must not rely on the information in this book as an alternative to medical advice from your doctor or other professional healthcare provider. If you have any specific questions about any medical matter, you should consult your doctor or other professional healthcare provider.

If you think that you may be suffering from any medical condition, you should seek immediate medical attention if possible. You should never delay seeking medical advice, disregard medical advice or discontinue medical treatment because of information in this book.

Errors that may be present in this book should be reported to Andy Caple, as soon as possible, at the email address below.

Copies of this book may be obtained for MREW affiliated teams and any other MR, SAR, cave rescue or similar organisation/individual at the cover price from andy.caple@lamrt.org.uk.

This book is also available on the MREW Virtual Learning Environment (VLE) website or at <https://casualtycarebook.com>.

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Preamble

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Thanks to the LAMRT Committee for their support and commitment to continue funding this work for the benefit of teams across the country, the Resuscitation Council (UK) and the National Ambulance Resilience Unit for their kind permission to reproduce their protocols, and Morgan Cole LLP (solicitors) for legal advice.

Thanks to those who contacted us with corrections or suggestions – this is always welcome.

Drugs

Drug treatments are mentioned in this book. It is not possible to provide comprehensive up-to-date guidance about safe usage. For full prescribing information, see the latest edition of the MREW Drug Formulary and local team drug protocols.

Formatting convention

<u>Text colour</u>	Black:	Main text
	Red:	Worth extra attention
	Red underlined:	Potential life threat
	Green:	Page cross reference/hyperlink

Revision information

The digital version now has hyperlinks. Some sections have been updated. We have added topics that are on the Casualty Care syllabus but were missing from previous editions e.g. pregnancy, nonfreezing cold injury, and added guidance on some less-common problems e.g. facial injury, so that quick reference material is available if a team encounters a casualty with one of these. *Full details of the changes in this edition are listed in an accompanying document on the MREW Moodle website.*

Primary Survey overview (Pages 9-14)

Rescuer's own safety must precede all treatment

To work methodically through **DR 'C' A 'with C-spine' BCDE** to identify and treat any condition that is an immediate threat to life.

Checking for and managing catastrophic haemorrhage precedes a check for Response because immediate treatment is essential regardless of the casualty's conscious level.

The aim is speed of delivery to identify and treat / stabilise threats to life as soon as they are identified, without being side-tracked by performing interventions that will not contribute to this main aim (e.g. measuring SpO₂ or BP during the primary survey). Examples of problems needing immediate intervention include catastrophic haemorrhage (Page 45), airway obstruction (Page 10), anaphylaxis (Page 24) and life-threatening asthma (Page 23) if identified during the Primary Survey.

If at any point, during the Primary Survey, the casualty's condition changes in any way, restart the survey at **A**.

Secondary Survey (Page 15)

A thorough head-to-toe examination of the casualty to identify and treat injuries and/or illness that are not immediately life-threatening.

Perform the SAMPLE survey (Page 15) and record all medical interventions that have been administered.

Primary Survey

Danger, Catastrophic haemorrhage (treat immediately)

Response (casualty's)

- PPE: Gloves on, helmet, rope protection, winter kit, crampons, respiratory (Covid), etc.
- Is it safe to approach the casualty? (so as not to become a casualty yourself)
- Read the wreckage: where, when, weather, who, gear, witnesses, what's around them.
- Could the 'mechanism of injury' cause spinal damage? (*spine, Page 43; C-spine, Page 62*)
- Hand on forehead in case C-spine problem. "Hello, can you hear me?"
- If no response, consider whether cardiac arrest possible. (*Page 66, 67*)
- Do not waste time if not a normal response (will be checked more fully in 'Disability').

Catastrophic haemorrhage

- Major bleeding that is an immediate threat to life.
- If untreated, will result in death within minutes.
- Rare in MR but may be encountered e.g. if team nearby when climbing accident occurs.
- *Internal bleeding* following a blunt injury e.g. from a major blood vessel in the chest in a fallen climber, cannot be diagnosed out of hospital and cannot be controlled on scene. CPR will be ineffective.
- *External bleeding* from a limb and/or soft tissue is controllable on scene e.g. penetrating injury following a fall onto a sharp object.

Symptoms and signs	Treatment
<ul style="list-style-type: none">• Clearly visible as you approach e.g. large amounts of blood on the ground, blood welling up e.g. out of a laceration or open fracture. May even be spurting.• Casualty or bystander may alert you that there is massive bleeding.• History of trauma.• If the casualty has a reduced conscious level from bleeding alone, $\geq 2L$ has been lost.• Pulse rate almost always very high. Rarely, the pulse rate can be $<100/\text{min}$ – due to a quirk in physiology in response to major bleeding.• BP will be very low (well below 90).	<ul style="list-style-type: none">• Don't waste time with any other task. Priority is to slow the bleeding.• Elevation• Pack open cavities firmly with a haemostatic dressing e.g. CELOX, so it makes good contact with the tissues. Apply pressure for 3-10 min over the packed wound (time depends on which product is being used).• Apply direct pressure:<ul style="list-style-type: none">• For as long as required (10 min minimum) with sterile non adhesive dressing.• Apply new dressings on top of old, if required, for additional pressure.• Tourniquet, if available, for a limb (Note: a tourniquet can threaten the viability of a limb if used incorrectly. Training required).• Immobilise, possibly with a splint.• Urgent evacuation by air if possible.

Airway + C-spine protection

AIRWAY IS THE MOST IMPORTANT CONSIDERATION AND TAKES PRECEDENCE OVER C-SPINE

If casualty is **fully conscious and co-operative**, tell them to keep their head and neck still.
If casualty has **reduced conscious level**, place your hand on their head to steady C-Spine.

CLEAR, OPEN and MAINTAIN AIRWAY

Clear (oral obstructions) **Open** (airway) **Maintain** (airway) **Protect** (C-spine)

Check in the mouth for obstructions (e.g. food, sweets, dentures, fluids, the tongue).
Remove with suction, Magill forceps, or *careful* finger sweep.

Caution! Fingers inserted blindly into the mouth can push obstruction further down throat.
Fingers can also be bitten or scratched by teeth.

Options to open the airway (commonest cause of airway obstruction is the tongue).

- Head tilt-chin lift or jaw thrust if C-spine injury unlikely.
- Jaw thrust only if suspect possible C-spine injury.

NOTE: casualty may have to be rolled carefully to clear mouth/airway e.g. facial injury, significant airway problem, fluid present, *even without knowing the C-spine status*.

AIRWAY MAINTENANCE

Oropharyngeal Airway (OPA) Unconscious without needing breathing support.

- Invert, Insert (with care) & Rotate.

Size of OPA is measured from the angle of the casualty's jawbone to centre of incisors.
If casualty rejects, then remove OPA and try NPA.

Nasopharyngeal Airway (NPA) (unconscious/semi-conscious; breathing support not needed)

(Do not force. Nosebleed can cause airway obstruction).

- Size: 6mm for average size female; 7mm for average size male.
- Lubricate well. In a casualty lying flat on the ground, insert by pushing and twisting in a vertical direction **towards the ground**, not towards the forehead.
- NPA's can be used with an OPA.

i-gel (Deeply unconscious with need for respiratory support) **EXTENDED SKILL FOR CAS CARERS**

- Used for cardiac arrest, drug overdose, head injury, severe hypothermia, and respiratory insufficiency.
- Lubricate back of i-gel only.

NOTES – Jaw Thrust

- Preferred method, if possible, for C-spine injury (causes minimal disturbance of neck position)
- Open the mouth and move the mandible forwards.
- The person responsible for airway maintenance and C-spine stability co-ordinates all movement of the casualty, maintaining C-spine control until replaced by full body motion restriction (vacuum mattress).

Treat any Airway problem before moving to Breathing

Primary Survey

Breathing

CHECK FOR BREATHING Place your ear/cheek near to the casualty's nose/mouth.

WATCH for chest rising, place hand on tummy to **FEEL** for movement, and **LISTEN** for breath sounds.

Check for up to 10 seconds to establish if the casualty is breathing.

No sign of breathing, start CPR (*Overview Page 66; CPR steps Page 67; Protocols Pages 68-69*)

Attach AED (defibrillator) **as soon as possible.**

No sign of breathing but pulse palpable, use Bag-Valve with Mask (BVM) or i-gel.

IF BREATHING

- Check for 20-30 seconds. Work out breathing rate per minute (respiratory rate. RR).
- Normal adult breathing rate: 12-20 breaths per minute.
- Can assist breathing with BVM (two-person technique) if ≤ 8 , unless severe hypothermia.
- Rate about 25 or more is **very serious** but impractical to assist outside hospital.

RESPIRATORY DISTRESS check for signs of:

Noisy breathing, use of accessory muscles (neck and shoulders), obvious distress, etc.

THOROUGH ASSESSMENT OF THE CHEST FOR LIFE-THREATENING INJURY

Examine from the Adam's Apple (larynx) to bottom of rib cage for abnormalities. If the casualty is conscious, ask them how their breathing is.

Important things to examine are:

- **Observe breathing pattern** before even touching the casualty:
 - Struggling to breathe or relaxed.
 - Can they speak full sentences?
- **Look at the chest wall** (front, back, sides including armpits) for:
 - Both sides of the chest moving equally.
 - Uneven shape; bruising; lacerations; holes; flail segment (produces asymmetrical movement of chest wall during breathing).
- **Feel the chest** for:
 - Tenderness
 - Surgical emphysema (air in tissues, feels crackly to gentle pressure)
 - Deformity due to a fractured rib or collar bone

If a problem is encountered, treat appropriately (*Page 40 for chest injury management*)

HIGH FLOW OXYGEN (if appropriate)

15L per minute (unless supplies are low). Non-rebreathing mask with reservoir bag. Make sure reservoir bag is full before using on the casualty.

Treat any chest injury (chest seal, etc.) before moving to Circulation

Primary Survey

Circulation

PULSE assess for rate, rhythm and strength and **record findings**.

NO RADIAL PULSE? Casualty breathing (not agonal gasps) check for carotid pulse.

STILL NO PULSE? Assume very low BP.

BP guide from the pulse	Palpable Radial pulse = BP >80 mm Hg	Palpable Femoral pulse = BP >70 mm Hg	Palpable Carotid pulse = BP >60 mm Hg	NOTE: two studies have shown that these figures may overestimate the true blood pressure but are an acceptable guide.
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CENTRAL CAPILLARY REFILL (CRT) check time (forehead or centre of chest)

5 seconds pressure. 2 seconds or less response time is normal.

EXTERNAL/INTERNAL HAEMORRHAGE

Look for **'one on the floor and four more'**

EXTERNAL HAEMORRHAGE (one on the floor)

Run hands under casualty & inside waterproof jacket if possible.

Control with pressure, packing of cavities and elevation (if possible). *(Page 45)*

Bleeding into soft ground can hide massive blood loss.

Bleeding on a hard surface can make moderate blood loss look worse.

INTERNAL HAEMORRHAGE (four more)

Chest (haemothorax)	Consider possibility in all chest injuries <i>(Page 40)</i>
Abdominal Cavity	Distension. Feel for tenderness & firmness (4 quadrants) .
Pelvic Fracture	Ideally from history. Gently feel for deformity (do not flex pelvis) . Ask about pain. If in doubt, splint with a Pelvic Binder .
Long bone fractures (total blood loss from e.g. two tibias can be as bad as one femur)	<ul style="list-style-type: none"> • Look and feel for shortening, abnormal leg position, bone visible and/or thigh deformity. • Splint mid-shaft femur with traction splint. • Do not apply femoral traction splint if hip/knee dislocation, or any ankle injury. If pelvic + femoral fractures, use Pelvic Binder plus femoral traction splint (+ see below).

HAEMORRHAGIC SHOCK *(Page 18)*

- Pulse >120 (or steadily increasing heart rate over a period)
- Raised respiratory rate (> normal)
- Skin pale, sweaty, cold, and clammy
- Feels faint on sitting up (altered levels of consciousness or confusion)
- Lie casualty down and raise legs (if no spinal or pelvic injury is suspected)
- High flow oxygen

If **both pelvic and femoral fractures are present**, the pelvic fracture is potentially more serious and takes precedence. Apply a pelvic binder and consider using a femoral traction splint that does not exert pressure against the pelvis in the mid-line (crotch) e.g. the Slishman, or Kendrick Traction Device. Do not use splints that press against the pelvis e.g. Sager *(Page 47)*.

Treat any Circulatory problem before moving to Disability

Primary Survey

Disability (i.e. mainly conscious level)

ACVPU (quick assessment of conscious level, sufficient for the primary survey)

A	Alert
C	New onset confusion. Casualty otherwise alert.
V	Responds to voice
P	Responds to pain
U	Unresponsive

- New onset confusion is clinically significant. Indicate using ACVPU (modified AVPU) (Williams B. The National Early Warning Score and the acutely confused patient. Roy Coll Physicians 2019)
- Hypothermic patients who are confused are more likely to have a cardiac arrest.
- GCS can be done at this stage if personnel are familiar with it. However, it takes longer and is more difficult than ACVPU for non-medical personnel, so it is reasonable to leave GCS until secondary survey.

After ACVPU, which tasks are undertaken in 'D', and the order, will depend on the problem.

HEAD/BRAIN INJURY

- Trauma: Any blow to the head \pm loss of consciousness. Associated with an increased risk of C-spine injury (Page 42)
- Stroke: Check F.A.S.T. (Page 22)

PEARL (Pupils Equal And Reactive to Light)

- Shape of pupils.
- Measure pupil size in mm (more meaningful than words like 'dilated'; normal 2-5 mm).
- Pupils should be similar size and shape to each other.
- Check if **both** pupils react when light is shone into **each** eye. They should get smaller (constrict).
- **Record** all assessments.
- Repeat as necessary.

BM (blood glucose) if indicated e.g. insulin-dependent diabetic, unconsciousness of unknown cause, etc. (normal 4 to 8 mmol)

TEMPERATURE if cold or heat could be the cause of reduced conscious level

(Pages 28, 30)

- Normal temperature 37°C.
- Other causes of unconsciousness include seizure, lightning strike, drugs, alcohol, major bleeding.

Primary Survey

Environment/Exposure

SHELTER

- Consider use of shelter etc. to protect casualty from the elements.

Treat Disability or Environment/Exposure before secondary survey

ON COMPLETION OF THE PRIMARY SURVEY

- Keep base fully informed
(Designate hill comms person to centralise information)
- Depending on findings, instigate swift evacuation
(especially as helicopter and land ambulance take time to organise)
- Organise extra manpower for protracted carry out.
- Start a thorough **secondary survey** if time allows.

Unless a problem can be treated completely on the hill e.g. hypoglycaemia, any ongoing Primary Survey problem is an indication for rapid evacuation because, by definition, it is a threat to life.

Secondary Survey

The secondary survey is a thorough head-to-toe assessment and is an extension of the primary survey. It should not be undertaken until the primary survey is complete and the casualty stabilised.

If any aspect of patient's condition changes, start the primary survey again at 'A'

C-SPINE

Assess C-spine if possible, using NEXUS (Page 62)

Fit collar if indicated. Make sure it isn't too tight.

If indicated, package casualty in vacuum mattress at a suitable point in the Secondary Survey.

BREATHING

Depth. Use of accessory muscles. Unusual sounds. Rate.

CIRCULATION

Pulse: strength, regularity. Minor wounds. Haemorrhage.

LIMBS

Distal pulse. CRT. Sensation and movement of injured limb. Compare with uninjured limb. Reduction, dressings and splinting.

SAMPLE History

Important: Do SAMPLE before administering any drugs

Symptoms

Allergies to any medication or anything else

Medication (prescribed or self-prescribed) or recreational drugs

Past illnesses

Last ate

Events leading up to the problem (incident history, illness and/or injury)

CLUES

Medical alerts. Search bag/pockets for medication etc.

MONITORING

Pulse rate. SpO₂ (on and/or off O₂). BP. BM. Temperature. Pupils.

PAIN

Onset (sudden or gradual onset) and body location

Provocation (what makes it worse or better)

Quality (e.g. stabbing) and whether getting worse, better or no change

Radiation

Severity (pain score)

Time (when it started)

U What do you (the casualty) think it might be?

Pain Score: 0 = No pain. 10 = Worst imaginable pain

Monitor before & during analgesia for effect, reactions, and trends

GLASGOW COMA SCALE (see <http://www.glasgowcomascale.org/> for practical tips on assessing GCS)

	6	5	4	3	2	1
Eye opening			Alert	Verbal	Pain	None
Verbal		Orientated	Confused	Single words	Groans	None
Motor	Obeys commands	Localises	Withdraws from pain	Abnormal flexion	Extension	None

Record all observations, readings, treatments, and details. Observe and monitor for trends and continuity at handover. Monitoring done during Primary Survey can be repeated during Secondary Survey to monitor casualty's condition without repeating the whole Primary Survey.

A working diagnosis should now be possible

Interpretation of vital signs in adults						
	Serious	Concerning	Acceptable	Concerning	Serious	
B	Resp. Rate (per min)	≤8	9 – 11	12 – 20	21 - 24	>24
	SpO ₂ (breathing air)	≤91%	92% - 95%	≥96%		
	Pulse (per min)	<45	45 – 54	55 – 90	91 – 119	≥120
C	Systolic BP	<90	90-110	110-160	161-180	≥181
	CRT (secs.)			2	3	≥4
	ACVPU			A	C	V/P/U
D	BM (mmol)	<3	3 – 3.9	4 – 8	8.1 – 15.9	>16
	Pupil Size (mm)*		1	2 – 5	≥6	
	GCS	≤12	13-14	15		
E	Temp (°C)	≤32	32.1 – 34.9	35 – 37.5	37.6 – 39	≥39.1

Symbols < Less Than ≤ Equal To or Less Than ≥ Equal To or Greater Than > Greater Than

* Check pupils in good overall lighting, but not e.g. with the casualty looking into the sun.

Normal vital signs in children			
	Resp. rate (per min)	Pulse rate (per min)	Systolic BP
4-7 years	20-30	80-130	85-110
8-11 years	15-25	70-120	90-110
12-14 years	12-24	65-110	100-120
>14 years	Adult values	Adult values	Adult values

- From Advanced Paediatric Life Support manual. 6th Edition. (2016)
- All other parameters are the same as for adults.

