

## 2 Trauma and emergencies

Preparation for trauma and emergencies .....	20
Assessing trauma — primary and secondary survey .....	27
Keeping airway open and assisting breathing .....	37
Open, clear and maintain airway .....	37
Assisting breathing .....	39
Advanced airway management .....	41
Chest procedures .....	49
Sealing a 'sucking' chest wound .....	49
Needle decompression of tension pneumothorax .....	49
Putting in chest drain .....	51
Head injuries — assessment .....	54
Pupil reactions .....	55
Coma scales .....	56
Immobilising the spine .....	60
Hypothermia .....	68
Burns .....	70
Management of major burns .....	73
Management of minor burns .....	75
Infected burns .....	77
Immobilising a snake bite .....	78

# Preparation for trauma and emergencies

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## Getting equipment ready

### Attention

- **Put aside an hour a week to check equipment and prepare staff**
  - **Test equipment** in clinic and ambulance, including radios and phones
  - **Practise emergency procedures** (mock emergency) so you are prepared when emergencies happen
    - Get as many people as possible involved, so they all know their role
    - Being prepared helps staff feel more confident, leads to better care
- When you arrive at a new clinic — always familiarise yourself with emergency equipment (including ambulance) and procedures

## What you need — to be prepared

### Remote Emergency Kit

Essential equipment for trauma and emergencies outside clinic.

- Keep emergency equipment separate, don't use for other purposes
- Keep equipment together in 1 room. Use container made from robust material, water and dust proof
  - Have laminated content list
  - Have clear sign with equipment saying
    - Where emergency medicines are stored, eg fridge, pharmacy
    - Where scheduled medicines are stored, eg safe, secured area
  - Check weekly or after use, seal, write date for next check
- Stock for 2–3 casualties. **Do not** overfill
  - If you know there are more casualties — take second container with extra bandages, pads, oxygen masks, cannula equipment, IV fluids, cervical collars

### Contents

- Clinical procedures and protocol manuals, eg *CPM*, *CARPA STM*, *WBM*
- Personal protective equipment (PPE)
  - Goggles
  - Gloves (non-sterile)
  - Impervious gowns or overalls
  - Reflective vests
  - Head lamp (miner's torch)
  - Sharps container
- Airway
  - Suction — checked regularly with backup battery, tubing, connectors
  - Yankauer suckers — adult, child sizes

- Y suction catheters — all sizes
- Cervical spine collars — all sizes or multi-size
- Airways — oropharyngeal, nasopharyngeal, laryngeal mask airways — all sizes
- Intubation equipment
  - Laryngoscope handles x 2 with fresh batteries
  - Curved laryngoscope blades (eg *Macintosh*) sizes 2, 3, 4
  - Straight laryngoscope blades (eg *Miller*) sizes 0, 2
  - Cuffed endotracheal tubes x 6–9
  - Uncuffed endotracheal tubes x 2–6
  - Bougie, lubricant, angled forceps (eg *Magill*) — adult, child sizes
  - Tapes for tube restraints
- For cricothyroidotomy — 14G non-retractable cannula, 5ml syringe, oxygen tubing, 3 way tap, no. 11 disposable retractable pointed scalpel
- Wooden spatulas
- Breathing
  - Portable oxygen/suction equipment with tubing
  - Resuscitation bags and masks with oxygen attachment — adult, child, infant sizes
  - Stethoscope
  - Masks — non-rebreather x 3, simple — adult, child sizes
  - Nebuliser
  - 14G non-retractable cannula for needle decompression
- Circulation
  - IV giving sets (blood/fluid pump sets) x 4
  - IV cannula — 4 x 16, 18, 20, 22, 24
  - IV bungs, extension tubing, IV dressings
  - IO needle device
  - IO needles — 15mm (child), 25mm (over 40kg), 45mm (obese)
  - Tourniquet
  - Rapid infusers
  - Alcohol wipes
  - Tape
  - Steristrips
  - Syringes 5ml and 10ml x 6 of each
  - Trauma scissors
  - Crepe bandages
  - Disposable scalpels
  - Large combine pads
  - Space blankets x 3

- Medicines — including sterile water and **normal saline** (4L)
- Gadgets
  - Pen torch
  - BP meter (sphygmomanometer) with multiple cuff sizes
  - O<sub>2</sub> sats monitor
  - Monitoring and defibrillation equipment with batteries charged
  - Watch with second hand
  - Glucometer
  - Suture kit
  - Sandbags
- **Extras** — need strong bag/backpack or container to carry these
  - Extra cervical collars
  - Nasogastric tubes, pH paper
  - Urinary catheters, drainage bags, lubricant, catheter syringe
  - Dressing packs x 2
  - Skin prep, eg **aqueous chlorhexidine**
  - Limb splints — all sizes
  - Extra crepe bandages
  - Elastic bandages
  - Slings
  - Safety pins and tape
  - Clipboard with paper, pens, trauma forms etc
  - Triage cards to attach to patients
  - Rubbish bags
  - Vomit bags
  - Chest drain sets — ICC sizes 32 x 3, 20 x 3, 12 x 3, large Kelly haemostats (clamps) x 2, scalpel eg no. 10 pointed, 4.0 skin suture set
  - Midwifery Emergency Pack (p435)

## In remote ambulance

### In addition to the remote emergency kit

- Emergency and local contact numbers laminated and stuck to visor, including
  - Doctor, RFDS, ambulance
  - Hospital
  - Your satellite phone number
  - Your mobile phone number
  - Your radio call signal

- Local community and regional maps with homelands marked
- Ceiling hook for IV
- **Safely secured**
  - Oxygen and suction
  - Emergency stretcher made up with blanket and pillow, wrapped in plastic to keep clean
  - Scoop and straps
- Tissues
- Vomit bags
- Box of gloves — replace every 2 months, perish in the heat
- Alcohol-based hand rub or gel
- Small tarp to lay out equipment
- Body bags
- Goggles
- Reflective vests
- Torch and spare batteries
- Hazard triangles
- Plenty of water
- Fuel tanks full at all times
- Basic tools to change tyres and dig yourself out of sand/mud/snow
- Shade, eg tarp

Remote areas use HF/CB radios, satellite phones, mobile phones.

- Make sure all staff know how these work and that they can operate them in an emergency. Need to know about
  - Emergency button on HF radios
  - Signal on satellite phone
  - Always using area code on satellite phone
- Always do satellite phone/radio check with base when setting off

### In remote clinic

Every clinic needs dedicated emergency area set up and stocked to manage trauma and emergencies.

**Keep copy of local disaster plan in emergency room.** If you don't have one — contact your local police and ask for one.

- Well-lit room
- Freestanding emergency stretcher/bed with IV poles

### • 3-drawer emergency trolley

- **Drawer 1** — Airway. Include intubation kit, CO<sub>2</sub> detector (colourimetric capnograph), emergency medicines, scissors
- **Drawer 2** — Breathing. Include chest drain kit
- **Drawer 3** — Circulation. Include rapid-infuser devices, IO device and needles, anaphylaxis kit, fit kit
- **On top** — monitor and defibrillator, O<sub>2</sub> sats monitor, sharps container
- **On bottom** — glucometer, documentation charts and clipboard, suture kit, sandbags, haemoglobinometer, torch

- Clock with second hand on wall
- PPE in separate trolley or on wall
- Freestanding ECG
- Oxygen and suction equipment (including spanner for changing cylinders)
- Hands-free telephone
- Examination light

For additional emergency room equipment — see *Extras* (p22).

## What you do

### Responding to remote emergency call-out (overview)

#### Information

- When you are called to trauma or emergency situation, make sure you get all available information **before** you leave clinic, eg
  - Exactly where incident is
  - Which road and how far away it is
  - Any identifying features nearby, eg 'on Corrugated Highway, one kilometre past Mt Lonely turn-off'
  - How many vehicles and/or people involved
  - How many are hurt, any deaths
  - Dangers/hazards, eg chemical/fuel spills, power lines
  - Who else knows about this already

#### Tell everyone involved and get help

- Call nearest police
- Call local emergency services, eg RFDS, Medical Air Services, St John Ambulance — or anyone else who can help. Ask them to tell on-call doctor so they are standing by
- Tell other staff and volunteers if needed — ask for
  - Someone to come with you
  - Someone to stand by clinic radio/phone, coordinate communications
  - Someone to get clinic ready if likely you will bring people back

## What to take with you

- Helper/s — never leave without someone with you, but leave room in ambulance for casualties
- Remote Emergency Kit (p20)
- Other items to ensure your safety and comfort
  - Water — at least 2L per person
  - Insect repellent, sunscreen
  - Hat, sturdy footwear, protective clothing — may be in sun, cold, rugged conditions for hours
  - Torch and batteries
  - Tissues, toilet paper
  - Snack bar, fruit

## What to do before you go

Work carefully through this checklist with helper before you go

- Is phone/radio working. Do test call/radio check before leaving
- Where are you going, do you know how to get there
- Double check you have told everyone where you are going, time you expect to arrive (ETA), when you will call again
- Check vehicle is ready to go — water, fuel, tools, spare tyres
  - Is all emergency equipment on board
  - Don't forget medicines, including scheduled drugs from safe/secured area
- Have you eaten recently. If not — take some food

On the way to scene decide who will lead operations.

## What you do when you get there

- Park as close as safely possible to protect you and accident scene
- Switch on hazard warning lights, put on reflective clothing
- Contact clinic/doctor — quickly tell them exactly where you are, what is happening. Ask them to pass on to others responding
- If on or near road — ask helper to manage traffic, put out hazard triangles to stop another accident
- Take very deep breath, have a good look, work out who is in charge, what has happened, what your priorities are
- **Remember:** If police/rescue/SES/fire brigade present — they are in charge of accident scene. Wait for them to declare it safe for you to approach
- Work out which casualties to deal with first (triage). Follow *Assessing trauma – primary and secondary survey* (p27)
- Use people around you to help, and keep a record of what you do

- Ask others to
  - Clear up rubbish — except sharps, which go straight into container
  - Carry spare equipment back to make room in ambulance for patients

### Take CARE of your patient and yourself

Caution	with your own safety at accident scene. Watch out for hidden dangers, eg live electric wires, leaking fuel etc
Carry	patient safely on stretchers/long boards. In ambulance, do up straps and make person comfortable for bumpy ride ahead
Care	of your back when lifting
Animals	on roads when driving. Also mosquitoes, snakes, crocodiles
Road traffic management	In dust cloud, on corners of roads or crests of hills, ask someone to watch for other vehicles approaching accident scene. Use your hazard signs
Environment	around you. Watch temperature — is it too hot, too cold, are people burning on hot bitumen. Protect patient and yourself from sun, wind, rain, cold

### Afterwards

- Record what you have done in each person's file notes
- Have a cup of tea, start to debrief with colleagues and emergency workers
- If you or your colleagues feel upset or traumatised by what you have seen or done — you must ask for help from your manager and/or use Bush Support Services — 1800 805 391
- Don't be too hard on yourself. You can only do your best in very difficult circumstances and learn from the experience
- Refuel and restock ambulance, restock Remote Emergency Kit



# Assessing trauma — primary and secondary survey

Although there seems a lot to read, each check only takes a few seconds.  
If no evidence of trauma — see *Life support – DRS ABC D (CARPA STM p2)*.