Using the Vital Signs table

There are over 50 published scoring systems that use vital signs to alert carers that the patient is deteriorating, but all were designed for healthcare professionals in hospitals or ambulances. There is no research on this subject in the context of mountain rescue. Therefore, the values in the Vital Signs table have been based on published alert ranges but have been modified by LAMRT for use by non-medical personnel in remote areas to provide a greater safety margin. If a casualty starts to deteriorate, it could be a long time before they are seen by a healthcare professional, by which time, parameters may be seriously deranged. Therefore, safety considerations dictate that some parameters be more conservative than those used in hospitals and ambulances.

A few changes have been made to the table from the previous edition of the book following a review of recent published literature.

Practical use

- “Normal” values will vary from person to person depending on age, gender, fitness, baseline health and any regular medication taken. For example, some people have a normal BP <100. However, it must only be accepted as normal *after a thorough check*, and not at all if other parameters e.g. pulse rate, are also abnormal. NOTE: In the presence of a brain injury, any BP <110 is always serious.
- An altered respiratory rate is a reliable early sign of acute illness and/or distress.
- It is uncommon for a significant abnormality to occur in just one sign. If a change falls into the “serious” category, expect to find changes in other clinical signs.
- The more parameters outside the “acceptable” range, the sicker the casualty. This should guide decisions about whether to request early healthcare professional support and the speed of evacuation e.g. air vs land.
- Watch for trends. Even if values are initially in the normal range, they should be rechecked, perhaps several times, to identify trends that can highlight deterioration in a casualty’s clinical condition. Failure to recognise and act on a deteriorating trend can lead to an adverse outcome.
- “Concerning” does not necessarily need action, but it must be established that the casualty is safe with physiological parameters in this range.
- A fall in GCS of 2 points or 1 point in ACVPU during a rescue is very serious.

The values are only a general guide. Clinical findings must be placed within the wider context of the individual and circumstances

SHOCK

Life-threatening condition where the circulation fails, causing inadequate oxygen delivery to the tissues. Main causes:

- *Heart pumps inadequately* (cardiogenic shock) e.g. myocardial infarction, sudden change in heart rhythm to extremely slow (≤ 30) or extremely fast (≥ 180) pulse rate.
- *Insufficient blood circulating:*
 - Blood loss due to haemorrhage (haemorrhagic shock; normal adult about 5L).
 - Extreme dehydration due to e.g. vomiting or heat illness, shrinks the blood volume.
 - Blood volume unchanged but has to spread over a greater area due to widespread blood vessel dilation e.g. anaphylaxis; spinal cord injury (neurogenic shock).
- Other causes (sepsis, clot on the lung blocking the circulation) extremely unlikely in mountain rescue.

HAEMORRHAGIC SHOCK

Symptoms and Signs	Treatment
<ul style="list-style-type: none">• High pulse >120• Raised respiratory rate• Pale, sweaty with cold clammy skin• Blood loss (obvious or hidden)• Low BP (hypotension)	<ul style="list-style-type: none">• Lie casualty down. Raise legs if possible.• High flow oxygen (15 L/min)• Treat external haemorrhage• Check for signs of internal bleeding• Check for and treat major fractures

NOTES (one on the floor and 4 more) (Page 12)

- Stem external bleeding (pressure; CELOX; etc.)
- Haemothorax (blood in the chest cavity)
- Abdomen: 4 quadrants, feel for firmness, pain/tenderness
- Fractured pelvis. Look and feel but do not flex. Pelvic binder if potentially fractured.
- Fractured femur. Look and feel. Traction splint e.g. Kendrick; Slishman; Sager; etc.

Other types of SHOCK relevant to MR

- **Cardiogenic shock** = extreme heart failure (MI) (Page 21) (sit casualty up if difficulty breathing; oxygen; possibility of cardiac arrest).
- **Neurogenic shock** (spinal cord injury) Slow pulse, low BP, warm skin
Beware: casualty will cool very quickly, and they cannot compensate for ongoing blood loss. Treat bleeding aggressively.
- **Anaphylactic shock** (Page 24) (Adrenaline or EpiPen/Jext)
Monitor and re-assess pulse, BP, and conscious level regularly.
Some cardiac drugs (Beta-blockers) prevent a high pulse.
- Fainting is caused by extreme emotion and causes very slow heartbeat plus dilation of the blood vessels leading to blood pressure fall (lie casualty down and elevate legs).

Urgent evacuation to hospital in all cases of shock

Personal Notes

MEDICAL

ANGINA

Symptoms and Signs	Treatment
<ul style="list-style-type: none"> • Ache or pain in centre of chest usually radiating to jaw, left arm or both. • Shortness of breath, dizziness. • Casualty will recognise symptoms if previously experienced. 	<ul style="list-style-type: none"> • Rest. Treat as suspected MI. • GTN spray/sublingual tablets if BP \geq90. Can repeat GTN after 5-10 mins. • Stretcher off or air evacuation (<i>always</i>). • Oxygen as for MI. • Keep casualty warm.

NOTES

Provoked by:

- Exercise, especially after food.
- Cold or windy weather.
- **Treat as MI if angina attack lasts longer than 15 minutes** (*Page 21*).
- Casualty may be on other drugs.
- Casualty will often self-manage and self-evacuate so it will be serious if MR is called.

MYOCARDIAL INFARCTION (Heart attack)

Symptoms and Signs	Treatment
<ul style="list-style-type: none"> • Suspect MI if central chest pain >15 minutes and casualty feels unwell. <p>Other symptoms that may be present</p> <ul style="list-style-type: none"> • Pain radiating to the jaw or arm. • Upper abdominal pain • Shortness of breath • Nausea and vomiting • Anxiety, light-headed • Palpitations • Looks very ill: cold, clammy, and pale. 	<p><u>Unresponsive: CPR and Defibrillation</u> (<i>Overview Page 66, CPR steps Page 67, Protocol Page 68; ROLE Page 72</i>)</p> <p>Responsive:</p> <ul style="list-style-type: none"> • Sitting (lazy W) for comfort • O₂ via non-rebreathing mask (see notes below) • Attach AED pads, in case needed. • GTN (<i>Pages 21</i>) if BP \geq90 • 300mg aspirin, if no contraindications • 10mg morphine with buccastem/ondansetron (ensure naloxone available in case it is needed) • Take an ECG trace (snapshot), if available • Keep the casualty warm

NOTES

Oxygen: If reliable SpO₂ reading is:

≥94% then no O₂ required.

<94%, short of breath, cold, shivering or not sure diagnosis is MI, then O₂ at 15L/min.

- **The risk of deterioration to cardiac arrest is ever present.**
- Monitor pulse, BP and SpO₂ frequently.
- **Urgent evacuation to hospital.**
- Not all chest pain is from the heart.
- See Shock (*Page 18*)

STROKE

Symptoms and Signs	Treatment
<p>F – Face, fallen to one side, smile?</p> <p>A – Raise their arms. Can they hold them above their head?</p> <p>S – Slurred speech?</p> <p>T – Time of stroke</p>	<ul style="list-style-type: none"> • Act F.A.S.T. • Urgent evacuation to hospital. • Do <u>NOT</u> give aspirin as some strokes are haemorrhagic. • Oxygen. Decide as for MI (<i>Page 21</i>) • Check blood pressure as stroke is more common in casualties with high blood pressure. • Upper body inclined upwards for transportation (reduces brain pressure).

NOTES

Other symptoms

- Paralysis to one side of the body, loss of vision.
- Dizziness, balance, and coordination problems.
- Difficulty swallowing, severe headache, and possible loss of consciousness.
- Possibility of seizure.

If the casualty has had stroke signs and symptoms and appears to have made a full recovery, they must still go to hospital urgently for assessment

MIGRAINE

Symptoms and Signs	Treatment
<ul style="list-style-type: none"> • Moderate or severe unilateral headache of a pulsating quality. • Nausea and/or vomiting. • Patient may get a warning of onset. • It is unlikely to be their first migraine so they may have taken prescribed drugs. • Photophobia (sensitivity to bright light) • Phonophobia (sensitivity to loud sound) 	<ul style="list-style-type: none"> • Paracetamol • Ibuprofen • Lie down • Protect from bright (any) light. • Antiemetic (buccastem) • High flow oxygen 15 L/min can abort some types of migraine.

NOTES

- Aggravated by walking or general movement.
- The cycle of dehydration and vomiting with acute migraine is often very debilitating. Buccastem is safe and can help improve symptoms. Encourage oral fluids. IV fluids will rarely be needed in a MR situation unless vomiting is bad.

ASTHMA

Symptoms and Signs	Treatment
<ul style="list-style-type: none"> • Shortness of breath • Short intake; longer, wheezy out. • May need to use accessory muscles to breathe. <p>MODERATE (any one of):</p> <ul style="list-style-type: none"> • Able to talk • Respiratory rate <25 • Pulse <110 • SpO₂ ≥92% on air <p>ACUTE SEVERE (any one of):</p> <ul style="list-style-type: none"> • Cannot complete sentence • Respiratory rate ≥25 per min • Pulse ≥110 • SpO₂ ≥92% on air <p>LIFE THREATENING (any one of):</p> <ul style="list-style-type: none"> • Single or no words • Exhaustion • Confusion or coma • Silent chest, feeble respiratory effort, cyanosis • Hypotension; slow pulse rate • SpO₂ <92% on air <p><u>(Imminent life threat if <92% and on oxygen)</u></p>	<ul style="list-style-type: none"> • Oxygen 15 L/min* (unless supply will not last duration of evacuation) • Keep casualty sitting up • Do not allow them to lie down • Keep them warm (shivering increases O₂ requirements) <p>* Use oxygen 10L/min via non-rebreathing mask if need to conserve supplies. Increase flow if reservoir bag collapses. Resume 15 L/min when possible.</p> <p>Exclude tension pneumothorax <i>(Page 40)</i></p> <p>Bronchodilator drugs for all severities:</p> <ul style="list-style-type: none"> • Salbutamol 5mg. Can be repeated after 10-20 minutes if needed. • Ipratropium 500 mcg (<u>one dose only</u>) if salbutamol ineffective. • These drugs can be given together for severe cases. • Adrenaline 0.5 mg (= 0.5 ml) IM adrenaline in adults from an ampoule, or an adrenaline injector pen e.g. Jext or EpiPen, if no response to above and deteriorating, OR could be anaphylaxis. <p>DELIVERY OF DRUGS</p> <p>Inhaler or spacer (10 puffs) with <u>good technique</u> acceptable if moderate asthma. If ineffective/more severe cases, use nebuliser.</p> <p>NEBULISER USAGE</p> <p>Check device label for correct oxygen flow rate, typically 6-8 L/min.</p>

NOTES

Airway changes: bronchial muscle contraction, mucus plugs, mucosal swelling

Provoked by:

- Inhaling pollen, dust, or other allergens; chest infection; exercise, especially in cold air.
- Drugs e.g. Beta-blockers, NSAIDs (includes aspirin), and penicillin.
- Life threatening asthma may take over 24 hours to develop but can be much faster.
- NOTE: if you allow a casualty with severe asthma to lie down, they can stop breathing.
- Always consider the possibility of **anaphylaxis** *(Page 24)* if breathing difficulties develop quickly or spontaneous pneumothorax. *(Page 40)*

ANAPHYLAXIS

Symptoms and Signs	Treatment
<p>HISTORY</p> <p>Symptoms and/or signs may follow very soon after a trigger e.g. bee sting, food, drugs, aspirin.</p> <p>Sudden onset and rapid progression of symptoms causing A, B, C problems:</p> <ul style="list-style-type: none">• [A] Swelling of upper airways including lips and tongue. Swelling in the throat can cause stridor (high-pitched sound when breathing in and/or out, due to partial upper airway obstruction).• [B] Bronchospasm (like asthma) ± persistent coughing• [C] Hypotension (shock) Cardiac arrest (Pages 66-69)• Skin rash (appears suddenly)<ul style="list-style-type: none">• May look like a nettle rash• Itchy• Spreads quickly• Abdominal pain or vomiting	<p><u>ANAPHYLAXIS must always be considered as life threatening</u></p> <ul style="list-style-type: none">• History to establish the diagnosis ASAP• Remove trigger if possible e.g. sting• Primary survey• If they tolerate lying flat, raising the legs helps keep the blood pressure up.• Do NOT stand the casualty up or sit them on a chair (can cause cardiac arrest). <p>DRUG TREATMENT</p> <ul style="list-style-type: none">• Adrenaline is the only effective drug in anaphylaxis. <u>Give as early as possible.</u>• Auto-injector pen or 0.5 mg (= 0.5 ml) IM adrenaline in adults• Oxygen 15L per minute.• Salbutamol for bronchospasm (second-line treatment only)• IV fluids if BP low (suitably qualified Cas Carer)

NOTES

- The treatment for anaphylaxis is immediate **ADRENALINE. This is time critical.**
If in doubt, give adrenaline
- Do not mistake anaphylaxis for asthma as this will delay definitive treatment. If unsure, treat as anaphylaxis. Asthma is a lung problem that causes wheeze. Anaphylaxis is a whole-body problem. One of the features often is wheeze, but it also affects the circulation and skin.
- Adrenaline can be repeated, if necessary, at 5-minute intervals according to blood pressure, pulse, and respiratory function.
- Severe anaphylaxis in patients taking beta-blocker drugs may not respond to adrenaline. Glucagon, if available, may be effective in these cases.
- Symptoms can improve and then deteriorate again.
- Even if the casualty responds to treatment, **urgent evacuation to hospital as a successfully treated attack can reoccur.**
- Anaphylaxis after drugs or bee sting can cause a myocardial infarction (rare).

Cardiac arrest due to anaphylaxis may occur very soon after onset, and is more likely if treatment with adrenaline is delayed

SEIZURES and 'FUNNY TURNS'

Seizures are involuntary bursts of electrical activity in the brain that temporarily affect how it works. They can cause a wide range of symptoms. The commonest are (1) 'Tonic-Clonic' (called a 'fit'), when the whole body becomes rigid (tonic), followed by uncontrolled jerking and shaking (clonic), and (2) losing awareness and staring blankly into space (called 'Absence').

EPILEPSY

Symptoms and Signs	Treatment
<ul style="list-style-type: none"> Epilepsy is a condition that affects the brain, causing repeated seizures. TONIC-CLONIC SEIZURE (formerly Grand Mal) ABSENCE SEIZURE (formerly Petit mal) where the patient is unresponsive for 10-30 seconds 	<p>Tonic-Clonic</p> <ul style="list-style-type: none"> Keep clear of flailing limbs. Move objects that the casualty could hurt themselves on (difficult on the hill). Treat persistent seizures with midazolam (IN, or buccal using syringe without needle) unless a witness who knows the casualty states the normal pattern is for the seizure to stop on its own. Repeat after 10 min if seizures continue. Airway obstruction common. Consider NPA. Oxygen (if possible) Sleep after a seizure is common. Place in recovery position and keep warm. <p>Absence seizure</p> <ul style="list-style-type: none"> No active treatment required.

NON-EPILEPSY CAUSES OF SEIZURES

Symptoms and Signs	Treatment
<p>POST HEAD INJURY</p> <ul style="list-style-type: none"> Appearance as tonic-clonic <p>HYPOGLYCAEMIA</p> <ul style="list-style-type: none"> Appearance as tonic-clonic <p>HEART & BREATHING</p> <ul style="list-style-type: none"> Faint Hypoxia Cardiac arrest (Pages 66, 67, 68, 69) 	<ul style="list-style-type: none"> Assess/treat head injury as appropriate. Treat head injury seizures as tonic-clonic. Treat low blood glucose <u>immediately</u>. (Page 27) Manage faint by lying casualty down, raise legs and constantly monitor airway and breathing. Airway Oxygen (High flow)

HEAT STROKE, FEVER and INFECTIONS

- More common if previous history of febrile convulsion or epilepsy.

DRUGS/ALCOHOL

- Pupil size may be pinpoint (opiates).

STROKE

- Check temperature.
- **Seizures due to heat stroke are a life threat.**
- Cool rapidly.

All seizures in this group:

- Treat as Tonic-Clonic.

See [Page 22](#)

NOTES

- People with epilepsy sometimes know when a seizure is imminent.
 - Intense or prolonged seizures can lead to hypoxia. Be prepared for cardiac arrest.
 - **All casualties in this category should be evacuated urgently to hospital.**
 - Unconscious casualty: airway obstruction is possible, *even in recovery position*. **Monitor airway continuously.**
 - When seizure resolved, consider if any precipitating causes and treat appropriately.
-

DIABETES

HYPOGLYCAEMIA (low blood glucose)

HYPERGLYCAEMIA (high blood glucose)

Symptoms and Signs	Treatment
<p>HYPOGLYCAEMIA BM <4 or appropriate symptoms:</p> <ul style="list-style-type: none">• Unsteady, confused• Tripping over their feet• Irritable and aggressive• Argumentative or irrational• Anxious• Often very hungry• Sweaty, pale and cold• Seizures in extreme cases• Raised pulse rate <p>Note: symptoms damped down if patient taking beta-blocker drugs e.g. atenolol</p> <p>Unconscious (BM <3) is a medical emergency (as urgent as cardiac arrest)</p> <p>HYPERGLYCAEMIA Can have “pear drop” smell in breath (fruity odour)</p>	<ul style="list-style-type: none">• 15-20g fast-release carbohydrate e.g. Glucogel (10g per tube); glucose tablets; fruit juice; fruit pastilles Note: Chocolate is no longer recommended as a fast-releasing carbohydrate but is better than nothing.• Recheck BM after 10min.• If BM >4, give food e.g. bread, cereal bars, a sandwich (slow release carbohydrate prevents another fall in blood glucose). <p>Unlike the normal brain, in the presence of a brain injury, it is better if the BM is >5.</p> <p>IM glucagon if not responding to buccal glucose (GlucoGel).</p> <ul style="list-style-type: none">• Under 12 years 0.5mg Glucagon IM• Over 12 years 1mg Glucagon IM <p>Urgent evacuation to hospital.</p> <ul style="list-style-type: none">• Will be very dehydrated and in need of fluid (unless reduced levels of consciousness). <p>If they are ill enough to ask for assistance, then they need urgent evacuation to hospital.</p>

NOTES

- Some diabetic patients do not exhibit the classic symptoms of hypoglycaemia so BM must be checked. Insulin-dependent diabetics may just collapse without warning.
- Normal level of blood glucose is a BM of between 4 – 8 mmol/l.
- Glucagon: should recover in <10 minutes. Give glucose & food on awakening.
- **Glucagon will not work in a hypothermic or totally exhausted casualty.**
- If seizures, treat with glucose before midazolam. Seizures will stop when blood glucose recovers.
- Casualty semi-conscious or unconscious and unsure if is hypo or hyper? Treat as hypo (no harm will be done).

DIABETES

Diabetes can be very difficult to treat. The only medication we should give if a diabetic has become ill is carbohydrate. Do not give any other medication, especially insulin, even if it is prescribed and carried by the casualty. In hyperglycaemia, do not give IV fluids to children (risk of brain swelling).

HYPOTHERMIA

Symptoms and Signs	Treatment
<p>STAGE I (Mild, 35° - 32°C) Shivering (usually) and alert.</p> <p>STAGE II (Moderate, <32° - 28°C) Impaired consciousness. May or may not be shivering.</p> <p>STAGE III (Severe, <28°C) Often unconscious; vital signs present.</p> <p>STAGE IV (Severe, Variable temp but <28°) Apparent death; vital signs absent. (Check for features incompatible with life)</p> <p><i>Cardiac arrest purely due to hypothermia is possible below 30°C. The risk increases substantially with further cooling.</i></p> <p>The lowest temperature from which successful resuscitation and rewarming has been achieved in an adult is currently 13.7°C and 11.8°C in a child. This limit should not exclude resuscitation attempts at even lower body temperatures.</p> <p>See further detailed information in the MREW Hypothermia protocol (Page 71)</p>	<ul style="list-style-type: none"> • Shelter • Replace wet clothing with dry clothing. • Check blood glucose. • Food & drink (avoid caffeine & alcohol). • Heat packs (if available) around chest and armpits if stage II or higher. • Oxygen useful in frail person who is shivering violently. • Walk off if mild hypothermia with no risk factors (see MREW Hypothermia protocol), as quicker, safer for the Team, and exercise generates heat. <p>Severe Hypothermia. Increasing risk of cardiac arrest induced by rough handling <30°C, becoming very high risk when temperature in the mid 20s.</p> <ul style="list-style-type: none"> • Not obligatory to remove wet clothes from casualty. If done, cut them off rather than undress, to reduce unnecessary movement. • Wrap casualty in an occlusive sheet sealed at all openings (acts as a vapour barrier). • Insulate with dry clothing, casualty bag, etc. • Heat packs (if available) around chest and armpits, <u>not limbs.</u> <ul style="list-style-type: none"> • Oxygen • Protect airway. If breathing for patient using i-gel and bag-valve, do not hyperventilate. • Temperature and ECG (if available). • Do not raise legs. Stretcher horizontally. • Expect a cardiac arrest to occur. CPR • Mechanical CPR device (if available). • Urgent evacuation to hospital. <p>REMEMBER You are not dead until you are warm and dead unless features incompatible with life.</p>

NOTES

- Oxygen consumption increases dramatically with shivering.
- Chance of survival is directly related to core temperature.
- CPR can be successful after prolonged periods (hours) in severe hypothermia.

COLD-INDUCED SOFT-TISSUE INJURY

Frostnip is superficial non-freezing cold injury of exposed skin, usually the cheeks, ears, and nose. The skin is pale and numb. Ice crystals form on the skin surface but not in the tissues. Symptoms resolve quickly when warmth is applied, and no tissue is lost. Conditions that allow frostnip to occur can lead to frostbite. Preventative action is needed (see below).

Non-freezing cold injury (NFCI) (“trench foot” or “immersion foot”) means damage to peripheral blood vessels, nerves and tissues when exposed to both cold *and* wet for several hours e.g. a walker who was lost in the hills in adverse conditions, especially if immobile. NFCI often leads to serious long-lasting problems including chronic pain and sensitivity to the cold.

Frostbite is cold injury caused by tissue freezing. It is more likely to occur in ambient temperatures below -15°C. Ice crystals form in the tissues.

Symptoms and Signs	Treatment
<ul style="list-style-type: none"> • Early symptoms: the affected part(s) feel cold and numb. Casualties often say it “feels like a block of wood”. • Difficulty in walking because they can’t feel their feet. • The extremity will be cold to the touch. • Skin colour will be abnormal. The actual colour depends on the injury severity. • Affected extremities are likely to be very painful once rewarmed. 	<ul style="list-style-type: none"> • Unless altitude >4000m or breathing problems, avoid supplemental oxygen. Excess oxygen can impair peripheral circulation (weak evidence). • Move the casualty to a warm environment as quickly as possible. Ideally, the casualty should be carried rather than walk. In NFCI, a vapour barrier with insulation, even over wet clothing, may be useful. • <i>Frostbite</i>: rewarm <u>quickly</u> (avoid direct heat as can burn), but <u>only</u> if re-exposure to cold and refreezing can be avoided (refreezing thawed tissue worsens injury). Otherwise, rewarm slowly. Apply dry dressing to damaged areas. • <i>NFCI</i>: rewarm <u>slowly</u>. • Protect the feet from trauma. • Ibuprofen (if no contraindications). Potentially reduces harmful inflammation. • Analgesia as required. May need opioids.

NOTES

- *Prevention*: minimise cold exposure; seek shelter; cover exposed skin to insulate from the cold; stay active (helps peripheral circulation); maintain adequate core temperature, hydration, and nutrition; avoid constrictive clothing and footwear; and avoid wet extremities (change into dry socks at least daily). Chemical hand and foot warmers are useful.
- Non-freezing cold injury and frostbite have some similarities. Both may be present.
- Important reviews:
 - McIntosh SE, et al. Wilderness Medical Society Practice Guidelines for the prevention and treatment of frostbite: 2019 update. *Wild Environ Med* 2019;**30**:S19-S32
 - Zafren K. Nonfreezing cold injury (Trench Foot). *Int J Environ Res Pub Health*. 2021;**18**: 10482. <https://doi.org/10.3390/ijerph181910482>

HEAT ILLNESS

Symptoms and Signs	Treatment
<p>HEAT EXHAUSTION</p> <ul style="list-style-type: none"> • Normal mental state • Rise in core temp up to 40°C • Thirst /dehydration • Headache, dizziness • Lack of coordination • Fatigue, nausea • High pulse rate. Low BP <p>HEAT STROKE</p> <ul style="list-style-type: none"> • Altered mental state (confusion, etc.) • Rise in core temp >40°C • Headache • Possibility of convulsions • Thirst/dehydration • May not be sweating • High pulse rate. Low BP • Rapid shallow breathing • Inappropriate shivering • Coma • DEATH 	<ul style="list-style-type: none"> • Stop exertion • Remove excess clothing • Shade • Cooling, tepid sponging, immersion • Water and salt (H₂O + salty snack) • May need IV fluids if vomiting • Do not restart exercise • Consider urgent evacuation <p><u>Heat Stroke is a medical emergency.</u></p> <ul style="list-style-type: none"> • Stop exertion • Shade if possible. • Cooling: <u>Urgent</u> <ul style="list-style-type: none"> ▪ Tepid sponging ▪ Immersion in water is most effective • ABCDE • Check for hypoglycaemia. Treat if present • Do not restart exercise • IV saline, 1 or 2 L (if suitably qualified Cas Carer present) • Midazolam for convulsions (Page 25) • Air evacuation to hospital when temp <40° (ideally <38° so cooling not interrupted during transfer).

NOTES

- Normal body temp: 37°C ± 0.5°. Problems can start to arise when temperature is >38°C.
- Heat cramps: Painful involuntary muscle contractions during or immediately after exercise.
- Heat syncope: Fainting because of overheating. Recovers quickly.
- Oral and ear thermometers underestimate higher body temperatures. If a casualty has a temperature in the high 30s and an altered mental state, assume heat stroke.
- Drinking excess water out of proportion to sodium intake causes the blood sodium level to fall (hyponatraemia). This scenario typically occurs in endurance situations in the heat. Symptoms mimic heat exhaustion/heat stroke. Seizures possible. Urgent hospitalisation.
- No drug treatment for heat exhaustion or heat stroke. Do not give aspirin or paracetamol.
- Heat exhaustion = core temperature up to 40°, dehydration and normal mental state.
- Heat stroke = core temperature >40°, dehydration and altered mental state.
- Heat stroke can occur at mild ambient temperatures (21°C) if the level of exertion is sufficient, especially if the casualty is wearing heavy clothing.
- Treatment of heat stroke almost as urgent as cardiac arrest. Mortality up to 80% if treatment delayed. With prompt treatment, >90% survive. Cool as much as possible before evacuation.

PREGNANCY

Any medical problems that occur in non-pregnant women can also occur during pregnancy.

MR teams are called to very few pregnant casualties, so get medical advice early

SOME SPECIFIC PREGNANCY PROBLEMS THAT MR TEAMS COULD ENCOUNTER

Fall in blood pressure if mother laid flat

- Occurs after ≈20 weeks pregnancy in some women because the large uterus presses on major blood vessels in the abdomen. This reduces the amount of blood returning to the heart from the lower half of the body.
- If it occurs, put the mother completely on her side, or tilt her 30° (left side preferred) by sufficient thickness padding under one hip.

Ectopic pregnancy (occurs in first three months of pregnancy)

- In ectopic pregnancy, instead of implanting in the uterus, the fertilised egg lodges in the tube connecting the ovary to the uterus (the fallopian tube). If this bursts, it leads to severe abdominal pain, and potentially profuse internal bleeding causing severe haemorrhagic shock (Page 18).
- If haemorrhagic shock, an urgent operation is usually needed to stop the bleeding. Consequently, in remote locations, there is a potential risk to the life of the mother.

Severe high blood pressure

- Occurs in some mothers. May be associated with seizures. These are usually self-limiting. Treat as for tonic-clonic seizures with midazolam, if seizures persist (Page 25).

Important questions to ask the pregnant woman

The number of weeks pregnant plus:

- Baby stopped moving around inside the uterus?
- Vaginal bleeding?
- Uterine contractions started (i.e. may be in labour)?
- Abdominal pain?

'YES' TO ANY OF THESE = OBSTETRIC EMERGENCY = AIR EVACUATION IF POSSIBLE

Almost all MR Drugs are safe in pregnancy as they are given as single doses, not a long course

Paracetamol	Salbutamol	Co-amoxiclav (unless woman in labour on the hill)	
Morphine	Adrenaline	Oxygen	Naloxone
Fentanyl	Midazolam (for seizures)	Entonox	Buccastem
GTN	Glucogel	Glucagon	Ondansetron

Aspirin and ipratropium are only used in emergency situations and are safe

Ibuprofen – avoid throughout pregnancy (simplest approach)

NOTES

- Consider pregnant women >3 months as having reduced physiological reserve because they have to supply their own needs plus those of the developing baby.
- Strongly consider air evacuation for any pregnancy-related problem unless very minor.
- More drug information, see MREW Drug Formulary 2022-2024 or British National Formulary.

ABDOMINAL PAIN

Background

Abdominal pain is caused by (1) an intra-abdominal problem; (2) pain radiating to the abdomen from elsewhere e.g. the heart in myocardial infarction ([Page 21](#)); (3) other e.g. Sickle Cell anaemia, in which abnormal red blood cells block blood vessels in the abdomen leading to pain.

The pain may come on suddenly or develop over several hours. It may last seconds or persist. MR teams are most likely to be called for persistent pain, where the patient is obviously ill and is unable to get back to safety themselves.

Common causes of sudden onset abdominal pain

- Perforation of a stomach or duodenal ulcer, or rupture of a part of the bowel
- Ectopic pregnancy ([Page 31](#))
- Stone in the kidney or gall bladder
- Appendicitis
- Twisted ovary
- Ruptured aortic aneurysm. The aorta is the largest blood vessel in the body. An aneurysm is an enlargement of part of it. If this bursts, profound internal bleeding occurs leading to severe haemorrhagic shock ([Page 18](#)).

A good history is essential in helping to identify the cause

- Ask whether they have had this pain before; time of onset; what was happening just before it started; pain location; description (e.g. stabbing, rising and falling, etc.); and pain score.
- Other issues e.g. high blood pressure, ulcers, pregnant, etc.
- Recent trauma e.g. fall, could indicate damage to liver or spleen.

Symptoms and Signs	Treatment
<ul style="list-style-type: none">• Patient looks ill. Pale, sweaty, reduced level of consciousness all possible.• May be writhing or lying still. The pain is severe (high pain score). May be worse on moving.• Check if pain is localised to one area or generalised over the whole abdomen.• Nausea and vomiting often present.• Primary Survey should include as full a set of observations as possible i.e. respiratory rate, pulse, blood pressure, conscious level (ACVPU), BM and temperature.	<ul style="list-style-type: none">• Keep the patient warm.• Treat the treatable e.g. if could be an MI, give aspirin (Page 21).• Oxygen often a good idea. Abdominal pain can make person breathe more shallowly.• Strong analgesia with opioids will be needed. Ideally, IM morphine.• Antiemetic: ondansetron preferable to buccastem as works much faster, causes no sedation and won't be spat out if the patient vomits (see MREW Drug Formulary).• If cannulation skills are available, IV fluids likely to be required.

NOTES

- Establish early on if shock is present. If it is, it's an immediate life threat.
- Cas Care skills only provide basic support. These patients are "Big Sick", especially on a mountain.
- The key is rapid evacuation, by air if possible. Try to provide a full history when putting in the call for support.

DRUG OVERDOSE & POISONING

Safe to Approach + PPE

Symptoms & signs depend on what has been taken, how much and when.

All body systems may be affected.

The focus of casualty care is supportive treatment only

- If casualty is conscious, enquire what has been taken, how much and when.
- Primary Survey in all cases. Treat as appropriate e.g. airway; etc.
- In the unconscious casualty, check temperature and BM. Seizures are possible due to the drug or if the casualty has been hypoxic due to airway obstruction.
- Some drugs can produce frozen-like state (called catatonic). In those cases, people should be very careful about trying to force limb movement and changing positions of the casualty.
- Ingested drugs and chemicals may have increasing adverse effects as time passes, so a casualty who seemed to be stable can deteriorate. Expect that the Primary Survey will need to be repeated several times, especially during a long evacuation.
- **Most common recreational drugs, or drugs used in overdose, require monitoring due to their effects on the heart and breathing.** If the casualty is calm and ECG monitor is available, save a copy of the ECG tracing in the memory. Leave the monitor running unless there is a quick handover to the ambulance service. Observations every 30min in a stable alert casualty; more often if unstable.

NOTES

- Although most deliberate self-harm patients are distressed, they do not have any intention to harm other people. Most are sad people, but this won't become clear until on scene.
- Personal & team safety take precedence. Follow the principles described in the section on managing despondent, suicidal, and violent people ([Page 34](#)).
- May be a deliberate suicide attempt or accidental overdose of recreational drugs. May have a history of mental health problems. May have taken a cocktail of drugs + alcohol.
- Beware of needles lying around. Remove any sharp objects, blades, etc. from the casualty's reach. Think very carefully about ropes and strap positioning in a truly suicidal casualty. Ideally, one team member should be given the role of observing the casualty throughout the evacuation.
- Gather containers, packets, anything smoked or sniffed, etc. for either information for hospital or evidence for police. Use a police evidence bag if available.
- **Try to get medical advice before giving naloxone** to a casualty suspected of having taken an opioid overdose, as complications have been reported: (1) The opioid may be part of a cocktail of drugs (e.g. heroin + cocaine), so reversing the opioid alone can have unpredictable effects; (2) Completely reversing an opioid with naloxone causes sudden withdrawal and can lead to cardiac complications or combative behaviour. It is safer and easier for the team to evacuate an unconscious casualty and assist breathing, if necessary, than to evacuate someone who is combative. If medical advice is not available and you are absolutely sure that it is a single prescription opioid overdose e.g. codeine, oral morphine, consider giving naloxone if respiratory rate <10, airway obstruction or P/U on ACVPU (MREW Drug Formulary).
- Detailed information about the effects of poisons and their management are available from the National Poisons Information Service (www.npis.org/) but this can only be accessed by healthcare professionals.
- Try not to get contaminated with body fluids (blood, vomit, etc.) or chemicals. People who have taken noxious substances are likely to vomit.
- Intravenous drug users may carry blood-borne diseases. Follow your team's protocol for needlestick injury or go straight to the nearest Emergency Department and explain you have had a needlestick.
- If a rescuer is splashed with a potentially contaminated substance, attempt to irrigate area ASAP with clean water. Get medical advice on return to Base.

MANAGING DESPONDENT, SUICIDAL AND VIOLENT PEOPLE

Approach and initial observations

- Discuss approach en-route e.g. full team or small group, so as not to alarm the casualty. Most appropriate person with relevant expertise should lead.
- Interacting with casualties who have taken a deliberate drug overdose or committed self-harm is a very skilled job, particularly if their behaviour is disturbed. Get the help of a doctor, paramedic, or the police ASAP.
- Approach from front or side slowly. Respect personal space. Maintain a safe distance and ensure there is easy exit for either party.
- Note the person's appearance e.g. normal, in disarray.
- Evaluate their speech & language e.g. normal or intoxicated.
- Try to establish early if they have access to any offensive weapon.
- Silent vehicle approach with blue lights off (light and noise carry a long way, especially in the dark).
- Be aware that badges on clothing or 'uniforms', even from compassionate organisations, can be perceived as authority and potentially a threat.

Rescuer's demeanour

- Do not be provocative. Keep your hands relaxed, maintain a non-confrontational body posture, and do not stare at the individual. Avoid prolonged direct eye contact.

Communication – general points

- Establish verbal contact. The first person to contact the individual should be the lead.
- Speak in a calm, non-confrontational and respectful manner.
- Be attentive and receptive, but without weakness or vulnerability.
- Use concise, simple language and direct clear questions e.g. "Do you feel like hurting yourself or someone else?" and "Are you carrying a knife?"

Tease out the important issues for the person. Offer help, but set limits

- Build a relationship using good communication skills e.g. by stating the obvious (e.g., "You look angry"). This may help the person to start sharing emotions.
- Clearly identify their feelings and desires e.g. "What are you hoping for?"
- Pacify with the "Yes" approach. Respond affirmatively "Yes, as soon as...", "Okay, but first we need to...,"
- Agree, or agree to disagree e.g. "Yes, everyone should be treated respectfully"; "There are others who would feel like you".
- Offer food, drink, clothes. Offer choices and optimism. But lay down the rules and set clear limits. If necessary, inform them that violence or abuse cannot be tolerated.