## Trauma assessment has 2 main parts

- **Primary survey** — rapid examination to find and start managing life-threatening injuries
  - Look for most life-threatening injuries first
  - Keep rechecking person's condition as you go through examination. If they get worse eg level of consciousness falls — go back to *A – Airway*
- **Secondary survey** — after life-threatening problems dealt with
  - If they get worse — go back to ABC D

## Primary survey — using DRS ABC DE

- If more than one of you — decide who is in charge (the boss) before you arrive at scene
- Check **top, bottom, front, back** so you don't miss life-threatening injury
- Make notes of what you find as you go, keep checking protocol manual

## D – Danger — make sure scene is safe

### To prevent more accidents or trauma and keep you safe

- Park your vehicle safely, put on reflective vest or jacket
- If on road — have someone manage traffic and crowd, put out hazard signs
- Check surface person lying on. If very hot — can cause burns (*p70*). If very cold — can cause hypothermia (*p68*)
- Check for other dangers, eg alcohol-fueled mob, car engine running, leaking chemicals/battery/petrol (anyone smoking), electricity cables, undeployed airbags

## Quickly survey scene

How was accident or trauma caused

- If vehicles involved
  - How many, what state are they in, eg accidents at high speeds (over 60km) usually cause more serious injuries
  - Any casualties outside vehicles
    - Thrown from vehicle or taken out
    - Pedestrians
  - If deceased person — may be other people with serious injuries

- If drowning victim — risk of hypothermia (p68)
  - Remove wet clothing, dry and warm person as soon as possible — but don't delay CPR if needed
  - Hypothermia may mask signs of life. If this is a possibility — continue CPR

## R – Response

- Your response to accident scene, person's response to you

## S – Send for help

- If you need help — send for it straight away
- If doctor on standby — call as soon as you arrive. Talk with them as much as you can

### Boss decides who to treat first (triages) using these priorities

1. Immediate life-threatening injuries, eg blocked airway
2. Life or limb in danger
3. No serious injuries, can wait for evacuation or be managed later
4. Death, injuries incompatible with life. Don't spend time with these people at the expense of those who can be helped

### Start with person with most life-threatening injury

- If conscious
  - If you can, kneel down with knees gently but firmly bracing either side of head — F 2.1  
Protects spine by stopping them moving head and neck when you talk to them
  - Tell person to keep their head still — not to move or shake head to say 'yes' or 'no' to your questions
  - Check if person knows you are there — call to them, ask their name



2.1

## A – Airway and cervical spine

- Airway most important, but try to protect cervical spine, keep in-line (p60) until able to fit semi-rigid collar (p62)
- Check for face, jaw, neck injuries that may cause blocked airway

### If talking OK and breathing normally

- Airway probably clear
  - Give **oxygen** with non-rebreather mask (if you have one) 10L/min child, 12–15L/min adult
  - See C – Circulation and controlling bleeding (p31)

## If unconscious or having trouble breathing

### • Open airway

- Adult or child
  - Use chin lift. Grip chin and gently lift it up — F 2.2
  - *OR* Jaw thrust. Hold jaw at point under ears, push upwards and forwards until chin juts out and airway opens — F 2.3
  - **Do not** tilt head backwards. May be neck injuries
- Infant (under 1 year)
  - Also put folded towel or nappy under shoulders and back — F 2.4



2.2



2.3

### • Clear airway

- Remove visible solid material using 2 'hooked' fingers in downward sweeping motion
- For liquid (blood, vomit, water) use suction if available *OR* log-roll onto side (p64), open mouth, turn downwards to allow to drain using gravity
- Drowning
  - If unconscious after drowning — expect vomit, put in recovery position — F 2.5 to clear airway
  - Log-roll (p64) if risk of spinal injury, eg diving injury, explosion, dumped in heavy surf
- Put in nasopharyngeal airway (p39) or oropharyngeal airway (p38) — F 2.6 to keep airway open, if needed



2.4



2.5

### • If airway still not open

- Think about laryngeal mask airway (LMA) (p41), needle cricothyroidotomy (p46), intubation (only if more than one of you) (p43)



2.6

### • If airway open

- **If not breathing** — go straight to *B – Breathing* (p30)
- **If person starts to vomit** — log-roll (p64) into recovery position — F 2.5
- **If breathing and no obvious life-threatening problems** — put on semi-rigid collar (p62) — F 2.7. Put sandbags, rolled blankets, or helper's knees either side of head to stop it moving



2.7

**Note:** Always put on semi-rigid collar after trauma to face, head or neck involving force. No place for soft collars in emergency care.

## B – Breathing

### Look

- At person's bare chest — cut off clothing but keep warm
  - Are they breathing, how fast and deeply, normal for age
  - Are both sides of chest moving the same, does one side suck in while other moves out
  - Do they look like they are working hard
- At neck to see if windpipe (trachea) straight (in midline)
  - If tension pneumothorax — may be pushed to one side
- For bulging/swollen neck veins. May be caused by tension pneumothorax
- For chest wounds. Log-roll onto side (p64) to check back of chest

### Listen

- Any unusual noises, eg grunting, gasping, snoring, wheezing, whistling

### Feel

- Is chest moving. One or both sides
- Is windpipe (trachea) in middle of throat — F 2.8
- For crackling feeling under skin (subcutaneous emphysema)
- For broken ribs. Gently squeeze chest from sides, and from front and back, feel ribs for deformity or breaks



2.8

### If breathing normally

- Give **oxygen** with non-rebreather mask 10L/min child, 12–15L/min adult
- See *C – Circulation and controlling bleeding* (p31)

### If not breathing and pulse not easily felt

- Start CPR. See *Life support – DRS ABC D* (CARPA STM p2)
- Look for and treat reversible causes, eg tension pneumothorax (CARPA STM p72), severe haemorrhage, hypoxia, hypothermia (p65)
- If multi-casualty event — triage as deceased. Leave and manage other seriously injured people first

### If unconscious with slowed/inadequate breathing but pulse easily felt

- Probably head injury
- Support breathing with bag and mask — F 2.9, or mouth-to-mouth with mouth guard
  - 10 breaths/minute adult, 15 breaths/min child



2.9

### If having trouble breathing but pulse easily felt

- Check airway still open
- Give **oxygen** with non-rebreather mask 10L/min child, 12–15L/min adult

- Check again for serious chest injury
  - Tension pneumothorax
  - Sucking chest wound
  - Fractures, flail chest
- These are all **emergencies**. Treat by
  - Needle decompression (*p49*)
  - *AND/OR* Sealing sucking chest wound (*p49*)
  - *AND/OR* Chest drain (*p51*)
  - *AND/OR* Assisted breathing (bag and mask)

## C – Circulation and controlling bleeding (haemorrhage)

- **Look** for bleeding
- **Control** external bleeding
  - Put on firm pressure with hand or pad to stop bleeding — F 2.10
  - If bleeding artery/vein
    - Try putting on pressure first
    - If ongoing bleeding — use figure of 8 sutures (*p315*)
  - If amputation or uncontrollable arterial bleeding in limb — use BP cuff tourniquet (*CARPA STM p71*)



### Check for signs of shock

- Rapid pulse
- Pale, cool, moist skin
- Capillary refill greater than 2 seconds
- Rapid breathing
- Anxiety
- Depressed level of consciousness

- Think about hidden bleeding — chest, abdomen, pelvis, long bones, back
  - If cause of shock not identified — log-roll onto side (*p64*) to check back
- If evidence of pelvic fracture (*CARPA STM p68*) — stabilise pelvis (*p238*)
- Put in 2 IV cannula, largest possible (*p85*). If can't get big needles in — start with small ones, put in bigger ones as soon as you can. Think about IO needle (*p89*)
  - For adult — run **normal saline** as fast as possible
  - For child — **normal saline** bolus at 20ml/kg
  - For newborn — **normal saline** bolus at 10ml/kg
  - If you can't weigh child — check for recent weight in file notes *OR* use age, see Table 2.1 (*p32*)
  - If drowning victim — use warm IV fluid

Table 2.1: Normal saline bolus by age or weight

Age	Under 3 mth		3 mth	6 mth	1 year	2 year	4 year	6 year	8 year	10 year	12 year	14 year	Adult
Weight (kg)	2	3.5	6	8	10	13	15	20	25	30	40	50	70+
Bolus (ml)	20	70	120	160	200	260	300	400	500	600	800	1000	1000

**If no pulse and unresponsive**

- If multi-casualty event — triage as deceased. Leave and manage other seriously injured people first
- If no other seriously injured people — start CPR. See *Life support – DRS ABC D (CARPA STM p2)*

Check ABC under control before starting D. If not — go back and restart resuscitation steps.

**D – Disability — head and/or spinal injury**

- Do rapid check for level of consciousness using **AVPU**. If only P or U — may need airway protection
  - **A** lert — eyes open, understanding, following commands, talking
    - Tell them not to move their head
  - **V** oice — not alert but responds to voice
  - **P** ain — responds only to pain
    - If only a small response, eg low groan without opening eyes — treat as unresponsive
  - **U** nresponsive — unconscious, not responding
- To test for pain response
  - Firmly squeeze muscle on top of shoulder with thumb and 2 fingers (trapezius squeeze) — F 2.11
  - *OR* Press bony ridge along top of eye (supraorbital pressure) — F 2.12
    - **Do not** do this if they have facial fractures
- **Check**
  - Pupils (p55) — same size, do pupils react to bright light by getting smaller (constrict)
  - BGL
  - Temp, pulse, BP, RR, O<sub>2</sub> sats



2.11



2.12

## E – Expose and examine

- To check person properly for significant injuries, take off as much clothing as you can. Always protect dignity, respect culture, keep warm
- Start at top, work down and around, front then back. Look, feel, listen
- By end of primary survey you will have checked face, neck, chest, abdomen, pelvis, (including genitals), arms, legs and back for immediate life-threatening injuries
- If by yourself — leave back until you get help. Do quick check by slipping hands underneath to feel for serious blood loss (be careful of broken glass)
- Cover with blanket or sheet

## Secondary survey

Check ABC D under control before starting secondary survey.

### Secondary survey is second!

- Don't start until ABC DE completed and no-one else with more serious injuries

- In most remote and rural areas, secondary survey done back in clinic

### 3 parts to secondary survey

- History
- Examination
- Treatment

## History using DeMIST, AMPLE, PQRST

- Can be done at same time as examination
- Record (document) what you are told by witnesses, what you see for yourself, what person tells you

### Document (DeMIST)

**D**escription of incident or illness

**M**echanism of injury

**I**njuries sustained

**S**igns and **S**ymptoms

**T**reatment so far

**Then ask questions (AMPLE)**

**A**llergies  
**M**edicines or current illness  
**P**ast history of illnesses, injuries, surgical operations, times in hospital  
**L**ast time they ate or drank  
**E**vent — what happened to cause the injuries, eg vehicle accident, burns

**To find out how severe a symptom is ask (PQRST)**

**P**osition — where is it  
**Q**uality — what is it like  
**R**egion and **R**adiation — where is it, does it spread or stay in one place  
**S**everity — how bad is it  
**T**iming — when did it start, is it there all the time

**Examination**

- **Look** — use eyes, torch, otoscope, ophthalmoscope
- **Listen** — with ears, stethoscope
- **Feel** — with your hands for injuries, do chest percussion (*p172*)
- Start at top and work down — **head to toe, front and back**

**Head (scalp) and face**

- Symmetry
- Wounds, deformities, bruising, swelling, depressions in bones
- Fluid draining from ears or nose
- Feel for tenderness. Ask about pain, numbness and tingling
- Eyes and lids
  - Pupil reactions (*p55*)
  - Bleeding or bruising
  - Check vision with fingers and hands
- Mouth, teeth, tongue and jaw
- Coma scale score (*p56*)

**Neck**

- Check semi-rigid collar fitted properly. Leave on until spinal injury ruled out by x-ray
- Wounds, deformities, bruising, swelling
- Hoarseness or stridor
- Large swollen (distended) neck veins



- Position of trachea — in middle of throat or pushed to one side
- Tenderness, especially midline at back. Open and refit collar for this, maintain in-line immobilisation (*p60*)
- Air under the skin (subcutaneous emphysema)

### Chest

- Breathing — RR and effort
- Chest movement — same on both sides, symmetrical rise and fall
- Wounds, deformities, bruising, swelling, depressions in bones
- Listen to chest sounds with stethoscope — is air coming into lungs properly on both sides
- ECG to exclude heart trauma

### Abdomen

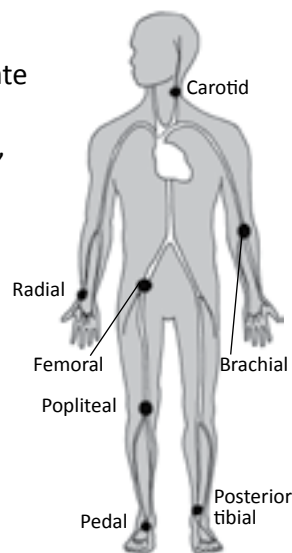
- Wounds, bruising or swellings on skin, swelling of whole abdomen (distension)
- Look for old scars
- Listen for bowel sounds
- Palpate for tenderness, rigidity or guarding (*p186*) — may be bleeding in abdomen

### Pelvis, rectum, genitals

- Take care with person's privacy and dignity
- Wounds, deformities, bruising
- Bleeding from urethra
- Bleeding in or around scrotum, rectum, vagina
- Signs of pelvic fracture (*p228*)
- Male patients with erection (priapism) — could indicate spinal injury
- **Do not** do vaginal or rectal examination unless skilled, know what you are looking for

### Arms and legs

- Wounds, deformities, bruising, swelling
- Shortening or rotation of lower limbs — hip/pelvic fracture
- Tenderness
- Check peripheral pulses — F 2.13
- Temp of limbs, hands and feet (hot or cold)
- Capillary refill
- Test dermatomes with cotton wool or ice



2.13

**Back — if helpers to log-roll**

- Log-roll (*p64*) to check back — take off clothes to see properly
- Wounds, deformities, bruising, swelling, depressions in bones
- Tenderness
- Bleeding from anus

Check ABC D under control before treating. Keep checking.