The Combative individual

- Don't argue, don't be condescending and don't command them to calm down.
- Don't criticize or interrupt.
- Don't respond defensively and never take things personally.

-
- Do clarify what they want before responding. Listen closely to what the individual is saying, and restate what they said to improve understanding, e.g. "Tell me if I have this right..."
-

NOTES

- As these people can be unpredictable, remember personal safety takes priority. Keep in a position of safety, always.
- Do not turn off your radio, even if requested to do so by the person.
- Although one person may lead the interaction with the person, at least one other team member must be close by.
- For medical issues, follow the usual routine ABCDE, only if/when it is safe to do so.

Guidance was taken from:

Verbal de-escalation of the agitated patient: Consensus statement of the American Association for Emergency Psychiatry Project Beta De-escalation Workgroup. *West J Emerg Med* 2012;**13**:17-25

CAPACITY AND CONSENT IN MR

Consent

Generally, casualties need to give consent before receiving any kind of health treatment. To give consent it needs to be:

1. **Voluntary** – be able to be given freely.
2. **Informed** – casualty has enough information to make that decision.
3. Casualty has the **capacity** to decide.

If an adult (16 years or older) has the capacity to make a voluntary and informed decision to **consent to or refuse** a particular treatment, their decision **must be respected**. If they are treated without consent this is usually against the law.

Whilst they can refuse consent to a treatment we offer, they cannot demand a treatment that the casualty carer does not believe should be given. Consent to treatment is not a blanket covering all – there can be separate decisions to different parts of care. It is always worth rechecking with the casualty that they are happy for you to proceed as treatment continues.

Mental Capacity

The Mental Capacity Act (MCA) states: “Everyone has the right to make his or her own decisions, which could be deemed unwise by others. Health and care professionals should always assume an individual has the capacity to make a decision for him or herself, unless it is proved otherwise through a capacity assessment.”

Casualty Carers are not expected to make capacity assessments

Examples of people who *may* lack capacity include those with:

- Dementia
- A learning disability
- A brain injury
- A mental health condition
- A stroke
- Substance or alcohol misuse
- Confusion, drowsiness or unconsciousness because of an illness or treatment for it

If a person does have one of these conditions, it does not necessarily mean they lack the capacity to make a specific decision and therefore individuals should be supported in being able to make a particular decision themselves.

Situations that arise during a rescue

1. **Able to give consent:** the majority of casualties seen in MR are conscious, have capacity and are able to consent to or refuse the treatment we offer. When a casualty refuses a particular treatment, it is worth exploring their thoughts around this to see if we can provide more information to support them in their decision making. If they still refuse our treatment, document this on the Casualty Report form and do your best with what they do consent to.

-
2. **Do not have capacity to give consent and need life-saving treatment:** if the casualty carer believes it is an emergency and the casualty requires life-saving treatment, then they can legally be treated without consent e.g. severe head injury. Document on the Casualty Report form that it was not possible to obtain consent.
 3. **Do not have capacity to give consent and require treatment that is not life-saving:** this is a difficult situation and casualty carers are not expected to perform capacity assessments or understand the MCA. Seek advice from a healthcare professional or, if none available, discuss with the police who have powers to support in this situation e.g. a person with dementia who has a broken lower leg and is refusing treatment.
 4. **Children:** children should be engaged in giving consent if they have the understanding to appreciate what is involved. However, generally, a person with parental responsibility can consent for them. In an emergency, where treatment is vital and waiting to obtain parental consent would place the child at risk, treatment can proceed without consent. Document that this decision was taken on the Casualty Report form.

If in doubt – ask for advice

Adapted from the Faculty of Prehospital Care Foundation Material for Immediate Care (2019)

Personal Notes

TRAUMA

CHEST INJURY

Chest injury often causes impaired breathing and hypoxia due to damage to the lung(s) and chest wall. If breathing is painful e.g. due to fractured ribs, this will make things worse. Massive internal bleeding can occur (haemothorax) (Page 12) causing haemorrhagic shock (Page 18). If the history indicates that a chest injury is possible, check thoroughly for evidence of it (Page 11).

High-flow oxygen via non-rebreathing mask for ALL chest injuries

PNEUMOTHORAX

This is when air collects between the lung and the chest wall, resulting in lung collapse. If the air pressure builds up, it is called a *tension pneumothorax*. Pneumothorax is rare in MR but if it occurs, it is an immediate life threat and needs urgent evacuation, ideally by air.

Symptoms and Signs	Treatment
<p>SIMPLE (closed) PNEUMOTHORAX</p> <ul style="list-style-type: none">Moderate chest painDifficulty breathingShortness of breathRaised respiratory rate <p>TENSION PNEUMOTHORAX</p> <ul style="list-style-type: none">Respiratory distressChest pain (different from cardiac pain)Raised pulse and respiratory ratesLow SpO₂ (O₂ administration will hide this warning sign until collapse imminent)Low blood pressure possible but uncommon(±Tracheal deviation - late sign)Cardiac arrest (reversible: circulation will recover if air is released from chest) <p>OPEN PNEUMOTHORAX (sucking chest wound)</p> <ul style="list-style-type: none">Open pneumothorax is like a CLOSED pneumothorax in that the lung collapses, but there is also an open chest wound.Sucking and/or gurgling sounds from the hole.Blood may be bubbling out of the hole.	<ul style="list-style-type: none">No specific treatment.Monitor in case tension pneumothorax develops (see below). <ul style="list-style-type: none">If a chest seal or dressing has been applied for an open pneumothorax and tension is building up, see below.Otherwise, immediate decompression will be needed using a needle or by a surgical approach. These are not Casualty Care skills.Try to get urgent healthcare professional advice, ideally to come on scene, but if this isn't possible, by radio or phone. <p>A hole in the chest wall seriously compromises breathing, so needs temporary treatment:</p> <ul style="list-style-type: none">Use commercial vented chest seal e.g. Russell, or similar. Theoretically, this allows trapped air from inside to escape while simultaneously preventing further air from entering the chest.If no chest seal, cover wound with thin, dry, adherent dressing or four-sided dressing.Do not allow patient to lie on the wound. <p><u>Vented seals can become blocked e.g. with blood, and stop releasing air from inside. This will result in a tension pneumothorax.</u></p>

If the hole in a chest wall has been covered with a chest seal or dressing, monitor in case a tension pneumothorax develops (see above). If it does, decompress by completely removing the coverings. This is usually sufficient in casualties who can breathe on their own.

In the rare case where breathing does not improve and the casualty continues to deteriorate, carefully push the tip of the little finger of a gloved hand into the hole, up to a depth of about 5cm to release trapped air. Get medical advice, if possible, before doing this.

OTHER CHEST INJURIES

Symptoms and Signs	Treatment
<p>HAEMOTHORAX <i>(Page 18)</i></p> <ul style="list-style-type: none"> • Shock • Chest pain • Difficulty breathing, low SpO2 • Shortness of breath <p>RIB FRACTURE</p> <ul style="list-style-type: none"> • Rib cage tenderness • Breathing causes localised pain • Signs of skin surface trauma <p>FLAIL SEGMENT</p> <ul style="list-style-type: none"> • 2 or more breaks in 3 or more adjacent ribs. • Deformed rib cage. Compare sides. • Paradoxical movement to breathing so on inspiration, normal side moves out but affected side moves in. • High risk of pneumothorax developing. • Underlying lung will be damaged. 	<p>See haemorrhagic shock <i>(Page 18)</i></p> <ul style="list-style-type: none"> • Pad injured side for comfort and potentially make breathing easier. • Analgesia (see below). <ul style="list-style-type: none"> • Pad injured side to help reduce movement of fractured segment that could potentially puncture a lung. • Analgesia (see below).

NOTES

- Pneumothorax can occur spontaneously without injury i.e. as a medical condition.
- Haemothorax and pneumothorax can occur together leading to severe compromise of the circulation.
- To assess the chest fully, expose down to the skin. Chest examination includes the back and armpit area. Explain the need and obtain verbal consent to remove clothes for this purpose.

Important management points for all cases

- Urgent evacuation of all patients with chest injury.
- **Entonox contraindicated** in case a pneumothorax is present.
- **Chest injuries are very painful, and this impairs breathing.** Paracetamol & ibuprofen are insufficient on their own. Opioid is best, but as the casualty will have impaired breathing, get medical advice first, if possible. Start with a smaller dose than usual and build up.
- **Continuously monitor all casualties with chest injury for deterioration during evacuation.**

HEAD / BRAIN INJURY

Symptoms and Signs	Treatment
<p>SCALP WOUNDS</p> <ul style="list-style-type: none"> • Can bleed profusely, especially small children. <p>BASE of SKULL FRACTURE</p> <ul style="list-style-type: none"> • Blood and/or fluid from ear and/or nose • Later signs (hours after injury): <ul style="list-style-type: none"> • Bilateral raccoon eyes (circular black eyes. Can also occur after scalp or facial injury) (Page 49) • Bruise behind ear (Battle's sign) <p>PRIMARY BRAIN INJURY (initial damage at time of incident)</p> <ul style="list-style-type: none"> • Reduced/falling GCS score • Abnormal pupil reaction (late sign) <p>SECONDARY BRAIN INJURY Damage occurring post injury is due to hypoxia, inadequate breathing rate/depth, hypotension, hypoglycaemia, hyperthermia and/or seizures.</p> <p>Severe injury can make the brain swell and increase the pressure inside the skull. This presents as the opposite of shock (high BP & low pulse rate – very late signs).</p>	<ul style="list-style-type: none"> • Stop any external bleeding to minimise shock. • ACVPU or GCS • Bandage only after bleeding ceases. • Leave foreign bodies in place for removal in hospital. • Analgesia as required. • ACVPU or GCS • Analgesia – paracetamol • New-onset confusion is very significant. Indicate using ACVPU (modified AVPU), where 'C' = new confusion (Page 13). <p>There is no treatment for primary injury. All management below is about preventing or minimising secondary brain injury.</p> <ul style="list-style-type: none"> • Ensure airway is open and clear. • Oxygen therapy 15 L/min if major trauma present. Otherwise, decide as for myocardial infarction (Page 21). • Assisted ventilation BVM/i-gel (if required) • ACVPU repeatedly (easier than GCS) (trends more important than individual scores) • Correctly fitting cervical collar (if required) • Transport 30° head-up inclination • Cannulate (if possible). IV saline if BP < 110 • BM should be >5 • Cool if raised body temperature

NOTES

If a casualty with a head injury is in shock, look for bleeding injuries.

- Urgent evacuation to hospital.
- Change in conscious level is the earliest and most important tool to detect and monitor brain injury.
- Trends. Watch for deterioration.
- High risk of C-spine injury in casualties with head injury ([Page 62](#))
- GCS Glasgow Coma Scale ([Page 15](#))
- **ANALGESIA:** Head injury + other painful injury: Paracetamol. Entonox only if GCS 15. Caution with opiates: use small doses (5mg morphine) at least 15 minutes apart.
- Scalp wounds can be difficult to see if casualty has a lot of hair.
- Helmet removal (cut straps, support C-Spine, remove with great care to maintain C-Spine alignment).

SPINAL TRAUMA

Symptoms and Signs	Treatment
<ul style="list-style-type: none"> • Mechanism of injury • Unconscious/semi-conscious • Head or face injury • Back/neck pain in line with spine • Distortion and/or tenderness anywhere along spine (check this during insertion of vacuum mattress) NB can be difficult to detect • Change in sensation anywhere • Loss of all feeling to limbs • Respiratory distress • Incontinence 	<p>Special handling and packaging required using vacuum mattress and lift-and-slide technique to ensure good spinal motion control.</p> <ul style="list-style-type: none"> • A with C-spine control, B, C, D • Oxygen therapy • Appropriate packaging (vac mat and head blocks) (Page 62) • Keep casualty warm • Analgesia: Morphine (be aware of respiratory depression) Entonox, paracetamol and ibuprofen • Record: ACVPU (or GCS), vital signs <p>Urgent evacuation to hospital</p>

NOTES

- **PRIMARY INJURY:** Occurs at the time of incident.
- **SECONDARY INJURY:** Further damage at a later time due to e.g. hypoxia, hypotension, mechanical injury, tissue swelling, poor blood supply, blood clot pressing on the cord.
- The higher a spinal injury, the more severe the consequences.
- Neurogenic shock can occur if cord damage is at or above the mid-thoracic region (Page 18).
- **Cervical Spine.** If mechanism of injury indicates possible damage, use manual in-line stabilisation immediately to minimise spinal movement. Assess and manage appropriately. Use NEXUS, if possible, to guide the need for motion restriction during evacuation (Page 62).
- **Thoracic and lumbar spinal injury** - immobilise if:
 - Pain in *thoracic or lumbar spine*
 - Evidence of intoxication
 - Reduced conscious level
 - Any neurological symptoms
 - Presence of painful distracting injuries
- **Handling and packaging**
 - Vacuum mattress with well formed "head blocks" by moulding around the head is as effective as a collar in restricting movement (Mike Greene, MR Magazine, Winter 2018).
 - Trapezius squeeze is more effective than holding sides of the head during transfer.
 - Latest evidence advises against Log Roll as it allows potentially dangerous amounts of spinal movement to occur. Use the "lift-and-slide" technique.
Keep the casualty in neutral alignment. Slide the vac mattress underneath and lower carefully (up to 8 people could be needed: 3 on each side; 1 at the head (Trap. Squeeze); 1 at foot end to slide in the vac mat in place). **Person in charge of the head co-ordinates all movement**
- Remove helmet in a controlled way to check the head and ensure neutral C-spine alignment.

BURNS

Symptoms and Signs	Treatment
<p>SCALD (including hot fat)</p> <ul style="list-style-type: none"> • Loss of fluid from burn area • Large blisters (scalds often look a lot worse than they are) <p>FLAME</p> <ul style="list-style-type: none"> • As scalding • Clothing may be adherent • Not so many blisters <p>INHALATION</p> <ul style="list-style-type: none"> • Coughing • Hoarse voice • Respiratory distress • Burns in mouth (visual) • Airway swells (blocks) • Singed nasal hairs <p>CHEMICAL</p> <ul style="list-style-type: none"> • History 	<ul style="list-style-type: none"> • Immediately cool with cold/cool water for at least 20 minutes (caution: can induce hypothermia if large body surface area affected). • If forearm/hand burn, remove all jewellery and watches, if possible. • Lay Clingfilm over burn (do not wrap), or sterile non-adhesive dressing, and secure loosely. • Elevate if possible. <p>Flame burn: remove clothing from burn area (unless stuck). Then as for scald.</p> <p>ABCDE</p> <ul style="list-style-type: none"> • Oxygen at 15L per minute <ul style="list-style-type: none"> • Wash with copious amounts of water (As for eyes Page 50). • As for Scalding and Flame

NOTES

- Reassurance for all burn victims.
- SpO₂ inaccurate if fire in a confined space and casualty breathed carbon monoxide.
- All types of burn can have all depths and thus similar clinical features.
- Surface of the hand is approx. 1% of the surface area of the body.
- Burns of less than 10% body area rarely risk serious body fluid loss.
- Consider IV fluids if more than 10% coverage, especially in children.
- For chemical burns, irrigate until all chemical has been removed.
- Shock can set in after the first hour (fluid loss + systemic effect).
- Most burns are painful. Cling film reduces pain. Morphine may be needed.
- Percent of burned body surface will be established in hospital. On scene, just describe the part(s) of the body burned e.g. forearm, etc.

SOFT TISSUE INJURY and WOUNDS

Symptoms and Signs	Treatment
<p>OPEN WOUNDS ± CONTAMINATION</p> <ul style="list-style-type: none">• Bleeding• If extensive, is this catastrophic haemorrhage? (see Page 9)• Includes bites <p>BRUISES</p> <ul style="list-style-type: none">• Soft tissue damage• Localised skin decolouration• Skin is not broken <p>HAEMATOMA</p> <ul style="list-style-type: none">• Deeper soft tissue damage (solid swelling of clotted blood in tissues)• Significant blood loss in large muscles	<p>INITIAL TASK IS TO STOP BLEEDING</p> <ul style="list-style-type: none">• If severe, treat as catastrophic haemorrhage (see Page 9).• Apply pressure:<ul style="list-style-type: none">• For as long as required (10 min minimum) with sterile non-adhesive dressing.• Apply new dressings on top of old, if required, for additional pressure.• Crepe bandage dressing with moderate pressure is an option (ensure no unintended tourniquet effect).• Limb lacerations, check pulse, cap refill, sensation, and motor distal to the injury, in case blood vessel or nerve damaged (Record findings on cas card).• Immobilise limbs, possibly with a splint.• Advise casualty to consult doctor re. a tetanus booster.• Sympathy!• Moderately firm bandaging• Avoid using limb (for a few days) as exercise can reactivate bleeding (not a treatment we can give but advice for casualty!).

NOTES

- Consider if any precipitating factors that led to the injury e.g. fainting.
- All human bites and some animal bites that break the skin need antibiotics if >1hr to hospital. Also need hospital review on the day they occur (see Page 52).
- Small wounds, remove obvious debris. One gentle wash (only if wound is obviously dirty).
- Suspect internal organ damage or broken bone when there is evidence of severe bruising in appropriate places (chest, limbs, and abdomen).

FRACTURES and DISLOCATIONS – General principles

FRACTURE TYPES

- *Closed* (no broken skin)
- *Open* (skin broken; bone ends may be visible; risk of infection)

Symptoms and Signs	Treatment
<p style="text-align: center;">ASSESSMENT</p> <ul style="list-style-type: none"> • PAIN: Location and severity • DEFORMITY: Check along length of the bone (may be hidden by surrounding soft tissue swelling). Compare with other limb. • SWELLING AND BRUISING: Present over fracture. Can contain a lot of blood. • LOSS OF FUNCTION: Does not work as it should. • CREPITUS: Crunching sensation as bone ends rub together. • TENTING (limb threatening) Fractured bone presses on the skin from the inside, thereby stretching the skin: <ul style="list-style-type: none"> • Compromises skin blood supply so skin looks very pale. • May puncture the skin resulting in an open fracture. This is very serious. Urgent evacuation. <p>Assess limb using M.C.S.</p> <p>Motor Test for movement</p> <p>Circulation Assess distal pulse (mark position with X), cap refill, skin colour, skin temperature (cold)</p> <p>Sensation Apply light touch. Can they feel it? Does it feel normal?</p>	<ul style="list-style-type: none"> • Reassurance • Analgesia: Entonox, morphine, diamorphine; fentanyl; ibuprofen; paracetamol. • Splinting (protects the limb; also, analgesic) • Reduction: realigning of the bone(s) to return it to as close to normal position as possible. This will protect the skin, blood vessels and nerves. • Management of wound in an open fracture. <i>(As in 'soft tissue injury' section Page 45)</i> • For open fractures, give co-amoxiclav, if time from injury to hospital >1 hours (be aware of possible Penicillin allergy). • Support affected area in most comfortable position. <p style="text-align: center;">Urgent evacuation to hospital if impaired circulation or neurology</p>

NOTES

- **LARGE FRACTURES:** (femur and pelvis) or **MULTIPLE LONG BONE FRACTURES** have the potential for **massive blood loss. Cumulative effect is very significant.**
- **IV FLUIDS:** (If casualty carer is qualified). Treat as for shock.
- **RECORD:** Everything that you find on examination, how you manage the case & outcome.
- **TRENDS:** Watch for deterioration.

DISLOCATION

- Occurs at a joint
- Intense pain
- Impossible to move the joint
- Deformity usually obvious
- Soft tissue damage if displaced joint pulls on muscles and nerves

FRACTURES and DISLOCATIONS – Lower limb

Symptoms and Signs	Treatment
<p>Ankle</p> <ul style="list-style-type: none"> • Audible crack. Sudden onset of pain. • Foot position may be abnormal if ankle is also dislocated. <p>Tibia (middle of leg below knee)</p> <ul style="list-style-type: none"> • Basic story as above • Lower leg beyond fracture may be in an abnormal position. Maintain in a neutral position. • Open fracture more common 	<p>+ see general principles of fracture management on Page 46</p> <p>May be very unstable. Maintain foot and leg in neutral position when removing shoe to examine. Do <u>not</u> let the foot flop out to side</p> <p>ANKLE/LOWER LEG FRACTURES</p> <ul style="list-style-type: none"> • Splint in that position • Antibiotics if open fracture • If tenting present, ideally manipulate to restore normal anatomical position
<p>Dislocated patella</p> <ul style="list-style-type: none"> • Bad knee pain • Displaced patella visible on outside of knee • Leg held in slight flexion 	<p>PATELLA</p> <ul style="list-style-type: none"> • Strong analgesia • Gently bend the hip and straighten the knee whilst pushing the patella back into position with thumbs. • Support the knee with vacuum splint. • If in doubt, splint leg in a comfortable position and leave knee alone for treatment in hospital..
<p>Femur – shaft fracture</p> <ul style="list-style-type: none"> • Extreme pain • Thigh bulging. Leg shortening • Can bleed a lot. Risk of shock 	<p>FEMUR (shaft)</p> <ul style="list-style-type: none"> • Strong analgesia • Traction splint (e.g. Sager; Slishman; Kendrick) for shaft fracture. If also a pelvic fracture, see below
<p>Fractured neck of femur (FNOF)</p> <ul style="list-style-type: none"> • Groin pain. • Leg usually rotated outwards • Can bleed, but less than fractured shaft 	<p>FEMUR (neck)</p> <ul style="list-style-type: none"> • Pad between knees. Figure-of-8 bandage to ankles (keeps legs together) and strap thighs together.
<p>Pelvic fracture</p> <ul style="list-style-type: none"> • High-energy injury • Can be hard to diagnose, esp if casualty not fully conscious. Go on mechanism of injury. • Bladder, urethra, many major blood vessels are inside pelvis and easily damaged. • Feel for deformity. May elicit pain. Do NOT flex. • Some fractures bleed profusely. Life threat. Watch for shock. Treat appropriately. 	<p>PELVIS</p> <ul style="list-style-type: none"> • Strong analgesia • Pelvic binder (if in doubt, apply it) • If both pelvic and femoral fractures are present, the pelvic fracture is potentially more serious and takes precedence. Apply a pelvic binder and consider using a femoral traction splint that does not exert pressure against the pelvis in the mid-line (crotch) e.g. the Slishman, or Kendrick Traction Device. • IV fluids will be needed.

NOTES

- Most casualties with lower limb fracture/dislocation will be unable to weight bear.
- After splinting, always recheck MCS. Record clinical findings and time of splint application.
- **Only manipulate a joint if been trained to do so.**
- Orthopaedic surgeons' advice: it can be difficult to differentiate between a FNOF and fractured shaft. It isn't wrong if a traction splint is used in FNOF, as this won't cause any harm and will improve patient comfort.

FRACTURES and DISLOCATIONS – Upper limb

Symptoms and Signs

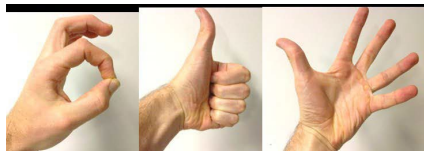
Shoulder dislocation

- Fall onto shoulder or blow to upper arm
- Little force may be needed if joint has been dislocated previously
- Extremely painful
- Restricted movement of arm
- "Squaring" of shoulder (loss of normal contour - compare with normal side)
- Loss of circulation and/or nerve supply to arm (**limb threat**)
- May also be an upper arm fracture

Humerus, forearm and wrist

- Fall onto outstretched arm
- **Circulation and nerve supply may be compromised. Limb threat**
- Bruising, swelling, deformity
- Loss of movement. Crepitus
- Extremely painful (esp. humerus fracture)
- Can be open fracture. **Limb threat**
- Restricted movement of arm
- Wrist: Colles fracture - "dinner fork" appearance
- In children <10y, supracondylar fracture (lower humerus just above elbow) is potential **limb threat**. Assess as shown below

Children with upper arm fracture, check if they can perform these movements. If not, very high risk of permanent damage.



Treatment

+ see general principles of fracture management on [Page 46](#)

- Strong analgesia (will help packaging for evacuation.)
 - Arm may be in abnormal position e.g. out to the side, making it difficult to package the casualty.
 - Use MCS for assessment.
 - Reduction is very difficult and should not be considered, particularly as a fracture might also be present. **Seek medical advice if circulation and/or nerve supply compromised.**
 - Support arm with arm sling.
 - **Urgent evacuation.**
-
- Casualty will usually have put the arm in the most comfortable position before the team arrives. Try to maintain this position when examining and packaging.
 - Humeral fracture may be very painful. Strong analgesia (will help packaging for evacuation).
 - Use MCS for assessment ([Page 46](#)).
 - Support arm with a sling or splint (whichever is most comfortable).

FACIAL TRAUMA

The face is a skeleton of bones overlaid by soft tissue to give the face its shape. It has a very rich blood supply. The main parts are the nasal cavity, cheeks, eye sockets, and jawbone (mandible). *Any major impact to the face can be accompanied by damage to the brain and/or cervical spine.* A, B, C, D principles of management apply, as always. The effects of facial injury are particularly important if the underlying bones are fractured:

- Fractured nasal bones can compromise the airway by blocking the nose. The mandible must be intact to stop the tongue falling back. Airway obstruction is likely if the mandible is fractured in more than one place, as all support to the tongue will be lost.
- Bleeding into the airway, which can't be controlled by direct pressure. For example, fractured nasal and cheek bones will result in a continuous trickle of blood down the back of the nose and into the airway. This can make it difficult for the casualty to breathe, especially if they are lying on their back or are unconscious.
- Visual disturbance from damage to the eyes or eye sockets.
- Lacerations cause external bleeding. Underlying tissues may be exposed.
- Significant bruising and swelling.

Symptoms and Signs	Treatment
<ul style="list-style-type: none"> • Bleeding <ul style="list-style-type: none"> ▪ Externally, on the surface of the face. ▪ Into the airway. The casualty may be repeatedly spitting out blood. Listen for gurgling sounds in an unconscious casualty (indicates free blood in the airway). • Airway obstruction due to blood, loss of the bony support for the tongue which falls back, or blocked nose. • Superficial bruising and lacerations <p><u>Facial injury may be isolated e.g. casualty falls forwards onto a rock, or part of major trauma.</u></p>	<ul style="list-style-type: none"> • Priority is Airway <ul style="list-style-type: none"> ▪ Manage as usual (<i>Page 10</i>) ▪ Suction for removing blood. ▪ OPA can be used, even if fractured mandible. ▪ Avoid NPA if nose damaged. ▪ If bleeding into the airway is continuous, or the mandible is fractured, turn the casualty onto their side so the tongue falls forward with gravity and blood trickles out. • Oxygen, especially if airway involved. • Check for signs of brain injury (<i>Page 42</i>). Manage as appropriate. • Cover open lacerations with clean dressing.

NOTES

- Consider the possibility of C-spine injury, but not at the expense of managing the airway.
- Any facial injury greater than a simple laceration is a potential life threat. Rapid evacuation is indicated.
- Jaw thrust only works if the mandible is intact. If jaw thrust is needed, do not lever on the cheek bones with your thumbs to make it easier to move the jaw forwards. In the presence of facial injuries, this can push the whole centre of the face inwards. Move the jaw forwards by pushing on both sides at the corner (angle) of the mandible.

EYE INJURIES

Symptoms and Signs	Treatment
<p>FOREIGN BODIES</p> <ul style="list-style-type: none"> • Windblown debris • Shards from broken glass • Rock chips • Object may penetrate eye <p>EYEBALL RUPTURE</p> <ul style="list-style-type: none"> • Laceration of the eyeball • Blood in front of iris • Irregular pupil • Ocular contents may leak out <p>ORBITAL FRACTURE (blunt blow, bony fracture)</p> <ul style="list-style-type: none"> • Pain worsened by movement • Numbness on cheek or gums • Nosebleed • Eye may appear displaced • Possible double vision • Air in tissues, feels crackly to gentle pressure (surgical emphysema) <p>LID LACERATIONS</p> <ul style="list-style-type: none"> • Cut to eyelid • Possibility of damage to underlying eyeball <p>CHEMICAL INJURIES</p> <ul style="list-style-type: none"> • History • Lacklustre appearance 	<ul style="list-style-type: none"> • Simple debris can be carefully removed. • Leave penetrating objects in place. • Avoid any pressure on the eye. <ul style="list-style-type: none"> • Do NOT exert any pressure on the eye. • Do not force lids open or closed. • Pain relief. Prevent nausea (vomiting raises pressure in the eye and increases damage). • Do not wipe ocular contents from the eye. <ul style="list-style-type: none"> • Cover without direct pressure. • Pain relief • The casualty should not blow their nose (doing so can force air from the nose and sinuses into the tissues surrounding the eyeball). <ul style="list-style-type: none"> • Non-adherent dressing • Make sure no pressure is exerted on the eye. • Eye should be covered with rigid eye shield (improvise). • Wash fully open eye with copious quantities of saline (remove any contact lens first). • Eyelid can be held open (barring penetrating injury). • If saline not available, use stream water (send a sample of chemical & water with casualty to hospital, for analysis in case contains infection).

NOTES

- Where possible, protect at-risk eyes with a with rigid shield (improvise e.g. helicopter goggles).
- Any eye injuries lead to a big increase in tear production. This helps irrigate the area.
- Test eyesight by holding hand/fingers at various distances. Observe pupil size and shape. Document findings.
- Eyes of unconscious patients may not be fully closed. Tape eyes closed to prevent drying out.
- Transport with head up if possible. May require urgent evacuation.

Advice from ophthalmic surgeons is not to put ointment in eyes, and all eye injuries should be seen in hospital

(possible exception is if the eye returns to complete normality – get medical advice)

DROWNING

Symptoms and Signs	Treatment
<ul style="list-style-type: none"> • Casualty in water with face in water (submersion) • Casualty in water with face out of water (immersion). • If wearing a life jacket so head is out of the water, hypothermia will develop. 	<p style="text-align: center;">SAFTEY: Cold water will affect rescuer as well. Be properly equipped</p> <ul style="list-style-type: none"> • Managing casualty in water is impossible, move to shore keeping horizontal. • Casualty may have other injuries. • Primary survey ABCDE • Vomiting likely. Be prepared! Protect airway. • 100% oxygen. High flow • Keep casualty warm to stop further cooling. • Pulse checks, and if necessary, 5 rescue breaths. Potentially can be done while the casualty is still in the water. • CPR can be effective after prolonged submersion in cold water, especially in small children (<i>page 69</i>).

NOTES

There is very limited good research evidence to inform clinical practice guidelines for drowning, so most guidance is based on expert opinion (Bierens J, et al. *Resuscitation* 2021;**162**:205-17).

Rescue Issues

- Undertake a dynamic risk assessment considering feasibility, chances of survival and risks to the rescuer (*Page 72*). Survival after cardiac arrest from drowning is rare and most survivors sustain severe neurological injury (European Resuscitation Council, 2021).
- Submersion duration is the strongest predictor of outcome. Outcome worsens with duration >5min (Olasveengen T, et al. *Circulation*. 2020;**142**(suppl 1):S41–S91).
- Water temp >6°C & submersion >30 minutes: survival/resuscitation is very unlikely.
- Water temp <6°C & submersion >90 minutes: survival/resuscitation is very unlikely.

Medical Issues

- For drowning to occur, at least the face and airway must be under water.
- Priority is to relieve hypoxia, therefore CPR for drowning starts with 5 rescue breaths.
- Froth from the mouth and nose is a bad sign.
- Drowning causes death by blocking access to oxygen (asphyxia).

BITES and STINGS

Symptoms and Signs

Treatment

BITES AND STINGS

- From animals, insects, or humans

- Control bleeding ([Page 45](#))
- Do not examine or attempt to close wound.
- Sterile non-adherent dressing.
- Analgesia.
- If skin broken, give antibiotic (co-amoxiclav).
- Hospital review required on the day of injury.

Be alert for anaphylaxis ([Page 24](#))
after stings and animal bites

SNAKEBITES

Common European Adder (*Vipera berus*)



Your safety is paramount. Do not get too close!
Photograph it if you can do so safely.

Check no snakes nearby

- The Adder is the only *indigenous* poisonous snake in the UK.
- Identified by dark diamond patterns, in the shape of a V or X, on its back.
- Usually <60cm long (grass snakes can be double this).
- Hibernates in winter so bites only occur at warmer times (peak in midsummer).
- *In about 5% bites, no venom is injected (called "dry bites").*
- Commonest symptoms:
 - Dizziness
 - Pain
 - Nausea, Vomiting
 - Diarrhoea
 - Abdominal pain

General issues for snakebite

- ABCDE
- Try to calm the casualty to slow the spread of the toxin around the body.
- Remove jewellery and loosen clothes on bitten limb in case it swells up.
- Rest. Immobilise bitten limb.
- Leave wound exposed. Do not interfere with it.
- **Urgent evacuation to hospital.**

Medical issues on site

- Paracetamol for pain. Do not give aspirin or ibuprofen. Venom can cause spontaneous bleeding.

Anaphylaxis occurs in <10% cases. This can start within minutes of the bite or after several hours.

- Monitor breathing, circulation, and conscious level, especially during prolonged evacuation .
- Monitor for signs of anaphylaxis including itching, wheezing, swelling of mouth, low blood pressure, etc.
- **Manage anaphylaxis in the usual way ([Page 24](#))**

(Notes for this section on next page)

NOTES

Human bites

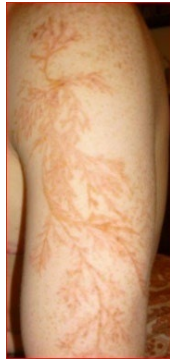
- May be more dangerous than animal bites because some microbes in human mouths can cause hard-to-treat infections as well as HIV, hepatitis.

Snakebites

- Adder bites are rarely fatal. Most victims show no or only mild symptoms.
 - Severity of the bite is graded. Casualties with extensive swelling and/or generalised symptoms will need antivenom in hospital.
 - Further reading:
 - Vipera berus. Lyle Brotherton. MR Magazine. July 2014.
 - NHS website (<https://www.nhs.uk/conditions/snake-bites>)
 - For advanced reading:
 - Hermansen MN, et al. Envenomation by the common European adder (*Vipera berus*): a case series of 219 patients. *Eur J Emerg Med* 2019;**26**:362-5
-

LIGHTNING STRIKE

Symptoms and Signs	Treatment
<ul style="list-style-type: none">• High current (DC) can cause:<ul style="list-style-type: none">▪ Respiratory arrest▪ Cardiac arrest• During this time, brain will be starved of oxygen.• Seizures possible.• Superficial burns from indirect strike (flash over) can cause fern like patterning on skin.• Entry and exit points can have full thickness burn. Organs may be damaged at these points.• 85% of injuries are caused by ground current or side flash.• Paralysis of lower limbs due to electrical disruption of the nervous system. Should make full recovery.• Spinal/head/other injuries if casualty has been thrown by shock wave.	<ul style="list-style-type: none">• Triage: Contrary to normal triage rules, resuscitate the apparently dead first.• Treat as ABCDE• Oxygen• Artificial ventilation (BVM or i-gel)• May need prolonged respiratory support as respiratory arrest often outlasts period of cardiac arrest.• Treat as for burns (Page 44) <p><u>Ground current</u>: When lightning strikes an object, energy travels outward from the strike in and along the ground surface.</p> <p><u>Side flash</u> occurs when lightning strikes a taller object near the victim and a portion of the current jumps from taller object to the victim.</p> <p>OTHER INJURIES</p> <ul style="list-style-type: none">• Treat as usual for these injuries



NOTES

- **Team safety is paramount**
- Summits and ridges should be avoided during a storm, as should:
 - Single trees
 - Sheltering under overhangs
 - Stream beds
 - Power lines and ski lifts
 - Walls
- Groups of people should spread out if outside during a thunderstorm.
- Almost all people with signs of life will recover without intervention.
- Victims of lightning strike can tolerate prolonged periods of resuscitation and survive with a good outcome.
- Possibility of respiratory arrest only (will need respiratory support with Bag Valve Mask, or Bag Valve i-gel).