**Treatment**

- Check person comfortable, not hot or cold
- Give pain relief as needed (*CARPA STM p399*)
- Check IV. Fill in fluid balance chart
- Put in nasogastric tube (*p82*) if
  - Severe multi-trauma
  - Severe abdominal injury
  - Quadriplegia, paraplegia
  - Head injury
  - Child with air swallowing and abdominal distention
  - **Do not** put in if facial injuries or suspected fracture at base of skull. Use orogastric tube, after intubation
- Put in indwelling urinary catheter (female *p410*, male *p498*) if
  - Needs fluid resuscitation
  - Immobilised or trouble voiding
  - Impaired level of consciousness
- If needed — close wounds (*p311*), dress wounds (*p301*), splint fractures (*p235*), etc
- Record findings including temp, pulse, BP, RR, O<sub>2</sub> sats, coma scale, pupils. Get paperwork in order
- Monitor person. Use cardiac monitor or oximeter, if you have them
- Get person ready to send to hospital
  - Think about anti-emetic for nausea, more pain relief

# Keeping airway open and assisting breathing



**Emergency life-saving procedures** to keep person's airway open when unable to maintain it themselves, eg unconscious or semiconscious.

**For newborn** — see *Newborn resuscitation* (p486)

**Remember ABC** — When **A**irway secure check **B**reathing, assist if needed. When breathing secure check **C**irculation.

See *Life support – DRS ABC D (CARPA STM p2) OR Assessing trauma – primary and secondary survey* (p27).

- Put unconscious person in recovery position
  - F 2.14 to help protect airway
  - Rest person's head on extended arm to help prevent neck movement



2.14

## Open, clear and maintain airway

### What you need

- Suction equipment
- Oropharyngeal airway
- Nasopharyngeal airway
- Oxygen equipment with non-rebreather or simple face mask

**Remember:** Open then clear then keep airway open.

### What you do

#### Open airway

In trauma **do not** tilt head back, can damage spinal cord.

#### Chin lift

- Grip chin and gently lift it up — F 2.15

#### Jaw thrust

- Hold jaw at point under both ears, push upwards and forwards until chin juts out and airway opens — F 2.16

#### Clear airway

##### Passive

- If person upset or slightly awake — log-roll (p64) into recovery position — F 2.14, let fluid drain away



2.15



2.16

## Finger sweep

- Only do if
  - Person unconscious
  - Suction or long-nose forceps (eg *Magill*) not available
  - Debris obvious and close to opening of mouth
- With gloves on, use 2 fingers to gently clear person's mouth of dirt, vomit, broken teeth, dentures (leave well-fitting ones in place), etc
  - Be careful not to push anything further back and block airway

## Suction

- If you have suction equipment — put Yankauer sucker (hard plastic suction device) at side of person's mouth, suck out any fluid
- Be careful not to damage teeth, tongue, back of throat
- **Do not** touch back of throat, can make person vomit

## Keep airway open

Choose type of airway to use.

## Attention

- Oropharyngeal airway only used for unconscious person
- Nasopharyngeal airway better for semiconscious person

### Do not use nasopharyngeal airway if

- Broken nose or cheekbones
- Bruising behind ears, blood and/or clear fluid coming from ears or nose, any signs of skull fracture (think about how they were injured)

## What you do

### Oropharyngeal airway

- Choose right sized airway. Should reach from front teeth to pinna — F 2.17, or corner of mouth to earlobe

### Inserting airway

- **For adults**
  - Open mouth and gently push airway in upside down with tip pointing up
  - Push airway back along roof of mouth, turn it over to slip the rest of the way over tongue — F 2.18
  - Use jaw thrust with last 2cm to avoid pushing tongue back with device



2.17



2.18

- **For small child** (under 2 years of age)
  - Use wooden spatula to push tongue down, gently push airway straight in

### Nasopharyngeal airway

- Choose right sized airway. Measure from tip of nostril to angle of jaw (or front of ear lobe) — F 2.19
  - Approximate sizes (id = internal diameter)
    - Large adult — 8.5–9.0mm id
    - Small adult — 7.5–8.0mm id
    - Adolescent — 6.5–7.0mm id
- Quick way to choose size is by matching to diameter of person's little finger



2.19

### Inserting airway

- **Put safety pin through flange** (or tie piece of long, thin string or tape under flange) to stop airway falling back into nose once in place
- Lubricate airway — can use person's saliva
- Gently push tip of airway straight back into biggest nostril
- Push along base of nose and into back of throat until flange and safety pin rest against nostril — F 2.20
  - If resistance — take out and try other nostril



2.20

**Remember ABC** — When Airway secure check **B**reathing, assist if needed.

## Assisting breathing

### Attention

#### Sniffing position — F 2.21

- Take care if cervical spine could be injured
- Extends head and flexes neck
- Cushion from shoulder to back of head (occiput)
- Ear canal level with sternal notch



2.21

### Giving oxygen

#### Attention

- **Do not** use nasal prongs in emergency situation
- Choose right sized oxygen mask for person's face. Person will get less oxygen if mask doesn't fit well
- **Oxygen mask**, eg simple face mask — give **oxygen** at 6–8L/min

- **Non-rebreather mask** with reservoir bag
  - Keep adult and paediatric non-rebreather masks in emergency pack
  - Give **oxygen** at 12–15L/min adult, 10L/min child to fill bag. Mask won't work properly if rate lower
  - Reservoir bag must be filled before you put mask on face

**Remember:** Non-rebreather masks need higher flow rates — think about how much oxygen you have, how many people need it, how long it will last.

## Bag and mask — manual ventilation

### Attention

**Unless used properly,** bag and mask will not give enough oxygen.

If you are not confident about using this equipment — do mouth-to-mask or mouth-to-nose resuscitation at 15 breaths/min.

- Resuscitation bags come in 3 sizes — adult, child, infant/newborn. Clinics need all 3
- Mask must fit firmly around nose, chin, and sides, not leak when bag squeezed
- Best with 2 operators — second person can get a better fit/seal with mask
- Reservoir bag will only inflate with high-flow **oxygen**. Fill reservoir bag first
  - 12–15L/min for adult
  - 10L/min for child
  - 6L/min for infant

**Note:** All remote and rural practitioners should be trained to manage an airway in an emergency. Practise using bag and mask on manikin as part of emergency training. Many different makes and models, read instruction manual.

### What you need

- Helper
- Oropharyngeal or nasopharyngeal airway in place
- Oxygen equipment with tubing connected
- Suction equipment with rigid nozzle, eg Yankauer sucker
- Correct size mask and bag

### What you do

- **Clear and open airway.** Put in oropharyngeal (p38) or nasopharyngeal (p39) airway
- Select approximate sized mask, eg adult 4, 5 — child 3 — infant 00, 01, 2

## 1 operator

- **First — make sure person is not breathing well enough on their own**
- Connect oxygen tubing to bag (if using **oxygen**) and turn on to 15L/min adult, 10L/min child, 6L/min infant
- Stand/sit/kneel at top of person's head
- Put head in sniffing position (*p39*) to get clear airway
- Hold bag in main (dominant) hand, put mask over face with other hand
- Keep index finger and thumb on mask, hold under jaw with last 3 fingers — F 2.22
  - Try to keep seal all around mask
- Squeeze back with main hand — watch to **make sure person's chest rises with each squeeze**. If any problems — check airway, head position, equipment
- Ventilate at 15 breaths/min. Count slowly to get this right, eg one — and two — and three — etc. Don't go too fast and overfill lungs



2.22

## 2 operators

- As above, except 1 person uses both hands to hold mask on and keep airway open, and other squeezes bag — F 2.23



2.23

**Remember ABC** — when **B**reathing secure check **C**irculation.

## Advanced airway management

Person must be **unconscious** for all these procedures.

### Laryngeal mask airway (LMA)

Advanced airway skill for **unconscious** person, to make sure they have enough oxygen, or as alternative to endotracheal intubation.

### Attention

Risks of using an LMA

- Does not fully protect against aspiration
  - If person not completely unconscious — larynx may spasm
  - If tube in wrong place — fills stomach with air
- 
- Inserting LMA should take about 10–20 seconds, but no more than 30 seconds — about as long as you can hold your breath
  - Can be done by 1 person

- If breathing adequate — pre-oxygenate for at least 2 minutes before inserting LMA
- If breathing not adequate, eg too laboured, too shallow, too slow — insert LMA without pre-oxygenating
- Amount of air needed to inflate cuff is written on side of tube or small pillow

If cervical spine injuries suspected — take great care when positioning head.

- Helper must support head in neutral position as much as possible
- Limit movement of head and neck — see *Manual in-line immobilisation* (p60)

## What you need

- 1–2 helpers if available
- Suction equipment with rigid suction tip attached to tubing
- Bag and mask with oxygen connector
- Oxygen equipment with oxygen tubing connected
- Right size disposable LMA
- 20ml syringe
- Water-based lubricant
- Cloth tape long enough to tie around tube then around base of head
- Stethoscope

## What you do

- Select LMA. Suggested size guide
  - Size 5 — Adult large (more than 70 kg)
  - Size 4 — Adult normal (51–70kg)
  - Size 3 — Adult small (30–50kg)
  - Size 2 — Child (5–29kg)
  - Size 1 — Neonate (less than 5kg)
- Inflate cuff with syringe to check cuff airtight, not perished. Let down but leave small amount of air in cuff to help with insertion
- Lubricate underside of mask if needed
  - Person's saliva may be enough
- Put head in neutral position — F 2.24
  - OR sniffing position (p39)
- Hold mask so opening is facing tongue
- With index finger of main (dominant) hand on top rim of mask, put into person's mouth, keep firmly against hard palate — F 2.25



2.24



2.25



- Keep index finger on top, gently push mask down air passage in one smooth motion until resistance felt.  
**Make sure it is all the way down** — F 2.26
- Tip of mask is now seated in upper oesophageal sphincter — F 2.27
- Inflate cuff fully (approximately 20ml of air). LMA tube will move out a little
- Connect bag to tube with **oxygen** running at 12–15L/min
- Do first assisted breath
- Listen with stethoscope over upper middle abdomen (epigastrium), watch chest wall to see if it expands on inflation
  - If stomach gurgles, chest doesn't expand — LMA is in the wrong place
    - Deflate cuff and pull out
    - **Hyperventilate with oxygen by bag and mask for at least 1 minute before trying again**
  - If no stomach gurgling, chest expands — listen to base and top of both lungs to check for air entry
- Secure tubes to face with tape
- Skilled operator must keep hands on LMA at all times
- Continue ventilation manually by bag as per CPR schedule (*CARPA STM p4*)



2.26



2.27

## Intubation — with endotracheal tube

Used for **unconscious** person when other methods have failed.