Personal Notes

ABBREVIATIONS

ABCDE	A irway, B reathing, C irculation, D isability, E xposure/Environment. These are the key steps of the Primary Survey after establishing safe to approach, etc.
AED	A utomated E xternal D efibrillator
ALS	A dvanced L ife S upport
ACVPU	A lert, R ecent onset confusion, V erbal, P ain, U nresponsive (simple scale of conscious level)
ATMIST	A ge, T ime of injury, M echanism of injury, I njuries sustained, S igns and symptoms, T reatment given so far
BLS	B asic L ife S upport
BM	B lood glucose level (obtained from a finger prick blood sample)
BP	B lood P ressure
BVM	B ag V alve M ask (device to deliver breaths when casualty not breathing. Can be used with an i-gel, in which case connect the Bag-Valve straight to the i-gel)
CRT	C apillary R efill T ime
CPR	C ardiopulmonary R esuscitation
Cat Haem	C atastrophic haemorrhage is very severe external bleeding that wells up rapidly in front of your eyes e.g. from a severed artery in a limb. It will result in death within minutes if not treated (Page 9)
DcRABCDE	D anger, C atastrophic haemorrhage, R esponse, A irway, B reathing, C irculation, D isability, E xposure/Environment
ECG	E lectrocardiogram
Five Ps	P endants, P atches, P acemaker, P iercings, P erspiration
FAST	A cronym to help identify stroke victim. F ace, A rms, S peech & T ime
GCS	G lasgow C oma S cale (a comprehensive scale of conscious level)
GTN	G lyceryl T rinitrate (angina treatment drug)
H₂O	C hemical symbol for water
ICP	I ntracranial P ressure (pressure inside the skull)
IM	I ntramuscular (injection of a drug into muscle)

IN	Intranasal (squirting an aerosol of drug up the nose)
IV	Intravenous (injection into a vein)
LMA/i-Gel	Devices inserted orally into unconscious casualty. Allows rescuer to deliver breaths with Bag-Mask e.g. during cardiac arrest
L	Litres
Mandible	Lower jaw bone
MCS	<u>M</u>otor <u>C</u>irculation <u>S</u>ensation
MI	Myocardial Infarction (heart attack)
mcg	Microgram
mg	Milligram
ml	Millilitres
mm Hg	Millimetres of Mercury
mmol/l	Millimoles per litre (e.g. for blood glucose level)
MR	Mountain Rescue
MREW	Mountain Rescue England and Wales
NEXUS	National Emergency X-ray Utilisation Study (hospital study to identify which patients with C-spine injury need an x-ray. Lead to identification of five criteria that we can use in MR to recognise casualties likely to have a significant C-spine injury).
NPA	Nasopharyngeal Airway (device to maintain airway via nose)
NSAID	Non-Steroidal Anti-inflammatory Drug e.g. aspirin, ibuprofen
O₂	Oxygen
OPA	Oropharyngeal Airway (device to maintain airway via mouth)
PEARL	Pupils Equal and Reactive to Light
PPE	Personal Protective Equipment e.g. gloves, facemask, helmet, goggles, etc.
ROLE	Recognition of Life Extinct (Page 72)
SAMPLE	Sample, Allergies, Medication, Past history, Last meal, Events leading up to the incident (record all this information on Cas card)
SpO₂	Oxygen saturation of blood measured by pulse oximeter (finger probe)
TIA	Transient Ischaemic Attack (transient stroke)

VF **Ventricular Fibrillation** (uncoordinated contraction of heart muscle causing cardiac arrest)

VOD **Verification of Death** *(Page 72)*

≤ Equal to or less than

≥ Equal to or more than

< Less than

> More than

± Plus or minus

GLOSSARY

Abdominal	Of the abdomen. Cavity of the body containing stomach, intestines, spleen, liver, kidneys, bladder, ovaries, uterus, appendix, gallbladder and pancreas.
Accessory muscles	Muscles, particularly around the neck, that assist the diaphragm and intercostal muscles when the work of breathing is increased e.g. strenuous exercise, severe asthma.
Adrenaline	A hormone that increases heart rate, BP, and blood glucose. Also known as epinephrine.
Ambulatory	Capable of walking, moving around, not stationary.
Analgesic	Any drug (e.g. paracetamol) or procedure (e.g. splinting) that reduces pain.
Analgesia	Pain relief.
Anaphylaxis	Severe allergic reaction that if untreated, can cause death.
Angina	Severe central chest pain, often also spreading to the shoulders, arms and neck, caused by an inadequate blood supply to the heart muscle.
Antiemetic	A drug that reduces or stops nausea and/or vomiting e.g. buccastem.
Arrhythmia	Abnormal heart rhythm.
Asphyxia	This happens when breathing is prevented despite efforts to do so e.g. choking, crush injury preventing breathing, avalanche burial, drowning. If not treated within minutes, asphyxia causes unconsciousness and death.
Asthma	Chronic lung condition: inflamed and narrowed airways. Can be triggered by allergy, exercise or breathing cold air. Audible wheeze, if not at a life-threatening stage.
Asymmetrical	Not symmetrical, unequal in shape and/or outline.
Asystole	Complete absence of electrical and mechanical activity in the heart. Shows as a flat line on the AED or ECG.
Beta-blockers	Drug sometimes used to treat high blood pressure or arrhythmia. Decreases heart rate. Can mask the signs of e.g. shock.
Bronchospasm	Spasm of the bronchi. Exhalation difficult and noisy (wheeze). Associated with asthma, bronchitis, and anaphylaxis.
Buccal	The gums and inside of the cheek.
Buccastem	A drug to prevent or alleviate nausea and vomiting. Given by buccal route.
C-spine	Cervical spine.
Cannula	A narrow plastic tube for insertion into a vein or bodily cavity for draining off air, fluid or giving medication or IV fluids.
Cap (capillary) refill	A method of testing circulation at a part of the body. Checked peripherally (finger or toenail) e.g. beyond an injury, or centrally (front of chest).
Cardiac arrest	Failure of the heart to beat in a way that will sustain life.
Carotid pulse	Pulsation of the carotid artery in the neck.
Catastrophic haemorrhage	Catastrophic haemorrhage is very severe external bleeding that wells up rapidly in front of your eyes e.g. from a severed artery in a limb. It will result in death within minutes if not treated.
Co-amoxiclav	Antibiotic now used by MR teams for the prevention/treatment of infection. NB contains penicillin.
Cerebrospinal	Of or relating to the brain and/or spinal cord.
Cerebrovascular	The blood vessels of the brain.

Cervical collar (rigid)	Collar designed to fit around the neck to reduce movement of the cervical spine.
Convulsion	See seizure
Conjunctiva	Thin tissue lining of the eyelid and the white of the eye but not the very centre of the eye where the iris and pupil are.
Contraindicate	To indicate a danger in a course of action and to prohibit that action. It must not be done e.g. a drug must not be given in certain circumstances.
Cornea	The clear tough layer that covers the iris and pupil.
Cyanosis	Blue or purple discoloration of the skin due to tissues near the skin surface lacking oxygen.
Diabetes	A condition characterised by high glucose resulting from defects in insulin secretion, insulin action or both.
Diamorphine	Opiate drug used intranasally to control severe pain.
Distal pulse	Pulse furthest away from the heart or beyond an injury site.
Distension	To be distended, swell out or expand as if from internal pressure. In vein distension, the vein will stand out. Abdominal distension can occur if there is a major injury inside the abdomen.
Distracting injury	An injury that draws the attention of the care provider or patient <i>away</i> from a more important, serious or life-threatening injury.
Entonox	Analgesia that works during inhalation but wears off quickly when not being taken. Gas mixture: 50% Nitrous oxide and 50% Oxygen. Caution: separation of the two gases occurs below 0°C.
EpiPen/Jext	Examples of spring-loaded automatic injector pens used as a means of administering adrenaline for anaphylaxis.
Febrile	Feverish
Femoral	Of the femur.
Femoral pulse	Pulse found in the groin.
Haematoma	Localised swelling filled with blood e.g. following an impact.
Haemorrhage	Bleeding
Haemothorax	An accumulation of blood within the chest.
Hyperglycaemia	High blood glucose
Hypertension	High blood pressure
Hyperthermia	Raised body temperature >37.5°C
Hypoglycaemia	Low blood glucose
Hypotension	Low blood pressure
Hypothermia	Core body temperature <35°C
Hypovolaemia	Low blood volume
Hypoxia	Reduced amount of oxygen reaching the tissues.
Ischaemia	Inadequate blood supply to a part of the body/organ due to a blocked/constricted artery.
Jaw thrust	A method of opening the airway by placing the fingers behind the angle of the jaw and bringing the jaw forward, so that the lower teeth are in front of the upper teeth. It is a safer technique if a C-spine injury is suspected.
Laryngeal	Of or pertaining to the larynx (voice box or Adam's Apple).
Log roll	A method of rolling a casualty onto their side, without bending them e.g. to insert vacuum mattress, spinal board or similar. Current guidelines advise

	against this technique as the amount of movement could exacerbate internal injuries e.g. spine, injury, internal bleeding and pelvic fracture.
Myocardial Infarction	(Heart Attack). Death of heart muscle resulting from obstruction of the blood supply to the heart.
Midazolam	A drug used for the treatment of epileptic fits. Used when the seizures are repeated or prolonged (more than 10 minutes).
Morphine	Opiate drug used IV or IM to control severe pain in certain conditions.
Naloxone	A drug used to reverse the effects of opiates such as morphine and diamorphine.
Nebuliser	An oxygen-powered dispenser that turns liquid drugs, such as salbutamol, into a fine mist that can be inhaled for relieving asthma.
Neurogenic shock	Neurogenic shock is caused by spinal cord damage at the level of the upper chest. It is characterised by hypotension, slow pulse rate and warm skin.
Non-rebreathing mask	A mask with one-way valve that allows casualty to breathe oxygen without rebreathing exhaled air.
Ocular	Of or pertaining to the eye.
Oedema	A build-up of fluid in tissue spaces. Often visible as swelling in the skin.
Open fracture	A fracture that has broken through the overlying skin.
Opiate/Opioid	Analgesics of the morphine family including diamorphine and fentanyl.
Orbital fracture	Fracture of one of the facial bones around the eye.
Palpable	Capable of being touched or felt e.g. a pulse.
Pneumothorax	(Abnormal) presence of air inside the chest, in the pleural cavity outside the lung.
Radial pulse	Pulsation of the radial artery at the wrist.
Salbutamol	A drug that when inhaled directly into the lungs, relieves constriction of the bronchial tubes.
Seizure	Fitting/convulsions caused by electrical disturbance in the brain.
Shock	A medical emergency in which the organs and tissues are not receiving sufficient oxygen. If untreated, can result in death.
Stroke	Sudden onset of impaired brain activity caused by blood failing to reach brain cells due to a blood clot or bleeding in the brain.
Surgical emphysema	A condition in which air is abnormally present within body tissues, most commonly, the chest wall e.g. tension pneumothorax. It is called 'surgical' to differentiate it from 'emphysema' which is a chronic lung condition.
Systemic	Affecting the whole body.
Systolic	The force of blood existing in the arteries while the heart beats. Top number in a blood pressure reading..
Thorax	Upper part of the trunk from below the neck to the bottom of the rib cage.
Thoracic	Of or pertaining to the thorax.
Thrombosis	Abnormal coagulation of the blood in any part of the circulatory system.
TIA	Transient Ischaemic Attack (temporary stroke).
Trachea	Windpipe that carries the air in and out of the lungs.
Trauma	Any physical damage to the body.
Vacuum mattress	A large splint that supports the whole body. Used when there is any suspicion of spinal trauma.

MR guidelines for assessing the casualty with a possible cervical spine injury

Background

Cervical spine injury is more likely in casualties with brain injury and/or severe general injuries. Whether the casualty has a significant C-spine injury will be decided in hospital. In the prehospital situation, research has demonstrated that the spine cannot be completely immobilised so '*selective motion control*' is now recommended for casualties who are likely to benefit.

Key messages for MR from recent studies

- Manual In-line Stabilisation (MILS) is as effective as a collar for C-spine. Thus, there is little need for a cervical collar.
- Trapezius squeeze is more effective than head squeeze during transfer in minimising C-spine movement as it ensures the head is kept in better alignment with the trunk.
- Lift-and-slide causes less spinal movement (at any level) than a log roll.
- A vacuum mattress, with well-formed 'head blocks' by moulding around the patient's head, is effective in restricting movement.

Important points

- There is general agreement that over emphasis on C-spine early in the Primary Survey can prevent timely treatment of life-threatening problems (termed "C-spine paralysis").
- For conscious patients, motion control can be "Please keep your head and neck still". This is good practice.
- Studies have shown that a conscious casualty is able to exert good control over their C-spine.
- For an unconscious patient with an airway concern or significant facial fracture, it is reasonable to turn the casualty into the recovery position, even without knowledge of the C-spine status.

Categories of spinal injury (at all levels) are recognised

- Uninjured spine i.e. bone pain but no spinal cord damage.
- Stable bone injury with no potential for neurological compromise.
- Unstable or potentially unstable bone injury but currently with no neurological compromise.
- Unstable bone injury with neurological compromise evident.
- Severely injured casualty with unknown spinal status.

It is unlikely that most MR personnel will feel confident to be able to differentiate between these. Therefore, consider a vacuum mattress with well-formed 'head blocks' for all casualties with a possible spinal injury. Assess the casualty for the ability to move their fingers and toes and feel touch on the arms and lower legs before packaging and again after packaging.

NEXUS

The **NEXUS rule** can be applied in the field to identify at-risk casualties following a blunt injury. NEXUS is negative if **NONE** of the five conditions listed below are present:

- *Midline cervical spine tenderness* i.e. the neck bones, not the adjacent muscles.
- *Neurological deficit* i.e. absence or change in sensation, or the inability to move any part of the body.
- *Depressed level of consciousness* (when assessed)
- *Intoxication* (drugs, alcohol, strong analgesia given before the team arrival)
- *Painful distracting injury* that is so painful, regardless of where it is, that it prevents the casualty from focusing on their neck to ascertain whether it is tender.

If **ANY** of the five elements are present, the C-spine should be considered at risk and managed appropriately. If you start to go down the list and the casualty fails the first one, they have failed all of them (called NEXUS Positive).

C-spine damage is rare in children. However, it is more likely in the elderly, possibly because the neck becomes stiffer as people age.

From the Faculty of Prehospital Care guidance (2017), there are four casualty groups with potential cervical spine injury based on mechanism of injury.

1. Awake: no pain or neurology

No value in traditional full immobilisation. Once the C-Spine has been cleared using NEXUS, these casualties can extricate and immobilise themselves under instruction.

2. Awake: neck pain and/or neurology (= NEXUS positive)

Gentle transportation to an appropriate hospital. As by definition, these casualties are NEXUS positive: they should be extricated and transported in a position of comfort with motion control methods i.e. manual in-line stabilisation initially, and then package with a vacuum mattress moulded to keep the head in a neutral position.

3. Agitated: combative (cannot assess as uncooperative)

Examination of the cervical spine is not possible. Keep them comfortable. Do not restrain them to impose immobilisation. Use MILS and vacuum mattress. Consider treatable causes of agitation e.g. low blood oxygen, pain.

4. Unconscious

This group is the most likely to have a spinal injury as well as other time-critical injuries. Aim to extricate rapidly (ABCDE). If resources are limited, a cervical collar may be useful to aid stabilising the head during extrication, but then remove it.

Summary: Group 1 probably does not have C-Spine injury; Group 2 probably does; and Groups 3 and 4 are unknown.

If the head is not in neutral alignment but leaning to one side

- In the casualty with impaired consciousness, stabilise the neck in the current position unless airway management is compromised.
- In an awake, responsive and co-operative casualty, the head can be very slowly and carefully realigned, but stop immediately if there is increased pain, neurologic deterioration, or resistance to movement.

Thanks to Mike Greene who provided most of the above explanations, and the algorithm on the next page in his presentation at the MREW Medical Conference (2017) and subsequently in MR Magazine (2018).

- Further reading:
 - Hawkins et al. Wilderness Medical Society Clinical Practice Guidelines for spinal cord protection. *Wild Environ Med* 2019;**30**:S87-S99

Management of Potential Spinal Injury



HS = Head Squeeze
 TS = Trap Squeeze
 VM = Vacuum mattress

Scene rapid assessment
 CABCADE

Trauma
 "Unconscious"
 A C V P U

Motion Restriction

- Hand on HS/TS
- Lift and Slide
- Vacuum mattress

Difficult
 Extrication /Carry/lower

Add Collar
 (remove once on VM in easier terrain)

Trauma
 "Conscious"
 A C V P U

Alone "Keep Still"
 ABCDE

MRT Hand on HS/TS
 ABCDE

NEXUS

NEXUS + ve
 or lumbar /thoracic pain

Minimal Handling

- No log roll
- Plan
- Move once and package

NEXUS – ve
No Motion Restriction

CARDIAC ARREST (Overview)

Symptoms and Signs	Treatment
<ul style="list-style-type: none">• No response• Not breathing ± agonal gasps	<ul style="list-style-type: none">• CPR step-by-step guide for all cases (Page 67); summary for adult (Page 68); summary for paediatric (Page 69)• Termination of resuscitation guidelines (Page 72) <p>USING AN AED</p> <p>Check 5 Ps before placing AED pads</p> <ul style="list-style-type: none">• Patches• Pendants• Perspiration• Piercings• Pacemaker (see below) <p>Shave hairy chest so pads will stick.</p> <p>If the chest is wet, dry it before using the AED</p>

NOTES

EARLY DEFIBRILLATION IS THE KEY TO SURVIVAL

- Cardiac arrest occurs when heart stops pumping blood.
- Risk is greatest after a myocardial infarction (heart attack) but can occur for other reasons e.g. anaphylaxis, major haemorrhage, hypothermia.
- Reversible causes of cardiac arrest relevant to MR are:
 - Hypothermia, Hypoxia, Hypovolaemia
 - Toxins (e.g. drugs), Thrombosis (e.g. MI), Tension Pneumothorax

Pacemakers and AED pad placement

- Most pacemakers are implanted in the upper L side of the chest, so well away from where AED pads are placed (upper R side of the chest and L armpit area).
- If the pacemaker is in the upper R side of the chest, then place the right AED pad at least 3cm away from the pacemaker, and the L in the normal place.