### Attention

- You need helper to do this procedure
- Putting in endotracheal tube **should take approximately 20 seconds but no more than 30 seconds** — about as long as you can hold your breath
- **Always double check that tube is in right place** — if it isn't person can quickly die

- Risks include bruising, chipped teeth, oesophageal intubation, right main bronchus intubation with left lung collapse, dislodgement
- **Cricoid pressure** can be used to help prevent regurgitation of stomach contents. Only use if asked to by person doing procedure

If cervical spine injuries suspected — take great care when positioning head.

- Helper must support head in sniffing position (*p39*)
- Limit movement of head and neck — see *Manual in-line immobilisation (p60)*

## What you need

- 1–2 helpers if possible
- Suction equipment with rigid suction tip attached to tubing
- Bag and mask connected to **oxygen**
- Laryngoscope — usually a size 3 or 4 curved blade, sometimes straight blade for children. Check light is bright
- Endotracheal tube of correct size

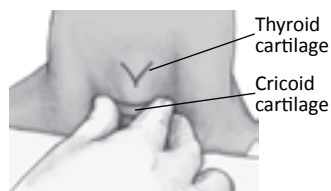
Quick way to choose size is to match to diameter of person's little finger.

- Women — 7.0–7.5mm id (id = internal diameter)
- Men — 8.0–8.5mm id
- Children —  $(\text{age} \div 4) + 4$

- Disposable introducer stylette to stiffen tube (recommended)
- 10ml syringe
- Long-nose (eg *Magill*) forceps
- Water-based lubricant
- Cloth tape long enough to tie around tube then around base of head
- End-tidal CO<sub>2</sub> detector if available
- Oropharyngeal airway (*p38*)
- Stethoscope

## What you do

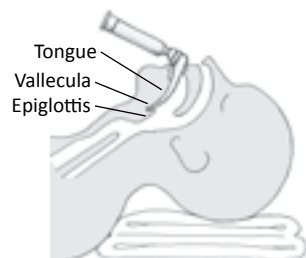
- Put head in sniffing position (*p39*)
- Attach oximeter, rhythm monitor, BP cuff
- In trauma ask helper to support head (in-line immobilisation *p60*)
- Pre-oxygenate for 2 minutes with bag and mask
- Put in introducer stylette. Must be at least 1.5cm from other end of tube and not poking through. Can kink it over at top to stop it slipping in too far
- Put lubricant on tube
- Test cuff, then fully deflate it
- Ask skilled person to apply cricoid pressure until cuff inflated — F 2.28
- Open person's mouth using fingers of right hand
- Hold laryngoscope in left hand, put blade into right side of mouth, push tongue to left
- Move blade to middle as you push it down towards base of tongue. At the same time gently push lower lip away from blade with index finger
- Suction out secretions etc



2.28

### • Using curved blade

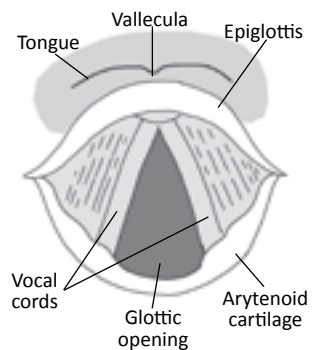
- Most people use size 3 curved blade
- Slide tip of blade into space between base of tongue and pharyngeal surface of epiglottis (vallecula) — F 2.29



2.29

### • Using straight blade

- Cover epiglottis with blade
- Maintaining angle of 45° to horizontal, lift up laryngoscope handle to expose glottic opening. **Do not** use teeth for leverage
- Should be able to clearly see structures of epiglottis and vocal cords — F 2.30



2.30

- If you can't see vocal cords — try BURP (Backward Upward Rightward Pressure) on thyroid cartilage to improve laryngeal position
- If you still can't see vocal chords — **do not** try to insert tube. **Stop** procedure, continue bag and mask ventilation, check patient positioning

- Insert endotracheal tube until you see cuff pass between vocal cords
  - Tube will be about halfway between cords and where trachea divides in 2 (carina)
  - In average-sized adult, depth marking on side of tube is 19–23cm at front teeth
- Remove laryngoscope while holding tube in place
- Remove introducer while holding tube in place
- Inflate tube cuff with enough air (5–10ml) to seal it around person's airway
- Use capnometer between tube and bag, if available
- Connect bag to tube with **oxygen** running at 12–15L/min to fill reservoir bag and ventilate — F 2.31



2.31

- Keep holding tube until it is tied in
- Look for fogging in tube, listen with stethoscope over upper middle abdomen (epigastrium) and both sides of upper chest, watch chest wall to see if it expands on inflation
- Observe colour change in capnometer
- If stomach gurgles and chest doesn't expand — tube is in wrong place
  - Deflate cuff and pull out
  - **Give oxygen with bag and mask for at least 1 minute before trying again**

- If no gurgling in stomach and chest expands
  - Listen to top of both lungs to check for air entry
  - If only 1 side of chest inflating — release air from cuff, pull tube back 1–2cm, reinflate cuff. Listen again
- Release cricoid pressure
- Recheck position of depth marker, tie tape around tube then around base of head to secure
- Continue to ventilate manually by bag as per CPR schedule (*CARPA STM p4*)

## Needle cricothyroidotomy — with IV cannula needle

Use when no other way of opening airway *AND* person **unconscious**.

### Attention

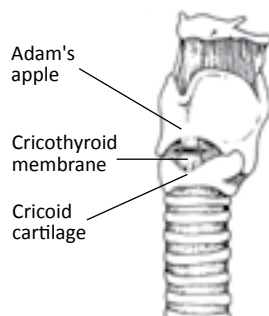
Provides oxygen. CO<sub>2</sub> will rise — but buys valuable time.

### Finding the cricothyroid membrane

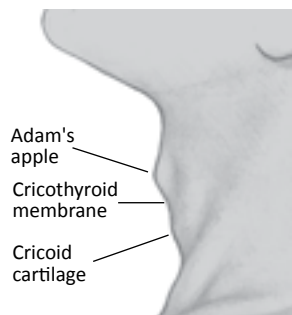
- Cricothyroid membrane is below the Adam's apple (thyroid cartilage) and above the cricoid cartilage — F 2.32, F 2.33
- Practise on yourself
  - Put finger on Adam's apple and swallow to feel it go up and down
  - Now slide your finger down to just below Adam's apple — F 2.34
  - Small dip here indicates cricothyroid membrane. Pressure is uncomfortable and you may want to cough or gag

### What you need

- Essential
  - Non-sterile gloves
  - Towel — or other padding
  - Large bore **non-retractable** IV cannula 12–14G, and spare
  - 5ml syringe, and spare
  - Oxygen tubing with small hole cut about 15cm from one end
  - Oxygen cylinder
  - Tape for holding cannula in place



2.32



2.33

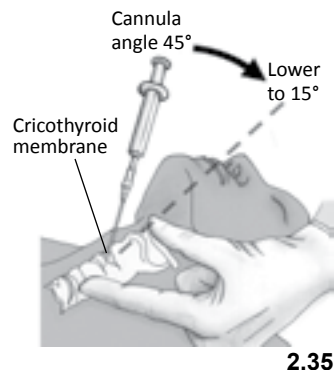


2.34

- If time
  - **Povidone-iodine** cleaning solution
  - Pulse oximeter

## What you do

- Cut small hole in oxygen tubing about 15cm from end, jam end of tubing into barrel of a syringe
- Connect other end to **oxygen** at 15L/min
- Clean site (if time)
- Put padding under person's shoulders to tip head back, make voice box (larynx) stand out
- Put on gloves
- Find cricoid membrane (p46)
- Keep voice box (larynx) still with firm steady pressure. **Do not** let go until cannula in place
- Connect cannula and syringe, put cannula needle at 45° angle to skin — F 2.35
- Puncture skin and cricothyroid membrane while drawing back on syringe. Aim towards feet at 45° angle to skin — F 2.35
- As soon as air comes back into syringe (aspiration), lower needle **angle to about 15°** — F 2.35
- **Push cannula in another 5mm, check you can still pull air back into syringe**
- Push plastic cannula in fully, off stylette (inner needle)
- Hold cannula in position with one hand, never let it go
- With other hand connect syringe with oxygen tubing to cannula — F 2.36
- Use intermittent positive pressure (IPP) cycle — F 2.37
  - Thumb over hole for 1 second on – 4 seconds off
- Check O<sub>2</sub> sats with pulse oximeter
- If plastic cannula blocks — unkink. Can put in another cannula close to first
- **If it keeps blocking — think about doing cricothyroidotomy (below)**



2.35



2.36



2.37

## Emergency cricothyroidotomy — open airway with scalpel

Use when no other way to keep airway open **AND** person **unconscious**.

### Attention

- **Try needle cricothyroidotomy first (p46).** If this fails — do cricothyroidotomy

- Can only be done in adults and children over 10 years
- For **incision site** — see *Finding the cricothyroid membrane (p46)*

## What you need

- Gloves
- Goggles
- Scalpel blade and handle *OR* disposable scalpel
- Airway device — tracheostomy tube *OR* *Mini Trach* tube *OR* size 6 ETT *OR* prepared oxygen tubing or other firm tube
  - Can use oxygen tubing as alternate airway by cutting the end off and cutting a small hole about 15cm from end
- Artery forceps
- Oxygen tubing and resuscitation bag

## What you do

- Prepare airway device
- Stand beside patient on same side as your dominant hand eg if right-handed you stand on person's right side
- Clean site, put padding under person's shoulders to tip head back (extend neck) and make voice box (larynx) stand out
- Put on gloves and goggles
- Use non-dominant hand to hold trachea and find cricothyroid membrane (*p46*). **Do not** let go until airway established
- Be ready for blood to be coughed in your face
- In one movement, with blade directed horizontally across trachea, stab cricothyroid membrane and drag (cut) towards you 20mm — F 2.38
- Widen opening with curved or straight artery forceps — F 2.39, or gloved little finger
- Put in tube being used for airway
- Give **oxygen** at 15L/min
  - If using tracheostomy tube, ETT, *Mini Trach* tube — attach resuscitation bag
  - If using prepared oxygen tubing — attach to oxygen source
- Intermittent positive pressure (IPP) cycle — F 2.37 (*p47*)
  - Thumb over hole for 1 second on – 4 seconds off
- Check O<sub>2</sub> sats with pulse oximeter



2.38



2.39

**Remember ABC** — when **A**irway and **B**reathing secure check **C**irculation.

# Chest procedures



## Sealing a 'sucking' chest wound

**Emergency life-saving procedure** to manage chest cavity with open wound.

### Attention

- Never take out object that is sticking into chest, eg knife, spear
- Person will need
  - IV drip (infusion)
  - **Oxygen** with non-rebreather mask, 12–15L/min
  - Probably chest drain (p51)
- **Do not** use gauze/combine to seal wound, may cause tension pneumothorax

### What you need

- Sterile gloves
- Piece of thin, flexible, water-proof paper or material a bit bigger than wound, eg *Op-site* packet, defibrillator pad, thin strong paper
- Tape

### What you do

- **Put on sterile gloves**
- Cover wound with piece of paper and seal well with tape on 3 sides, leaving bottom edge free — F 2.40
- Forms vacuum seal around wound when person breathes in, but lets air in chest cavity escape when person breathes out. Allows blood to drain from wound
- If object sticking into chest — bandage to make firm and secure (p232) but still open on one side
- Watch for tension pneumothorax (CARPA STM p72)



2.40

Return to *Assessing trauma – primary and secondary survey* (p27). When breathing problems treated, see *C – Circulation and controlling bleeding* (p31).

## Needle decompression of tension pneumothorax

**Emergency life-saving procedure** to let out air trapped in chest cavity and putting pressure on lung. Makes breathing easier, improves BP.

- **Need to act very quickly**



## Attention

If/when plastic cannula blocks, tension pneumothorax can come back. Put in new cannula as needed, close to original position.

- If air doesn't whoosh out when you put needle in — may be in wrong side. Try other side

## Look for

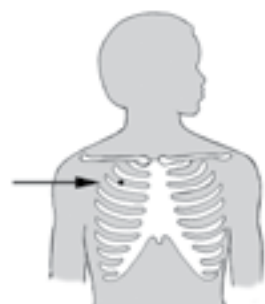
- Severe shortness of breath
- Very frightened person
- Heavy sweating (diaphoretic)
- Trachea moving away from injured side (deviation). Often hard to see/feel
- Hollow sound when tapping on affected side
- Reduced air entry on affected side
- Bulging of neck veins — late sign
- Severe shock (pre-terminal sign)
- Cardiac arrest with pulseless electrical activity (PEA) — terminal sign

## What you need

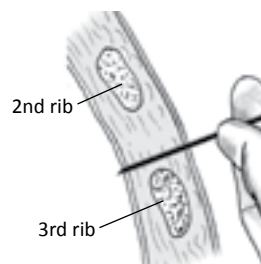
- Gloves (sterile not necessary — life-threatening problem)
- Alcohol swab
- 14G non-retractable cannula (several)
- 20ml syringe (optional)

## What you do

- If person conscious — explain procedure
- Leave person in position they find most comfortable
- Give **oxygen** by non-rebreather mask, 12–15L/min
- Find site for needle — space between 2nd and 3rd ribs (intercostal space) in mid-clavicular line — F 2.41
- Swab site with alcohol wipe
- Insert cannula to full length at 90° to chest wall and just above upper edge of 3rd rib (to avoid neurovascular bundle) — F 2.42
  - Can use 20ml syringe attached to cannula needle. Allows release of air on entry to pleural space
- Remove metal needle, leaving plastic cannula in place — shouldn't need to be taped
- Check breathing regularly to make sure it is improving
- Put in proper chest drain as soon as possible — leave cannula in until then



2.41



2.42



- Can make valve over end of cannula using finger tip of disposable glove, but not needed for emergency treatment

Return to *Assessing trauma – primary and secondary survey (p27)*. When breathing problems treated, see *C – Circulation and controlling bleeding (p31)*.

## Putting in chest drain

Intercostal chest drain lets out air or blood trapped in chest cavity, makes breathing easier.

- Use after doing needle decompression (*p49*)
- If person stable — can be delayed until help arrives

### Attention

- **Never** use big metal trocar that comes with chest drain to make hole in chest
- Always put drain into chest by going directly above **top** of lower rib. There are blood vessels and nerves along bottom of ribs
- If haemothorax (*CARPA STM p73*) — blood may come down drain tube, as well as air

### What you need

- Helper
- Marker pen (optional)
- Sterile dressing pack
- Sterile gloves
- Sterile gauze
- **Povidone-iodine** or **chlorhexidine** in alcohol antiseptic solution
- Sterile towels/drapes
- 2 ampoules (10ml) of **lignocaine 1% with adrenaline 1:100 000**
- 10ml syringe and long 23G needle
- Sterile scalpel
- 2 long artery forceps (eg large *Kelly* haemostats)
- Intercostal drain
- Heimlich valve or underwater seal device
- Suture set with 3-0 silk/nylon/prolene for skin closure
- Strong suture for securing tube, eg size 1 mersilene or size 2 silk
  - As guide for ordering — *Ethicon R995* (mersilene 1) or *1689* (silk) suitable
- Vented urine/fluid collection bag/set and tubing
- 2 large clear dressings

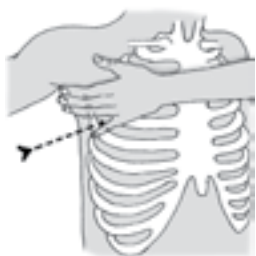
- **Intercostal catheter.** Size guide — use smaller size for draining air, larger size for draining blood/fluid
  - Newborn 8–12
  - Infant 12–16
  - Child 16–24
  - Adolescent 20–32
  - Adult 28–32



2.43

## What you do

- If person conscious — explain procedure
- Person sits upright supported by pillows, hand on injured side behind head — F 2.43
- Attach available monitoring equipment (eg BP, ECG, O<sub>2</sub> sats), put in IV cannula (p85)
- Give **oxygen** by mask, 8–15L/min
- Painful procedure — give **morphine** IV as analgesic and sedative (*CARPA STM p402*)
- Mark site with marker pen — F 2.43
  - 4th or 5th intercostal space just in front (anterior) of mid-axillary line (lower middle of armpit)
- Count rib spaces at front and follow them back with finger to mid-axillary line. 4th space is about 3 finger widths below armpit, above level of nipple — F 2.44
- Lay out equipment (**not** metal trocar)
- Use forceps to clamp tube closed at far end
- Open Heimlich valve, check which end connects to intercostal drain (it is marked) — F 2.45 *OR* prepare underwater drain following manufacturer's instructions
- Clean site, drape with sterile towels if possible
- Give **lignocaine with adrenaline** (8ml for adult) with needle and syringe. Aim to anaesthetise area in intercostal space about 4–6cm wide
  - Give in 2 lots, check for withdrawal of blood each time
  - Give half (4ml for adults) just under skin — F 2.46
  - *THEN* half (4ml for adults) along top edge of rib below (to avoid neurovascular bundle) — F 2.47
    - When air aspirated you have reached pleural cavity
    - Begin infiltrating as you withdraw needle slowly so anaesthesia includes pleura
- **Remember:** Anaesthetic takes a few minutes to work



2.44



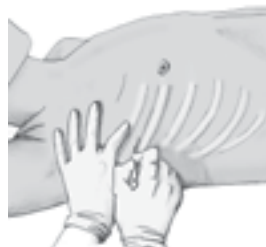
2.45



2.46



2.47



2.48

## To put in drain

- Use scalpel to make 3–5cm incision through skin, above and parallel to rib below — F 2.48

- Use artery forceps to blunt dissect. Open and close them against muscle to separate tissue down to pleura — F 2.49
  - Support forceps so you are not too forceful — F 2.50
  - Will feel a pop and change in resistance as you enter pleural cavity
  - Open forceps in all directions to enlarge hole
- Replace forceps with gloved finger — F 2.51. Sweep around gently in all directions to clear away any tissue, make sure you are in chest cavity — F 2.52
- Guide tip of tube in beside gloved finger, aim drain up towards top of lung. Use forceps to help — F 2.53
- Push drain **at least 2cm** past last hole seen in tube, more if person has more fat. Centimetre markings taken from closest hole on tube, not from tip



2.49



2.50



2.51

### Connect Heimlich valve or underwater seal

- Look for fogging in tube, a good sign
- Connect Heimlich valve *OR* underwater seal
- Release forceps clamping tube
- Check for valve flapping *OR* bubbling/swinging water
- Connect vented urine/fluid collection bag to valve to collect blood or fluid
  - Leave bag vent open to allow draining air to escape. If no vent — cut small hole at top



2.52

### To make drain secure

- Close wound each side of drain with interrupted sutures (p314)
  - Tie long ends of suture material firmly around tube to hold in place. **Do not** use purse string suture
  - *OR* Suture tube in place with separate 1.0/2.0 silk or mersilene stitch 1cm from wound edge. Tie knot compactly, tight enough to indent tube
- Cover with see-through dressing
- Make sure tube not kinked
- Check valve still flapping *OR* water still bubbling/swinging



2.53

Re-expanding the lung is painful. Give extra morphine now (CARPA STM p402).

Return to *Assessing trauma – primary and secondary survey* (p27). When breathing problems treated, see *C – Circulation and controlling bleeding* (p31).

# Head injuries — assessment

**Remember** — *Assessing trauma – primary and secondary survey (p27).*

- All people with a head injury must be treated as though they also have a neck (cervical spine) injury (*CARPA STM p76*)
- If unconscious person has been drinking — always treat as head injury and do **medical consult**. **Do not** assume it is due to alcohol (grog)
- Send everyone with severe or moderate head injury, skull fracture, minor head injury with other serious injury/instability, to hospital for CT scan, further assessment and management

## Initial assessment — all head injuries

- If person has **any** risk factors (*p55*) — may have **serious head injury**. **Medical consult** straight away

### Ask

- Has person had any alcohol (grog) or other drugs

### Check

- Do quick check for level of consciousness using **AVPU**. If only P or U — may need airway protection
  - **A** lert — eyes open, understanding, following commands, talking
    - Tell them not to move their head
  - **V** oice — not alert but responds to your voice
  - **P** ain — responds only to pain, eg squeezing muscle at top of shoulder — F 2.54
    - If only a small response, eg low groan without opening eyes — treat as unresponsive
  - **U** nresponsive — unconscious, not responding
- Temp, pulse, BP, RR, BGL
- Pupil reactions (*p55*)
- Coma scale score (*p56*) — record time in file notes
- For signs of skull fracture
  - Laceration or blood filled swelling (haematoma) on scalp
  - Bruising around eyes (raccoon eyes) or behind ears
  - Clear or blood-stained fluid (CSF) from ears or nose
  - Blood in ear canal or behind eardrum
  - Bleeding into white of eye and can't see back edge of bleed (*CARPA STM p368*)
  - **Wearing sterile gloves**, feel for skull fractures/bogginess under cuts and bruises on head or face



2.54

- **Skull fractures aren't always directly under cuts or bruises, can easily be missed on examination.** If in doubt — **medical consult**
- Limb weakness, lack of movement
- Other risk factors

#### **Risk factors**

- Unconscious for more than 5 minutes after injury
  - Coma scale score (*p56*)
    - Less than 14 on arrival
    - Drops by 2 or more
    - Less than 15 after 2 hours
  - Pupils unequal (*p55*)
  - Any localised or one-sided weakness
  - Stab or 'penetrating' wound to head
  - Suspected skull fracture (*p54*)
  - Fitting — especially if delayed fit
  - Vomiting — especially if continues to vomit
  - Remains drowsy
  - Remains confused
  - Bad headache
  - Known bleeding disorder, eg anticoagulant use, liver disease, dialysis
  - Dangerous cause
    - Bad car crash, eg thrown from car, car badly damaged, someone killed, car going more than 60km/hr
    - Pedestrian hit by vehicle
    - Fall from more than 1m *OR* fall from horse, ladder, bicycle
    - Hit by bat or club
  - Over 65 years
- Having 2 or more risk factors more of a concern than having only 1.
- Person with drowsiness, confusion, headache, vomiting and not improving within 4 hours probably has serious head injury

## **Pupil reactions**

- Pupils should be the same size
- Both should get smaller when a light is shone into either one of them

## **Check**

- Move out of direct sunlight or have someone shade person's eyes so you can see pupils clearly

- Look at both pupils with a bright light
  - Are pupils the same size
  - Does size change when bright light shone into them
  - Is reaction time fast or slow
- If pupils dilated, sluggish, unequal — F 2.55 — may be due to
  - Eye injury
  - Increased intracranial pressure, eg bleeding into brain
  - Some eye drops
  - Some toxins, chemicals



2.55

**Note:** Difference in pupil size (0.5–1.0mm) may be normal for person (anisocoria). Check carefully for difference in reaction.

## Coma scales

Used to assess severity of head injuries.