KEY POINTS FOR GOOD QUALITY CPR

- Continuous chest compressions. Minimise interruptions e.g. for rescue breaths.
- Continue compressions whilst charging AED, if this will not disrupt AED processing information (check user manual).
- Ventilate with BVM or an i-gel connected to a bag-valve, and O₂.
- Decisions about starting/stopping CPR: discuss with team medical staff ([+ see Page 72](#))

CPR (Step-by-step)

DR AB (continuation of Primary Survey beyond 'B' not necessary to diagnose cardiac arrest)

Danger

- Appropriate PPE
- Safe to approach casualty? If '**NO**', consider if safe to start CPR (*Page 72*) or if the casualty needs to be moved to a safer place first.

Response

- Any response to shaking, spoken voice, or squeezing trapezius muscle? (Note: this is a simple, quick check, not a full ACVPU assessment)

If '**NO**' i.e. unresponsive, proceed with the assessment for cardiac arrest

Shout for help

Airway

- Open the mouth and check for foreign bodies. Remove if present.
- Open mouth. Clear airway obstruction due to the tongue using head tilt-chin lift or jaw thrust.

Breathing

- Check for up to 10 seconds (no longer) for normal breathing (an occasional gasp means cardiac arrest).
- Look for the even rise and fall of the chest, and listen for breath sounds.
- Put your ear close to casualty's nose and mouth, if feel it is safe to do so.
- If '**NO**' normal breathing, assume cardiac arrest.

Call or Phone for help; state 'cardiac arrest'; request an AED (Defibrillator)

Chest

Compressions

- Place the heel of one hand on the centre of the casualty's chest. Then place the palm of the other hand on top and interlock the fingers.
- Press down by 5-6 cm (2-2.5 inches) at a steady rate of 100 to 120 compressions a minute (roughly 2 compressions per second).
- Count compressions. After 30, give two rescue breaths.

Rescue breaths

- 'Head tilt-chin lift', pinch casualty's nose, seal your mouth over casualty's open mouth. Alternatively, use OPA+BVM or i-gel and Bag-valve .
- Blow steadily and firmly into their mouth for about 1 second. Check that their chest rises. Come off the casualty between breaths to allow the chest to fall. Give 2 breaths like this.
- Aim to deliver the two breaths *within 5 seconds* to minimise the pause in chest compressions. Then straight back on to the chest.
- Repeat 30:2 until relieved by another CPR provider or exhausted.
- Change rescuer every 2 minutes so CPR is maximum quality.
- Attach AED as soon as possible and follow machine's verbal instructions.

Children

5 rescue breaths first and CPR for 1 minute before going for help

Drowning

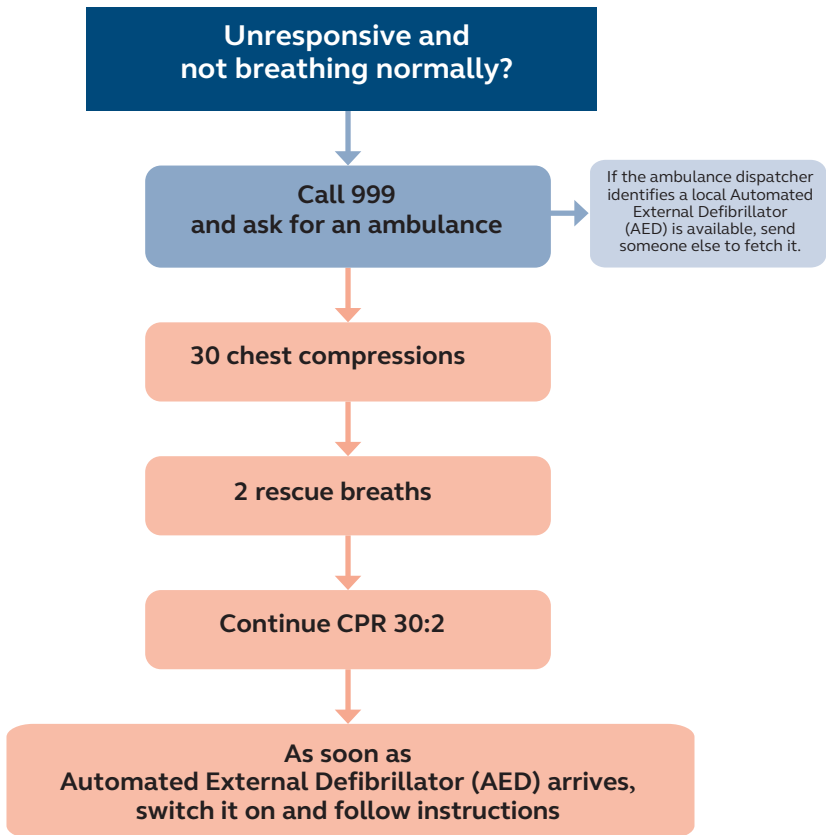
5 rescue breaths before chest compressions

NOTES

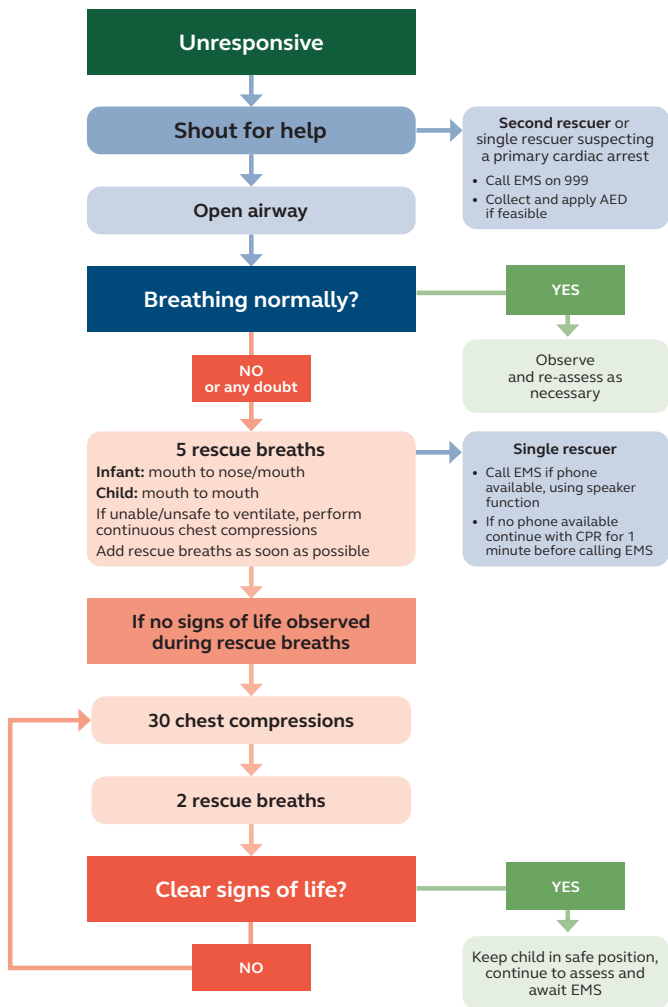
- Do not deliver chest compressions >120/min as this is less efficient
- If concerned about infection risk, do compression-only CPR i.e. no rescue breaths
- For general information about CPR, see the Resuscitation Council UK (<https://www.resus.org.uk>) or NHS (<https://www.nhs.uk/conditions/first-aid/cpr/>) websites
- For the latest guidance about CPR in a casualty with Covid, see MREW Moodle website



Adult basic life support in community settings

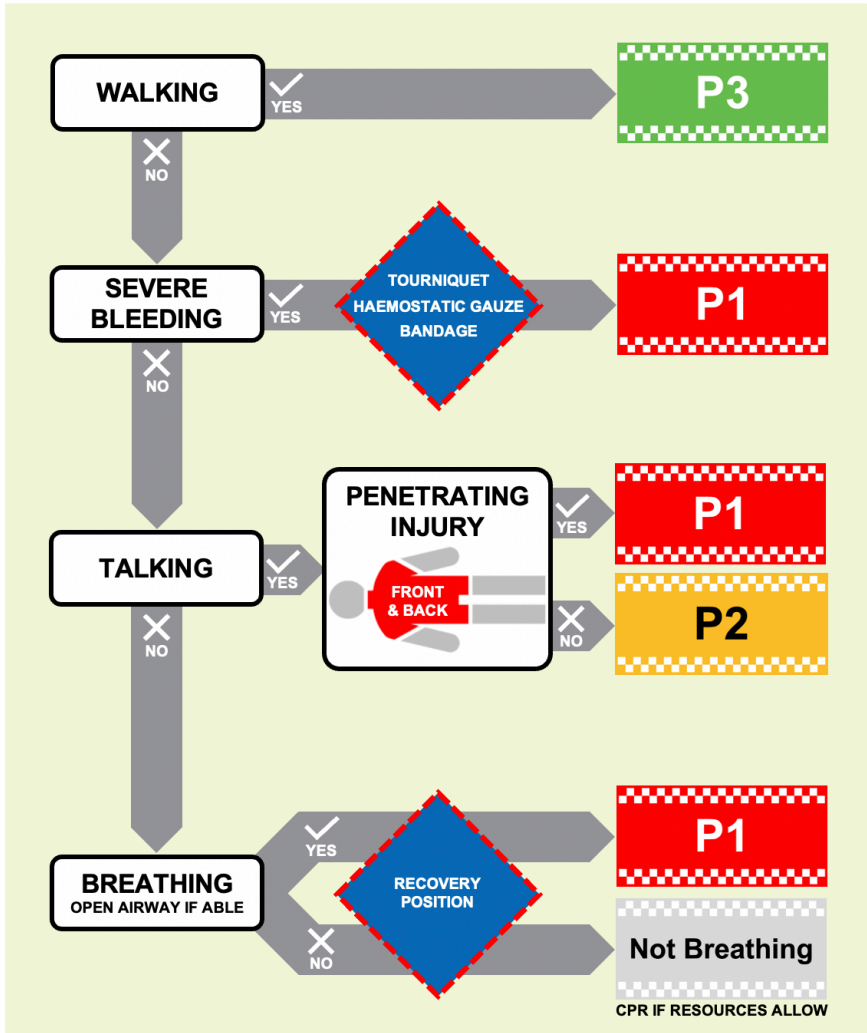


Paediatric out-of-hospital basic life support



Those trained only in 'adult' BLS (may include healthcare providers and lay rescuers) who have no specific knowledge of paediatric resuscitation, should use the adult sequence they are familiar with, including paediatric modifications.

Ten Second Triage (TST)



The intention is for the tool to be useable by anyone. It will be used by all emergency services from spring 2023. Re. MR use:

- For “severe bleeding” (deliberate decision not to use the term “catastrophic haemorrhage” as this is often misunderstood), try to stop the bleeding using whatever is available and depending on the location of the bleed i.e. packing, direct pressure, pressure dressing, tourniquet, haemostatics e.g. Celox, tourniquet.
- The airway blue action diamond can be head tilt-chin lift, jaw thrust, OPA or NPA

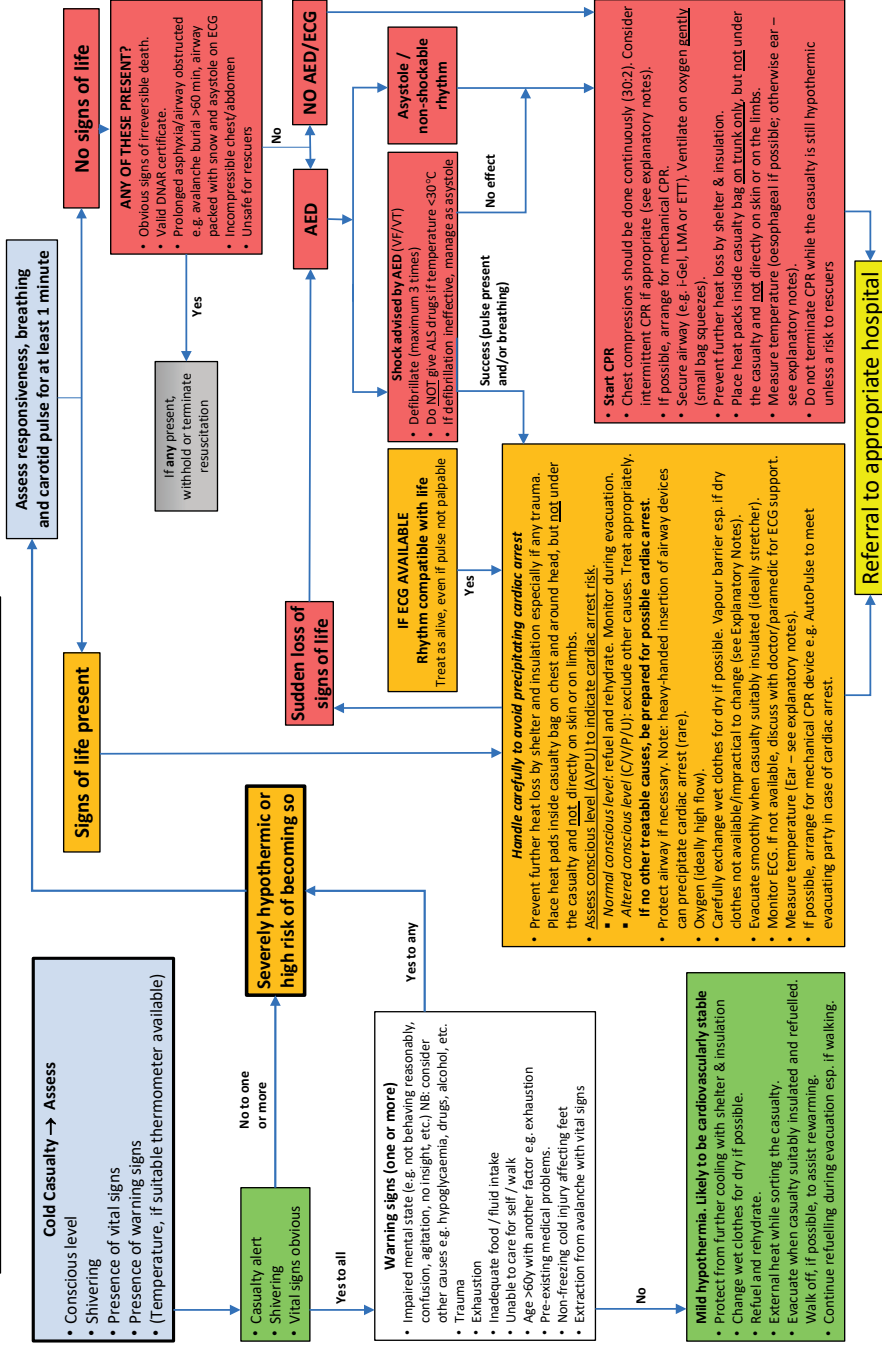


Mountain Rescue England & Wales

Assessment & management of hypothermic casualties

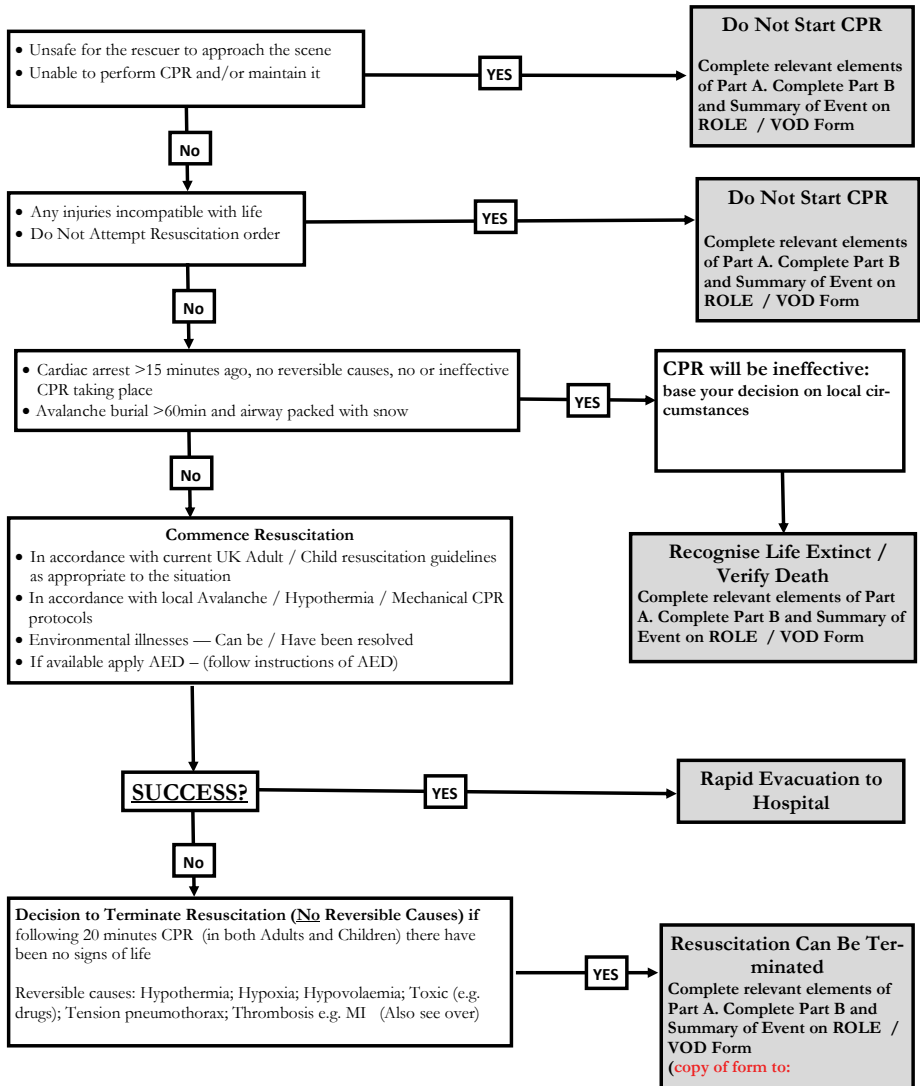
Assume all casualties will be hypothermic when team arrives on scene. Start improving the casualty's insulation immediately!

V14k
Jan 2022.
Review
Jan 2023.





Resuscitation Decision Tree



REMEMBER—Good quality CPR depends on good quality chest compressions AND airway management. Both these elements need to be achieved for CPR to have any chance of success. The ability to perform these two elements may well influence your decision(s).