- Check person understands English before using coma scales
- Same person should do all assessments so patterns and small differences can be noticed. If not possible — show new person how assessment was done
- Painful stimulus above neck is most reliable, eg pressure in notch above eye (supraorbital pressure) — F 2.56



2.56

## If coma scale score falling

- **Drop of 2 or more points in score is very serious**
  - May be problems other than head injury, eg shock
  - May be due to rising intracranial pressure

## Check

- Airway, RR, breathing pattern, O<sub>2</sub> sats, temp, pulse, BP, BGL

## Do

- **Medical consult** straight away
- Give **oxygen** — try to keep O<sub>2</sub> sats at or near 100%
  - Non-rebreather mask, 10L/min child, 15L/min adult
  - *OR* If breathing poorly — bag and mask ventilation
- Treat any chest or respiratory issues, eg pneumothorax (*CARPA STM p72*)
- Put in IV cannula (*p85*), run **normal saline** as needed — aim to get systolic BP more than 100mmHg
- If low BGL — see *Low blood glucose (CARPA STM p94)*
- Keep temp normal — warm up if T less than 34°C, cool if T more than 38°C

## Assessment

### Glasgow Coma Scale

Check	Response	Score
<b>EYES</b> Are person's eyes open	Opens eyes by themselves	4
	Only opens eyes if you ask them to	3
	Only opens eyes in response to pain	2
	Will not open eyes	1
	<b>E Score</b>	
<b>VERBAL</b> Does person know • Their name • Where they are Are they making sense	Knows their name and where they are, making good sense	5
	Not sure what their name is or where they are, talking, but not making much sense	4
	Talking rubbish only, not making any sense	3
	Only making strange sounds	2
	Making no sounds	1
	<b>V Score</b>	
<b>MOTOR</b> What movement does person make	Obeys commands — does simple things you ask • To check for body paralysis — ask to poke out tongue or raise eyebrows	6
	Localisation — purposeful movement to change painful stimulus (supraorbital pressure), attempts to remove or avoid it	5
	Withdrawal — pulls arm or leg away in response to local pain (pinched limb)	4
	Abnormal flexion in response to pain (supraorbital pressure) — clenched fists and bending of wrists and elbows, without localisation	3
	Abnormal extension in response to pain (supraorbital pressure) — straightened wrists and elbows, without localisation	2
	No movement	1
	<b>M Score</b>	
	<b>TOTAL SCORE</b>	

## Adelaide Coma Scale

Used for children under 10 years.

Check	Response	Score
<b>EYES</b> Are child's eyes open	Opens eyes by themselves	4
	Only opens eyes if you ask them to	3
	Only opens eyes in response to pain	2
	Will not open eyes	1
	<b>E Score</b>	
<b>VERBAL*</b>	Smiles, interacts	5
	Cries but can be comforted (consolable)	4
	Cries and can occasionally be comforted	3
	Cries and can't be comforted (inconsolable), agitated	2
	Making no sounds	1
	<b>V Score</b>	
<b>MOTOR**</b> What movements does child make	Obeys commands — does simple things you ask	6
	Localisation — purposeful movement to change painful stimulus (supraorbital pressure) eg rolls away, pushes your hand away, keeps eyes shut	5
	Withdrawal — pulls arm or leg away in response to local pain (pinched limb)	4
	Abnormal flexion in response to pain (supraorbital pressure) — clenched fists and bending of wrists and elbows, without localisation	3
	Abnormal extension in response to pain (supraorbital pressure) — straightened wrists and elbows, without localisation	2
	No movement	1
	<b>M Score</b>	
	<b>TOTAL SCORE</b>	

\* Child over 5 years can often answer simple questions.

\*\* Child over 2 years can often follow commands.



## Scoring the coma scales

- Don't record amnesia as confusion
- If in doubt between 2 levels — score at higher level
- Report scores of each part (E3, V2, M5) as well as total score
  - Motor score (M) most useful

## Interpreting score

- 3–8 — severe head injury (*CARPA STM p81*)
- 9–13 — moderate head injury (*CARPA STM p81*)
- 14–15 — minor head injury (*CARPA STM p82*)

A score of 15 doesn't mean 'normal'. Can still have altered cognitive function.

## Follow-up

- Repeat assessment every 30 minutes until score is 15
  - *THEN* Every 30 minutes for next 2 hours
  - *THEN* Every hour for next 4 hours
  - *THEN* Every 2 hours
- If score drops below 15 — repeat every 30 minutes until score returns to 15, then as above
- If score drops below 14 — **medical consult**

# Immobilising the spine



Generally accepted that immobilising spine during treatment, movement, or transfer will stop more damage to existing injuries, eg broken neck, lower spine — but limited evidence that immobilising alters outcomes. If immobilising spine gets in the way of other activities, eg maintaining airway — delay immobilisation.

**Immobilise spine** — any time there is suspicion of injury (*CARPA STM p91*).

## Manual in-line immobilisation

### Attention

- **Keep head and neck in line with spine at all times**
- Ask helper to look after person's head, even after collar is on and/or immobilised by straps — they may become unstable or vomit
- Make sure back pockets are empty, nothing caught under person
- Log-roll to check back and put board/stretcher underneath
- Put sandbags/rolled towels either side of head, on board/stretcher

### Secure person so their body can't move in any direction

- Straps must go all the way around board/stretcher and be firm but not tight. Don't stop chest movement, cut off blood/nerve supply to hands/feet, flatten IV lines etc
- Strap body (with arms across chest) **before** strapping head
- Unstrap forehead **before** making any changes to torso position
- Once semi-rigid collar fitted, fix chin strap across its rigid frame and around board/stretcher — F 2.57
- Always tie feet together before strapping rest of legs



2.57

- When board/stretcher picked up, check there is no movement of person or loosening of straps
- **Mind your back when lifting. Bend your knees**

**Note:** Read manufacturer's instructions, practise using extrication devices and stretchers. Many types of stretchers. For scoop stretcher — know how to make leg support longer or shorter, take 2 halves apart, put back together.

### What you need

- Helpers
- Sandbags or thick, heavy padding, eg rolled blankets
- Semi-rigid collar, measured for right size (*p62*)

- Scoop stretcher or immobilisation board
- Extra padding, folded blankets, sheets, towels etc
- Triangular bandages. Use ordinary ones if you have nothing else

## Taking off crash helmet

### Attention

- Airway **always** takes priority. Need to remove helmet to fully assess and maintain airway, assess head and neck
- Some emergency services have a policy of not taking off helmets before person reaches hospital unless there is no airway

### What you need

- Helper 1
- Helper 2

### What you do

- Lie person flat on back if you can
- Tell person what you are doing
- **Helper 1**
  - Keep head still with
    - Knees on either side of head
    - Hands on either side of helmet with fingers hooked lightly underneath — F 2.58
- **Helper 2**
  - Undo or cut chin strap
  - Put thumbs on upper jaw with fingers around back of lower head (not covered by helmet), stabilise head — F 2.58
  - Be prepared for weight of head, don't let head drop back when helmet comes off
- **Helper 1**
  - If person wearing glasses — let go of helmet and take glasses off
  - Grip helmet under lower edge on either side, very gently expand it outwards
  - At same time tilt helmet forward slightly (to pass over back of skull) and use backwards and forwards movement to 'walk' helmet over nose and off head — F 2.59
- Be very gentle, it may take some minutes to remove helmet



- **Helper 1** takes over from **Helper 2** — F 2.60, manually immobilises neck in in-line position — F 2.61



2.60



2.61

When helmet removed — return to *Assessing trauma – primary and secondary survey* (p27), check *A – Airway and cervical spine* (p28).

## Measuring and putting on semi-rigid collar

**Emergency procedure** to prevent further damage to neck (cervical spine) after trauma.

### Attention

- **Make sure you keep neck immobilised** while you measure and fit collar. Someone needs to keep hold of head until whole body fully immobilised
- At accident scene. If dangerous mechanism, head, neck or spinal injury — put on collar, even if person is/has been walking around
- Use semi-rigid collar. Soft collars are **never good enough**

- Putting on semi-rigid collar only the first step. To complete immobilisation see *Manual in-line immobilisation* (p60)
- **Semi-rigid collar must fit properly** — not too big or too small. Person must not be able to move head inside collar

**Note:** Collars are packaged flat, need to be made into circular band. Can look confusing when you are stressed. Measure and put on semi-rigid collars as part of regular practising of emergency procedures.

### What you do

#### Measure person for collar

- Tell person what you are doing — even if unconscious
  - Ask them to stay very still, **not** try to help
- Take off any jewellery
- With head in neutral position, draw one imaginary line from top of shoulder and another from tip of chin. Use your fingers (or measuring tool in pack) to measure space between top of shoulder and chin — F 2.62
- Choose right collar size by measuring with same number of fingers from lower edge of rigid plastic to black fastener on side — F 2.63 **OR** follow instructions in pack



2.62



2.63

- Make up collar into circular band (follow instructions in pack)
- Fold in velcro band to prevent it sticking to hair, seat, glass, dirt etc
- **Ask helper to keep holding either side of head**

#### THEN

- Slide chin piece up chest wall until chin supported properly, with head still in neutral position — F 2.64
- Keeping firm, gentle grip on collar around neck and under chin (to keep head still), slide back of collar band around/under neck and bring velcro band round to fasten
- *OR* If person obese or lots of thick hair — may be easier to slide back of collar band around neck first — F 2.65, then position chin piece and fasten velcro band
- Tighten velcro until chin and neck fully supported — F 2.66
- Check position and fit



2.64



2.65

#### Check

- Collar on straight — nose, chin, collar, umbilicus in straight line
- Collar holding person's head in neutral position
  - Neck not tilted backwards (hyperextended)
- Chin resting securely on hard plastic chin support of collar
- Ears not trapped under collar
- Collar not pinching skin on shoulders or squeezing neck



2.66

If there are any problems, you must start again.

When cervical spine problems treated — return to *Assessing trauma – primary and secondary survey (p27)*, check *B – Breathing (p30)*.

## Immobilising neck using semi-rigid collar

### Attention

- If person still in vehicle and sitting upright — use extrication device
- **Ideally neck should stay in neutral position.** If bent or rotated when found — move gently to neutral position and immobilise
- If airway **not** compromised — **do not** move head if
  - At odd, unnatural angle (extreme deformity)
  - By doing so, their airway becomes blocked
  - It makes their neck spasm

- It gives them more pain
- It causes numbness or tingling of arms or legs
- It causes loss of limb movement
- If any of above — support head in current position

## What you do

### If person lying on back (supine) **AND** head can be put in neutral position

- Put knees either side of head to stop it moving — F 2.67, check response (p28) and airway (p28)
- Put hands either side of head with index fingers in notch between upper teeth and lower jaw — F 2.68. Don't cover ears
- Gently bring head into line with spine and shoulders (neutral position)
- Measure and fit semi-rigid collar (p62), support with sandbags/rolled blankets. Have someone keep their hands or knees either side of head — F 2.69
- Make sure sandbags secured/taped. Sandbags are heavy, can slide during lifts, log-roll, or transport and cause sideways (lateral) movement of head and neck



2.67



2.68



2.69

When cervical spine problems treated — return to *Assessing trauma – primary and secondary survey (p27)*, check *B – Breathing (p30)*.

## Log-rolling person

If person needs to be turned over, eg to check back, to put on back board — use 'log-roll' technique.

## Attention

**Minimum of 3 people needed when log-rolling** to keep head, neck and body in straight line and protect spine from further injury. **Do not** try with less.

## What you do

### If person lying on back (supine) and head can be put in in-line neutral position

- Put on semi-rigid collar (p62)
- **Helper in charge** (the boss)
  - Supports head and neck throughout roll
  - Ensures helpers all roll person at the same time

- **Other helpers**

- Put board/stretcher beside person, if using
- Put person's arms by sides, palms turned inwards or flexed over their chest
- Kneel on one side of person, hold legs or part of body — F 2.70. If only 2 helpers — interlock arms to give more support



2.70

- **Boss** calls to roll person when everyone in position

- **Helpers** roll person onto side towards helpers, keeping head, neck, upper back, lower spine in straight line — F 2.71

- Roll back onto board/stretcher, if using



2.71

### If person lying on stomach (prone)

- **Helper in charge** (the boss)

- Supports head and neck in position head is facing — F 2.72, and throughout the roll
- Ensures helpers all roll person at the same time

- **Other helpers**

- Put board/stretcher beside person, if using
- Put person's arms by sides, palms turned inwards
- Kneel beside person, hold legs or part of body — F 2.72



2.72

- **Boss** calls to roll person when everyone in position

- **Helpers** roll person onto side, **away** from direction head is facing, keeping head, neck, upper back, lower spine in straight line — F 2.73



2.73

- Keep rolling until person on back on board/stretcher, if using

- Put on semi-rigid collar (p62)

Return to *Assessing trauma – primary and secondary survey* (p27).

## Using long boards — from lying position

Person lying on back (supine), semi-rigid collar fitted.

### Attention

- Make sure back pockets empty, nothing caught between person and stretcher
- Make sure scoop stretcher properly orientated — person's head at head-end



- Scoop stretcher comes apart down centre of its length. Each half can be put under person lying on back without need to log-roll

## What you do

- Put padding (eg towels, clothing) on board where bottom, heels, elbows will go. Need padding for bumpy ride ahead
- If not using scoop stretcher — log-roll person onto side (p64), put board underneath, log-roll onto board
- Secure body (torso) and arms with straps
- Secure head. Keep head and neck in line with spine
  - **Do not** flex backwards — F 2.74 or forwards — F 2.75
- Padding may be needed to keep neck and spine in neutral position
  - Under head for adults and older children — F 2.76
  - From under shoulders to buttocks for child under 7 years — F 2.77
- Put sandbags either side of head
- Put more padding under elbows and heels
- Tie feet together
- Put rolled blankets either side of legs (if room) before strapping, to stop sideways movement
- Using 4–6 helpers, lift board evenly. Someone stays at head of board to watch for and prevent movement of head and neck during lift
  - **If movement** — fix strapping
- Put board evenly onto stretcher trolley



2.74



2.75



2.76



2.77

## Using extrication device — from sitting in vehicle

### What you need

- 3 people, more if you have them
  - **Helper 1 = head supporter**
  - **Helper 2 = device fitter**
  - **Helper 3 = lifter**
- Extra helpers to lift person out of vehicle

### What you do

- Decide who will be boss and organiser



2.78



**Helper 1**

- Get behind person (if possible)
- Put hands either side of head, with thumbs against back of head and fingers over each cheek in notch between upper teeth and lower jaw — F 2.78 (p66). Don't cover ears
- Bring head into line with spine and shoulders (neutral position)
- Support head while Helper 2 fits semi-rigid collar (p62), then device

**Helper 2**

- Fit semi-rigid collar, undo seat belt
- Release and position all straps on extrication device
- Put device into place down length of person's back
- Extra padding may be needed behind head and/or shoulders to support head and spine in neutral position
- Firmly strap person to device
  - Start with middle strap around torso
  - Then lower torso
  - Then straps under buttocks and between legs. Pull straps firmly. Take care not to include gear stick
  - Finish with forehead strap
- Check person firmly supported
- Take over supporting head from Helper 1

**Helper 1**

- Come around to front of person, hold and support head from this position so Helper 2 can let go
- Keep holding person's head as they are taken out

**Boss**

- Work out best way to remove strapped person, eg side doors, back or front window, depending on state of crashed vehicle

**Helpers 2 and 3**

- Prepare exit as agreed, eg by taking off vehicle door, bending door right back against side of frame, taking glass out of back window

**THEN**

- Put person straight onto ambulance/vehicle stretcher in device. Try not to move them any more than you have to
- Unclip straps around groin and hips, try to straighten legs. Check person's condition again — **ABC**
- Leave device in place if not needed for another person. Strap person to long board or stretcher before moving them again
- Have 2 helpers help guide head of stretcher as loaded into ambulance

# Hypothermia

**Remember** — *Life support – DRS ABC D (CARPA STM p2).*

Follows exposure to cold, affects all body organs and systems.

- **Mild** (core T 32–35°C) — alert and shivering. Use passive rewarming, may not need to send to hospital if no complications
  - **Moderate** (core T 28–32°C) — drowsy, not shivering, may appear drunk or as if they had stroke. Need active rewarming and advanced support
  - **Severe** (core temp below 28°C) — unconscious, with or without vital signs
- In severe hypothermia person may appear lifeless and mistakenly be pronounced dead. If in doubt — start and continue resuscitation. Evidence of death includes airway obstruction (eg vomit, snow, debris), or injuries incompatible with life.

## Check

- Core temp (best with low reading thermometer or probe), pulse, BP, RR, O<sub>2</sub> sats (best centrally)
- 12 lead ECG, continue to monitor
- BGL, serum potassium, hCG, blood culture, FBE
- If not able to monitor core temp — use history (eg AMPLE p33), clinical signs
  - Think about other causes or predisposing factors, eg sepsis, stroke

## Do not

- **Do not** give **Hartmann's solution**

## Do — if mild

- Protect cervical spine in trauma (p60)
- Stop further heat loss by removing wet clothing, rubbing dry
  - Have clinic room or ambulance uncomfortably warm
- Rewarm person
  - Put on dry clothing, wrap in dry blankets or sleeping bag, cover head
  - Put heat packs/covered hot water bottles under arms (axilla), on groin, abdomen, base of neck
  - In remote context — skin-to-skin contact, eg family member gets in sleeping bag with person
- Give something sweet to drink
- If signs of infection, eg UTI, pneumonia, skin infection — treat
  - If no signs of infection but under 3 months *OR* elderly *OR* chronic illness, eg diabetes, chronic kidney disease — treat as for severe sepsis

## Do — if moderate

### As for mild **AND**

- **Medical consult** — can deteriorate very quickly. Expert advice needed while stabilising person and waiting to send to hospital

- Give **oxygen** by non-rebreather mask, 12–15L/min
- Put in IV cannula (*p85*) or IO needle (*p89*), warm IV fluids to 43–45°C
  - Give 250–500ml bolus of **normal saline** (0.9%)
  - *THEN* Give infusion of **normal saline with 5% glucose** at 150–200ml/hr (adult) *OR* match IV input with urine output
- Put in urinary catheter (female *p410*, male *p498*)
  - Do U/A, pregnancy test if female, hourly urine measures
- If any chance person is long term or regular heavy drinker of alcohol *OR* malnourished — give **thiamine** 300mg IV infusion over 30 minutes

## Do — if severe

### As for moderate *AND*

- **Medical consult straight away** — expert advice needed

In severe hypothermia — high risk of ventricular fibrillation (VF).

- Must be moved very gently, no sudden movements
- Nurse flat, change position slowly, carefully
- Cut away clothing, don't drag off
- Intubation (*p43*) may bring on VF, but still follow usual emergency care, with **very careful** handling

## Starting CPR

- Life support – DRS ABC D (*CARPA STM p4*)
- Feel for neck (carotid) or groin (femoral) pulse for **at least 30–45 seconds**
- If you feel any pulse, no matter how slow — chest compressions **not** needed. Concentrate on rewarming person
  - Only indications for compressions are no heart beat (asystole), VF, VT
- Once started, CPR must continue until return of circulation *OR* death diagnosed
  - Circulation should return when core temp around 32°C
  - May take hours, needs huge commitment of resources and effort
- Use 30 compressions and 2 breaths at rate of 100 compressions/minute
  - **Do not** give usual resuscitation (ALS) medicines until core T 30°C or more
  - When core temp more than 32°C — standard resuscitation algorithms and decision making used
- Defibrillation indicated for VT or VF — 200 joules biphasic or 360 joules monophasic for adults, 4 joules/kg for children
  - May not work if core temp less than 32°C
  - Try once. If doesn't work — **do not** shock again until core T 30°C or more
  - Continue CPR

# Burns

**Remember** — *Assessing trauma – primary and secondary survey (p27).*

## Do — first

### Stop the burning process

- Scalds or liquid chemicals — remove any wet clothing
- Chemical burns — brush powder or solid chemicals from skin (use gloves), remove contaminated clothing. If eye involved — double evert eyelid (p145) and wash eye (p144) immediately

### Cool the burn — continue assessment while this is happening

- **Do not** use ice, ice packs or refrigerated water — can cause more damage
- Cool burned area with cool water (aim for 15°C) — can start up to 3 hours after burn
  - Thermal burns — cool for 20 minutes
    - Run or pour cool water over burn
    - *OR* Submerge burn in water, change water every few minutes
    - *OR* If no suitable water available — wrap burn in towels/cloths soaked in water or **normal saline**, change towels/cloths every 2–3 minutes
  - Alkali burns — pour water over burn for 2 hours or until burning pain stops
  - Acid burns — pour water over burn for 1 hour or until burning pain stops
- **Do not** wash chemicals over unaffected skin/eye or let water collect in shoes
- Once cooling started — remove clothing not stuck to burn, and watches, rings, or anything else that that might get tight with swelling
- Keep rest of person warm
  - If skin loss more than 10% — risk of hypothermia from cooling (p68)
- Take digital photo of uncovered burn if possible. Send by email, MMS (phone), web camera, videoconference for **medical/burns unit consult**
  - Phone first and they will tell you how to do this
- When burn cooled — gently pat dry with clean towel, cover with cling wrap

## Ask

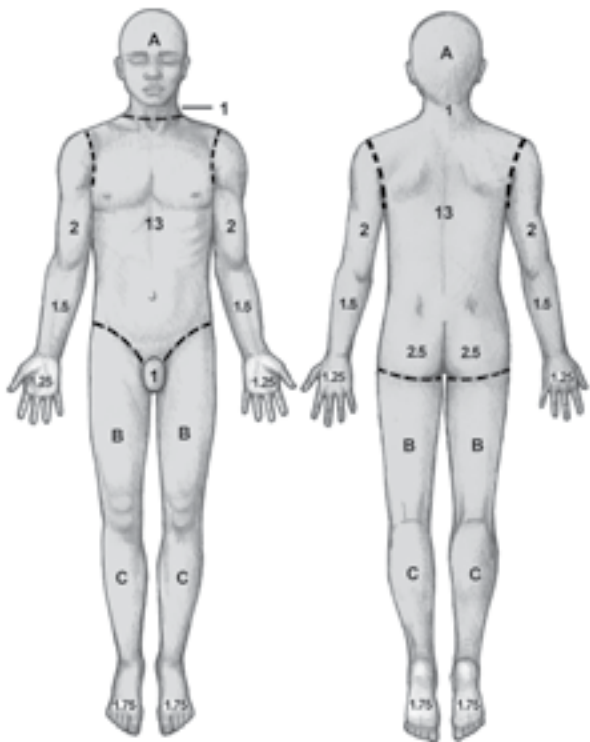
- When did burn happen
- What caused it and how long was it in contact with person
- Thermal, chemical, electrical (including lightning)
- Where did it happen, eg in closed room, out in camp
- What has already been done

## Check

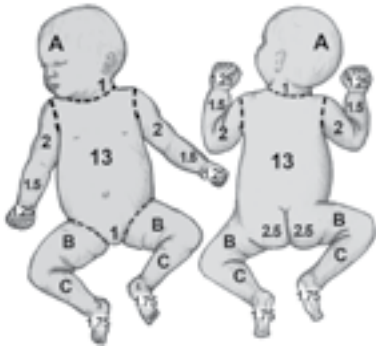
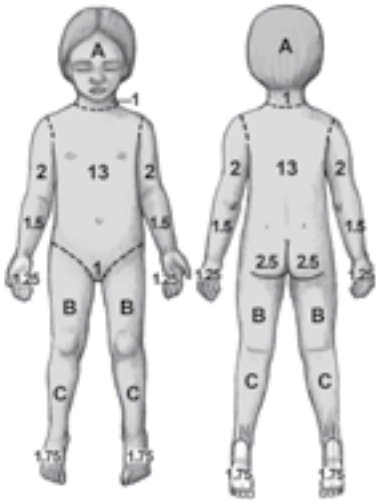
Look for burns all the way around limbs (circumferential).