A casualty card / patient report form must accompany each ROLE / VOD Form
Send a copy of the ROLE/VOD Form to : uksarrole@lancashire.police.uk



Resuscitation Decision Tree

REMEMBER—Good quality CPR depends on good quality chest compressions AND airway management. Both these elements need to be achieved for CPR to have any chance of success. The ability to perform these two elements will may influence your decision(s)

Recognition of Life Extinct / Verification of Death*

Confirm:

- No attempts at breathing
- Absence of breath sounds
- No palpable carotid pulse (check for 1 minute)
- No spontaneous movement
- No pupil response (fixed & dilated)
- No corneal reflex
- No motor response to firm supraorbital pressure

Time of Recognition of Life Extinct is the point at which these criteria are met.

An AED and / or stethoscope are not essential for ROLE / VOD in SAR scenario

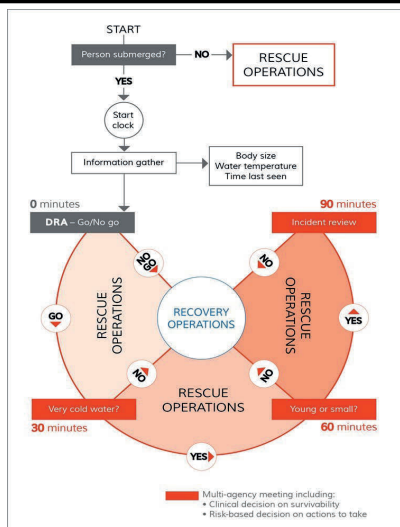
*Assessed by two or more people with competence to do so

Injuries Incompatible with Life

- Decapitation
- Body cut in half
- Massive skull & brain destruction
- Decomposition or Putrefaction
- Animals have picked at the body
- Rigor Mortis
- Whole body frozen (chest incompressible)
- Submersion for >60 minutes in non-icy water*
- Submersion for >90 minutes in icy water*
- Avalanche burial ≥ 60 min and airway packed with snow and asystole on ECG for >1 minute*
- Incineration
- Hypostasis (accumulation of blood in the lower parts of the body after death under the influence of gravity)

* Refer to specific guidelines for further info / advice
You do not need to complete Part C if injuries incompatible with life have occurred

Although the below algorithm is designed for water rescue, the basic principles apply across all rescues.
ASSESS - PLAN - ACT IN SAFETY



ROLE / VOD Audit Data—UKSAR Teams may find it useful to collect the data from this form as well as other parameters from the casualty card / patient report form such as:

CPR

Ongoing on arrival of SAR
Duration prior to SAR arrival
Continuous / non continuous
SAR witnessed arrest
Time CPR started by SAR
Time CPR stopped by SAR

AED / Defib

Time of 1st shock
Total number of shocks
Initial rhythm
Any rhythm changes

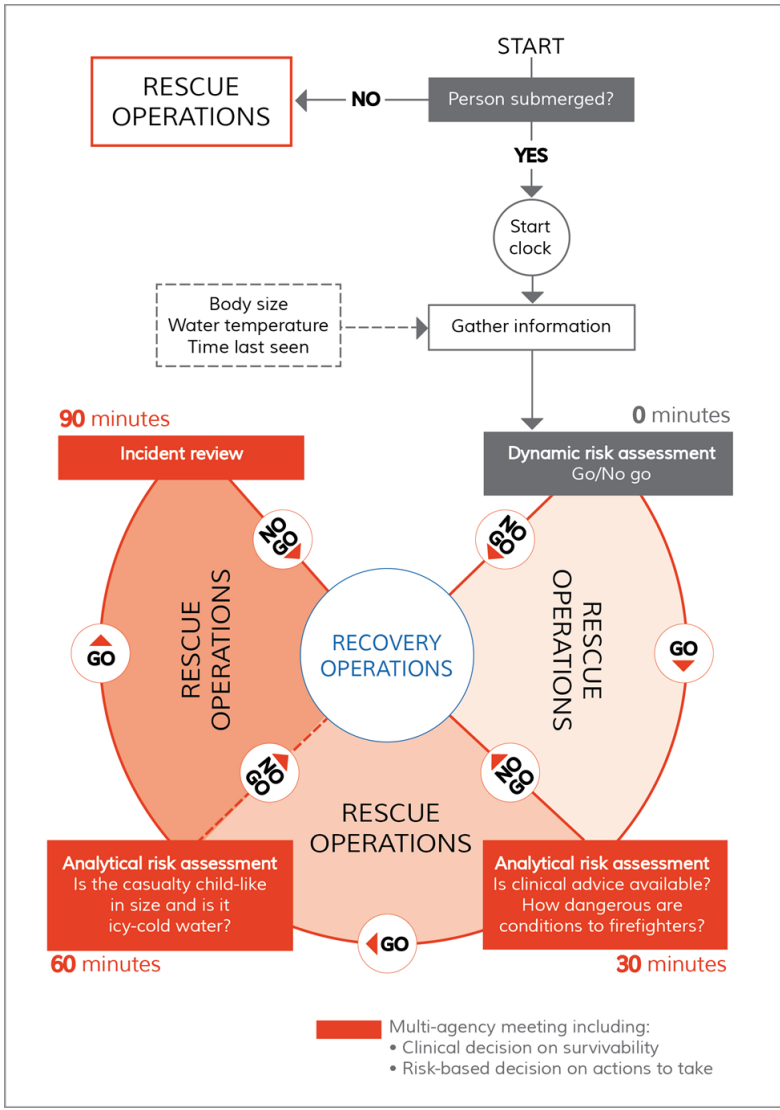
Airway management

ETT / SAD used
ETCO₂ values
NP / OP used
Bag Valve Mask

Drugs used (inc oxygen)

This is by no means exhaustive. The Utstein template may be useful to utilise.

Send a copy of the ROLE/VOD Form to : uksarrole@lancashire.police.uk





Ver 4.0 22-01-17

Review date: 2 years

RECOGNITION OF LIFE EXTINGUISHED (ROLE) / VERIFICATION OF DEATH (VOD) (Both terms mean the same)

An AED and / or stethoscope are not essential for ROLE in SAR scenario

Date:	Time of Incident: Incident Number:	Location & HM Coronial District (if known):
Name:	Address:	Age/DOB: NOK: Relationship: Tel:

Part A	ROLE / VOD - Resuscitation was Not Attempted	
Resuscitation Not Attempted	Unsafe for rescuer to approach the scene <input type="checkbox"/>	Unable to perform CPR and/or maintain it <input type="checkbox"/>
	Injuries Incompatible with Life (also tick box below) <input type="checkbox"/>	Valid Do Not Resuscitate Order <input type="checkbox"/>
	Other:	

Injuries Incompatible with Life	Decapitation <input type="checkbox"/>	Decomposition or Putrefaction <input type="checkbox"/>	Massive skull & brain destruction <input type="checkbox"/>
	Rigor Mortis <input type="checkbox"/>	Animals have picked at the body <input type="checkbox"/>	Submersion for >60 minutes in non-icy water <input type="checkbox"/>
	Incineration <input type="checkbox"/>	Body cut in half <input type="checkbox"/>	Submersion for >1.5 hours in icy water <input type="checkbox"/>
	Hypostasis <input type="checkbox"/>	Whole body frozen <input type="checkbox"/>	Other:

ROLE / VOD - Resuscitation was Attempted and Terminated	
Resuscitation details	Cardiac Arrest >15 min ago, no or ineffective CPR taking place, no reversible causes, including environmental illnesses <input type="checkbox"/>
	Avalanche burial >60 min and airway packed with snow <input type="checkbox"/>
	CPR Start: <input type="text"/> CPR Stop: <input type="text"/> Brief reasons : <input type="text"/>
PRF Completed <input type="checkbox"/>	

Part B	Recognition of Life Extinct / Verification of Death	
Casualty observed for 5 minutes to confirm:	No attempts at breathing (check for 1 min) <input type="checkbox"/>	Absence of breath sounds <input type="checkbox"/>
	No carotid pulse (check for 1 min) <input type="checkbox"/>	No spontaneous movement <input type="checkbox"/>
After 5 minutes observation, confirm:	No pupil response (fixed & dilated) <input type="checkbox"/>	No motor response to supraorbital pressure <input type="checkbox"/>
	Other:	

Summary of Event

When completed, e-mail a copy of this form to: uksarrole@lancashire.police.uk

Part C	Additional Tasks				
Time of Recognition of Life Extinct / Verification of Death:	Police informed <input type="checkbox"/> Log Number: <input type="text"/>	Scene & possessions secured <input type="checkbox"/>	Scene photographed <input type="checkbox"/>		
Witness contact details taken <input type="checkbox"/>	Permission to move the body granted by: Responsibility for deceased person handed over to:				
Other Agencies on Scene	Amb Ser <input type="checkbox"/>	Police <input type="checkbox"/>	FRS <input type="checkbox"/>	RNLI <input type="checkbox"/>	Coastguard <input type="checkbox"/> Other <input type="checkbox"/>

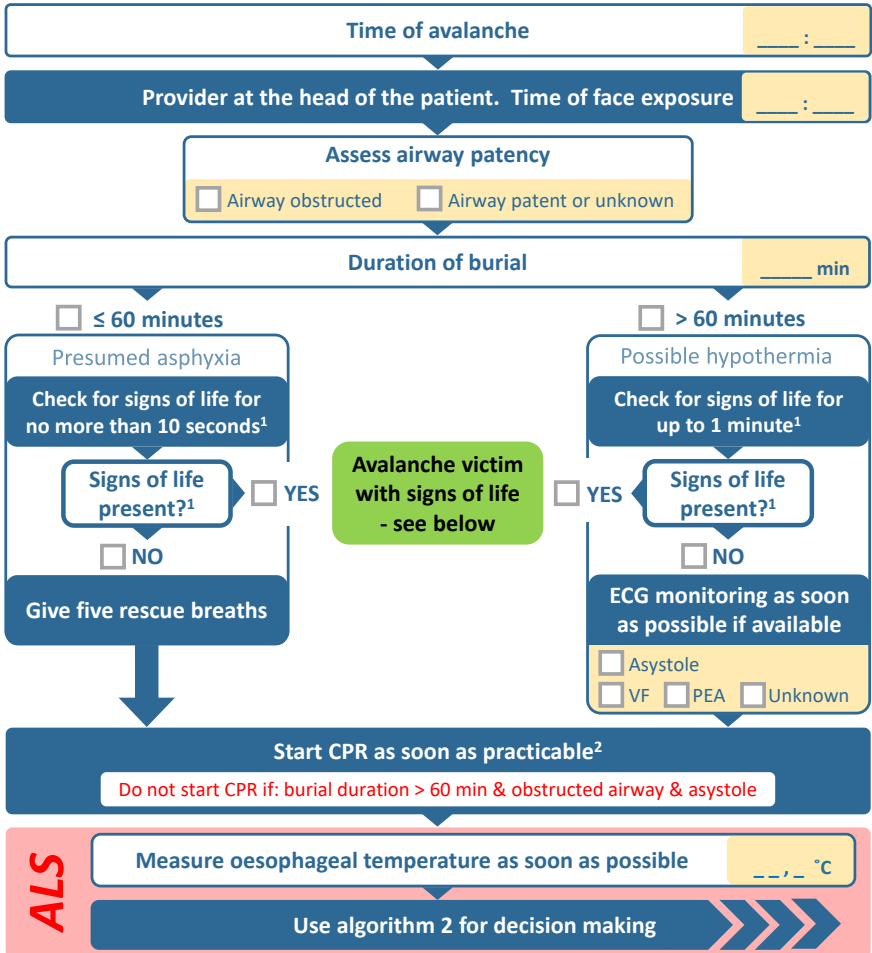
ROLE / VOD Completed by	Name: <input type="text"/>	Signed: <input type="text"/>	Reg Num : <input type="text"/>
	Name: <input type="text"/>	Signed: <input type="text"/>	Reg Num : <input type="text"/>

CASUALTY HANDOVER

- A** Age
- T** Time of injury
- M** Mechanism of injury
- I** Injuries sustained
- S** Signs and symptoms
- T** Treatment given so far

1

Initial management of a critically buried avalanche victim



Critically buried avalanche victim with signs of life

- ECG monitoring as soon as possible (ideally before handling or moving the patient)
- Gentle handling and consider potential trauma
- Transfer to the most appropriate hospital
- Consider transfer to an ECLS hospital for hypothermic patients with:
Core temperature <30°C or ventricular arrhythmia or systolic blood pressure <90 mmHg
- The management of medical conditions which are not specific to avalanche victims (e.g. hypothermia, trauma) should follow the most recent recommendations



WELLBEING INFORMATION

For the family and team members of mountain and cave rescue

Being a mountain or cave rescue volunteer can be mentally and physically stressful. Sometimes we can struggle to cope. It's important to seek help if you feel that you or one of your colleagues need it.

YOUR TEAM SUPPORT NAME AND NUMBER IF YOU NEED A CHAT:

Name: _____ **Contact number:** _____

Other useful contacts:

Togetherall offers anonymous, 24/7 online mental health support for mountain and cave rescue team members. To register, go to: togetherall.com/joinnow/rescuebenevolentfund or scan the QR code



The Samaritans: Call **116 123** for confidential emotional support, 24 hours a day

Blue Light Together offers support if you're experiencing a personal crisis, feel unable to cope and need support. Help with urgent issues such as:

- Suicidal thoughts • Abuse or assault • Self-harm • Bullying • Relationship challenges

Go to BlueLightTogether.org.uk or call **0300 303 4434** 08:00–20:00 daily

Blue Light Crisis Text Line: Text **BLUELIGHT** to **85258**

CALM: National Helpline for Men: Call **0800 58 58 58**

17:00 – midnight to talk about any troubles you are feeling

MIND Mental Health Charity: Infoline: **0300 123 3393** Monday – Friday 09:00–18:00

Information and access to support services for:

- Mental health problems • Where to get help near you • Treatment options available • Advocacy services

The Rescue Benevolent Fund: Email secretary@rescuebenevolentfund.org.uk or go to rescuebenevolentfund.org.uk to find out more

For when you need more structured therapy — either physical or emotional — with a defined treatment plan from a professional therapist, you can apply to the fund for financial support

Go to mrew-wellbeing.org.uk for the MREW Wellbeing page



MOUNTAIN RESCUE ENGLAND AND WALES
BRITISH CAVE RESCUE COUNCIL

We can all need help sometimes. Don't be embarrassed to ask for it.

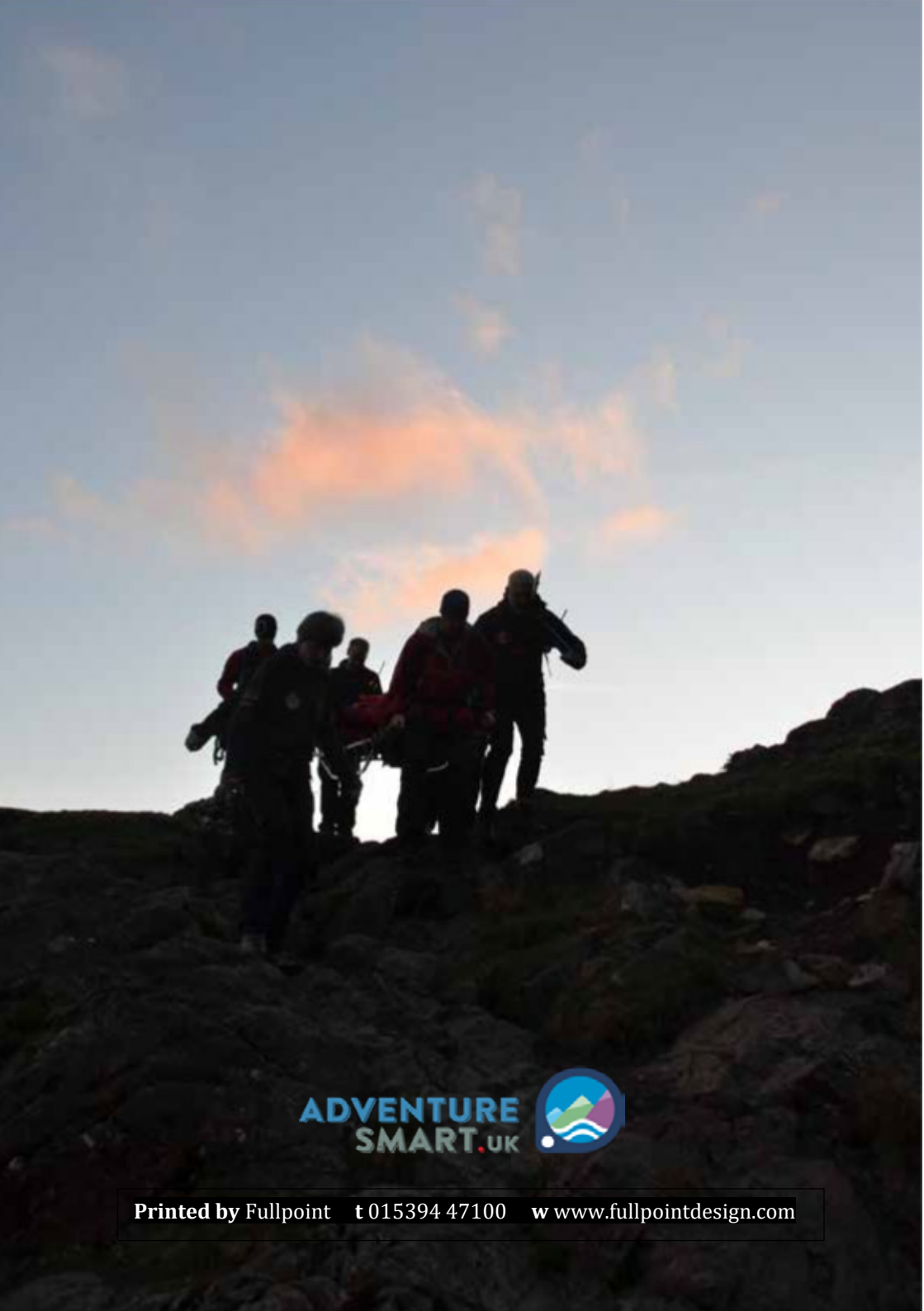
Personal Notes

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**ADVENTURE
SMART.UK**



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