- **Medical emergency** — **medical/burns unit consult** straight away

Lund and Browder Charts for area of body burnt



Burnt area	%
Head	
Neck	
Trunk (front)	
Trunk (back)	
Arm (right)	
Arm (left)	
Hand (right)	
Hand (left)	
Buttock (right)	
Buttock (left)	
Genitals	
Leg (right)	
Leg (left)	
Feet (right)	
Feet (left)	
Total burnt area	



Age (years)	Under 1	2-4	5-9	10-14	15	Adult
A — ½ of head	9½	8½	6½	5½	4½	3½
B — ½ of one thigh	2¼	3¼	4	4½	4½	4¾
C — ½ of one leg	2½	2½	2¾	3	3¾	3

2.79

- Check pulses and capillary refill distal to injury, eg toes, fingers
  - Capillary refill — press skin (or base of burn if no distal skin) for 5 seconds then release. Will turn white (blanch) — how long does it take for colour to return (refill). Normal refill = 2 seconds
- Work out **area of burn**. Check again a couple of hours after first assessment
  - Measure area that is blistered or deeper — **do not** include area that is just red (simple erythema)
  - Count number of 'palm areas' that are burnt — person's own palm is about 1% of their body area
  - *OR* Use body charts, eg Lund and Browder Charts — F 2.79 (p71)
- Work out **depth of burn** — see Table 2.2. Important for deciding how burn should be treated. Always check again after a couple of hours
- Decide if major or minor burn, manage accordingly
- Check for any other injuries apart from burns

Table 2.2: Working out depth of the burn

	Superficial		Partial thickness		Full thickness
	Epidermal	Dermal	Mid-dermal	Deep dermal	
<b>Burn colour</b>	Red	Red or pale pink	Dark pink	Blotchy red or white	White
<b>Blisters</b>	No	Yes – thin or popped	Yes – thick walled	Yes or no	No
<b>Capillary refill</b>	1–2 seconds	1–2 seconds	More than 2 seconds	More than 2 seconds / absent	Absent
<b>Sensation</b>	Painful	Painful	May be reduced	Reduced	Absent
<b>Ooze</b>	None	Lot	Some	Little	None
<b>Healing</b>	Within 7 days	Within 14 days	2–3 weeks – may need grafting	Grafting needed	Grafting needed
<b>Scarring</b>	None	None or colour change	Yes – if 3 or more weeks to heal	Yes	Yes

## Management of major burns

- **Send major (serious) burns to hospital urgently** — usually to burns unit
- **Medical consult** straight away — work out fluids and pain relief
- May also need direct consult with burns unit

### Major burns

- Burns involving airway (inhalation burn), eg from breathing in smoke
- Burns going all the way around neck, chest, arm, leg. **Medical emergency** — need **specialist/burns surgeon consult** straight away
- Special areas burnt — eyes, face, hands, feet, perineum, major joints
- Full thickness burns larger than a 20 cent piece
- Partial thickness burns covering more than
  - 5% of body surface area for child under 17 years
  - 10% of body surface area for person 17 years or over
- Chemical burns
- Electrical burns — unless very minor. Often deeper than they look
- Burns with other injuries
- If person is very young or very old
- If person has pre-existing medical condition, psychiatric condition, or disability that could affect treatment

### Check

- Hoarseness or noisy breathing (stridor), coughing black dust (soot), any face burn — person may suddenly get worse and their airway will need to be protected, usually need intubation
- Temp, pulse, BP, RR, O<sub>2</sub> sats — at least every 30 minutes
- Hydration — person with major burns needs large amounts of fluids very early on. **Always do medical/burns unit consult**
  - Correct fluid replacement prevents excess swelling — may prevent need for intubation or cuts to release pressure (escharotomy)
- Tetanus status, give if needed (*CARPA STM p438*)

### Do

- Give **oxygen** by mask 6L/min child, 8L/min adult
  - If inhalation burns — give high concentration
- Put in IV cannula, largest possible (*p85*), 2 if you can. Try for unburnt skin
- Give IV fluids (*p85*). In airway burns, run slowly until you get advice and airway secure
- Keep person warm with space/ordinary blanket — person with major burns can't control their temp

- Give **pain relief** — best given IV/IO
  - Use **morphine** in small doses (*CARPA STM p402*)
- Put in nasogastric tube (*p82*), especially for child. Avoids vomiting, aspiration
- Elevate burnt limb (keep in raised position)
- If burns to 15% or more of body or extensive burns to perineal area — put in indwelling urinary catheter (female *p410*, male *p498*), measure urine hourly
  - **Medical consult** if urine output less than
    - 1ml/kg/hr for child weighing less than 30kg
    - 0.5–1ml/kg/hr for child weighing 30kg or more
    - 0.5ml/kg/hr for adult — 1ml/kg/hr if electrical burn
- Take digital photo of uncovered burn if possible, send by email, MMS (phone), web camera, videoconference for **medical/burns unit consult**
  - Phone first and they will tell you how to do this
- **Medical/burns unit consult** before applying first dressing if possible
- Cover major burns with plastic cling wrap or blueys with plastic side to skin — then in clean towel/s ready to send to hospital. Change every 4 hours
  - **Do not** wrap plastic around limbs, will become tight if they keep swelling — lay lengthways
  - **Do not** cover face or chemical burns with plastic wrap — use damp cloth or non-stick dressing
- If delay in sending to hospital or long travel time — remove plastic wrap, put on soft paraffin, non-medicated dressing (eg *Jelonet*), combine dressing, loose bandage
  - **Do not** use any creams or medicated dressings until after **burns unit consult**

## Working out fluids needed

- **Medical/burns unit consult** about fluid resuscitation
  - Fluid formula only a guide to fluid needs
  - If delay in sending to hospital — change according to clinical response, eg urine output, pulse rate. **Medical/burns unit consult**
  - Record accurately time fluids started, amount given. Send in with person

Be careful with airway burns — give less fluid until airway secure.

- Adults and children need replacement fluids. Older people may need less
- Work out amount of fluids needed for first 24 hours — **start from when person was burnt, not when you first saw them**
  - Give half in first 8 hours
  - *THEN* give rest in next 16 hours
- Use **Hartmann's solution**. If not available — use **normal saline**



- Adult, child weighing 30kg or more, child weighing less than 30kg with burns to less than 15% of body — replacement fluids
  - $4\text{ml of fluid} \times \text{weight (kg)} \times \% \text{ body surface area burnt} = \text{volume (ml) in 24 hours}$
- Child weighing less than 30kg with burns to 15% or more of body — replacement fluids *AND* maintenance fluids at the same time. Use 2 IV cannula or 2 lines
  - **Line 1 — replacement fluids**
    - $4\text{ml of fluid} \times \text{weight (kg)} \times \% \text{ body surface area burnt} = \text{volume (ml) in 24 hours}$
  - **AND Line 2 — maintenance fluids** (*CARPA STM p452*)
    - **2.5% glucose in ½ normal saline** — evenly over 24 hours (from time of burn)

#### Example — working out fluids needed

Child aged 8 years weighing 24kg receives burns to 30% of their body

#### Replacement fluids

Total =  $4\text{ml} \times 24(\text{kg}) \times 30(\%) = 2880\text{ml}$  over 24 hours.

Half in first 8 hours =  $1440\text{ml} = 180\text{ml/hr}$  (or more — depends on time from burn to starting fluid replacement, give evenly over rest of first 8 hours).

Half in next 16 hours =  $1440\text{ml} = 90\text{ml/hr}$ .

#### Maintenance fluids

65ml/hr.

## Management of minor burns

Minor burns may still need consult with burns unit or to be sent to hospital.

**Medical/burns unit consult** for advice.

#### People who often need hospital assessment

- Pain not adequately controlled with oral pain medicines
- Infection (eg cellulitis) needing IV antibiotics
- Need for bed rest with leg elevated (in raised position)
- Person or carer/s unable to manage dressing care
- Very old or very young
- Child with burn that could be from child abuse or neglect
  - Must also report to child protection services (*CARPA STM p151*)

**Remember:** Good early management important for good healing. Always get help if not sure.

- Early treatment to prevent or reduce swelling can prevent chronic problems
  - Compression bandages, eg *Coban* self-adherent wrap
  - Elevate body part above heart when at rest
  - Active muscle contraction and movement helps remove swelling. Reassure person that movement will help healing, not harm burn wound

## Burns being managed in the community

### Check

- Depth of burn (*p72*)
- Risk of infection
- Tetanus status, give if needed (*CARPA STM p438*)

#### Burns at risk of infection if

- Caused by dirty/contaminated materials, friction, flames, chemicals
- Rolled in dirt to put out flames, burns first cooled in dirty water
- Happened over 12 hours before you saw person
- In area with lots of bacteria, eg armpit, umbilicus

### Do

- Clean with **mild soap and water**. **Do not** use skin disinfectant
- Clip body hair from burn wound and 2.5cm around it — not eyebrows
- Dry carefully around burn, but not the burn itself
- Give pain relief (*CARPA STM p399*)
- Remove blisters, loose or burned skin
- Dress and review as below

### Superficial burns — skin intact

- Use simple moisturising cream several times a day

### Superficial burns — blistered **OR** Clean partial thickness burns

- If oozing (usual for first 3 days) — put on hydrocolloid dressing (*p303*). Change within 2 days
- If no ooze or when ooze stopped (ie almost healed and not as first dressing) — put on non-woven dressing (eg *Fixomull*, *Hypafix*, *Mefix*) sticky side down, for burn protection
  - **Do not** use if delayed healing or fragile skin
  - Leave on for up to a week or until it comes off by itself
  - Healing burn can be damaged if not removed correctly — see *To remove* (*p304*)

## Partial thickness burns at risk of infection *OR* Full thickness burns smaller than a 20 cent piece

- Use topical anti-bacterial, silver-coated dressing (*p304*) (eg *Acticoat*) held in place with non-woven dressing
  - Put *Acticoat* on blue side down — leave for 3 days before reassessing
  - Wet (activate) dressing with sterile water then wait a few minutes before putting it on, to lessen stinging/burning
  - Tell person and/or carer to wet dressing at least twice a day with clean water only (**not normal saline or salt water**, these deactivate dressing) then pat dry
- *OR Silver sulfadiazine* cream — 1cm thick layer covered with non-stick dressing (dressing will stick if not enough cream)
  - **Do not** use **silver sulfadiazine** cream on face, person with sulphur allergy, child under 6 months — **medical/burns unit consult**
  - Wash cream off with sterile **normal saline** and redress every day
  - If it stings or burns for more than 30 minutes after applied — remove

## Infected burns

- Infection likely if
  - Pain and swelling worse after 2 days
  - Not healing in 1 week
  - Burn smelly, pussy, surrounded by red/hot area
  - Person has a fever

## Do

- **Medical consult**
- Swab burn area for MC&S (*p380*)
- Dress as for partial thickness burns at risk of infection (*p76*)
- Give **procaine penicillin** IM once a day for 3–5 days (doses *CARPA STM p460*)
  - If allergic to **penicillin** — give **cephazolin** IV twice a day for 3–5 days (doses *CARPA STM p456*)

# Immobilising a snake bite

Use for snake and funnel web spider bites, blue-ringed octopus and cone shell stings, and bee, wasp, ant stings in people with allergy.

## Attention

- Use for bite on limb. If bitten on head or torso — just bandage bite site
- Keep monitoring
- Keep person calm, reassured, lying or sitting still
- **Do not** wash, cut or drain wound, or apply suction
- Work quickly, don't bother to remove clothing

## What you need

- 3 or more 10–15cm tension/elastic compression bandages
  - If elasticised bandages not available — use crepe bandages
- Splint
- Tape
- Marker/pen, for marking bite site

## What you do

- Wrap 1st bandage over bite site — F 2.80
- Start 2nd bandage at fingers or toes, wrap bandage/s firmly up limb as far as possible — F 2.81
  - Include fingers/toes in bandaging, to stop them moving and moving muscles
  - Leave tips of fingers/toes visible to check circulation
  - Mark site of bite or sting on bandage — F 2.81
- Bandage firmly as for sprain — hard to insert fingers under bandage, not tight enough to cut circulation
- Aims to prevent spread of venom by
  - Stopping muscle, limb, joint movement
  - Compressing lymphatic vessels
- Use last bandage to bind limb to splint — F 2.82, F 2.83
- Bites to arm or hand
  - Have elbow bent
  - Put arm in sling to stop movement — F 2.83
- Bites to leg or foot
  - If no splint handy — tie legs together — F 2.84



2.80



2.81



2.82



2.83



2.84