Safe Transfer of the Burn Injured Patient

Dr Owen McIntyre

Canolfan Llosgiadau a Llawfeddygaeth Blastig Cymru
Welsh Centre for Burns and Plastic Surgery

EMRTS Cymru

Emergency Medical Retrieval & Transfer Service

www.emrts.wales.nhs.uk

emrts@wales.nhs.uk

ELUSEN AMBIWLANS AWYR CYMRU
WALES AIR AMBULANCE CHARITY

GIG CYMRU NHS WALES

Ariennir gan Lywodraeth Cymru
Funded by Welsh Government

Overview

- Nature of multiple patient transfers post-incident
- Consultant/Coordinator considerations for transfers
- Process and practicalities
- Pre-departure Checklist & Action Card

Transfer of Multiple Burns Patients

Factors affecting Primary vs Secondary Transfers

- Number of casualties
- Location of the incident
- Time of the incident
- Emergency Service Response – Ambulance & HEMS/PHEM
- Early communications with National Burns Bed Bureau

Transfer of Multiple Burns Patients

Factors affecting Secondary Transfers

- Burn care capability
- Critical care capacity
- Efficiency and accuracy of Triage process
- Resources available: Medical staff
  Transport
  Equipment

EARLY	**DELAYED**
Direct from Emergency Department	From Intensive Care Department
Hours	Hours to days
Relatively straightforward??	Potentially complicated – MOF/Sepsis

Consultant/Coordinator Considerations

- Central tenet is to maintain equivalent standard of care for the transfer
  - ICS - Guidelines for the transport of the critically ill adult (3rd Edition 2011)
  - SWUK Burns Network MI Plan
  - Burns National Incident Plan (Annex5)

Can we expect to maintain standard of care in mass casualty incidents?

- Accepted models of conservative care exist
  - military, developing world, reducing ventilator days

- Possible approaches to transfer in mass casualties
  - Raised threshold for intubation
  - Conservative intravenous fluid regimes or non at all
  - Upright positioning, elevated limbs

Consultant/Coordinator Considerations

- Decisions on seniority of transferring team - Who goes?
  - Competence and experience of team
  - Condition of patient

  - The ‘If this was my Mum’ test

- Maintaining communications with transferring team
  - Very isolated once mobile
  - Quite different to usual on-call arrangement
  - Direct mobile line to Consultant for advice or discussion

Process and Practicalities

- Simplify

- Structure
  - Modified A-E approach
  - Start with Oxygen Delivery & Ventilator
  - Finish with Pre-departure Checklist

- Attention to detail but maintain momentum

- Re-assessments or Sit Reps
  - Regular
  - Shared aloud with the whole team

Oxygen Delivery & Ventilator

Do you have enough O_2 for the trip? Do you know how to access it?

Oxygen Required (litres) =

[(MV + bias flow for ventilator) x duration of transfer] x 2

Note FiO_2 taken as 1.0 gives additional safety factor

Double check volumes and fill of O_2 cylinders available

- Do you know how to change the supply?
- Do you know the ventilator and circuit?
- What's your battery time and power source?
- What's your back up ventilation?

Oxygen Delivery & Ventilator

Oxylog 3000 plus

- Patient MV at 10l/min (NB FiO_2 1.0)
- Bias Flow at 0.5l/min

Typical ambulance oxygen set up and all full…

- 2 x ZX Cylinders -3040l = 6080l
- 2 x ZD Cylinders - 605l = 1210l
- Plus 2x CDs - 460l = 920l = 8130 litres

Bottom line = sufficient Oxygen for 13 hours

Airway

2 key questions

- Does the patient need intubation for transfer?

- What's the best way to secure the tube?
  - Tape useless
  - Ties better, padded if possible
  - Tube holders useful but can still move with swelling
  - Take personal responsibility

  - Uncut tubes prone to move – in and out
  - Measure at teeth and document

Airway

- Facial oedema is accelerated by..

 - resuscitation fluids

 - lying the patient flat

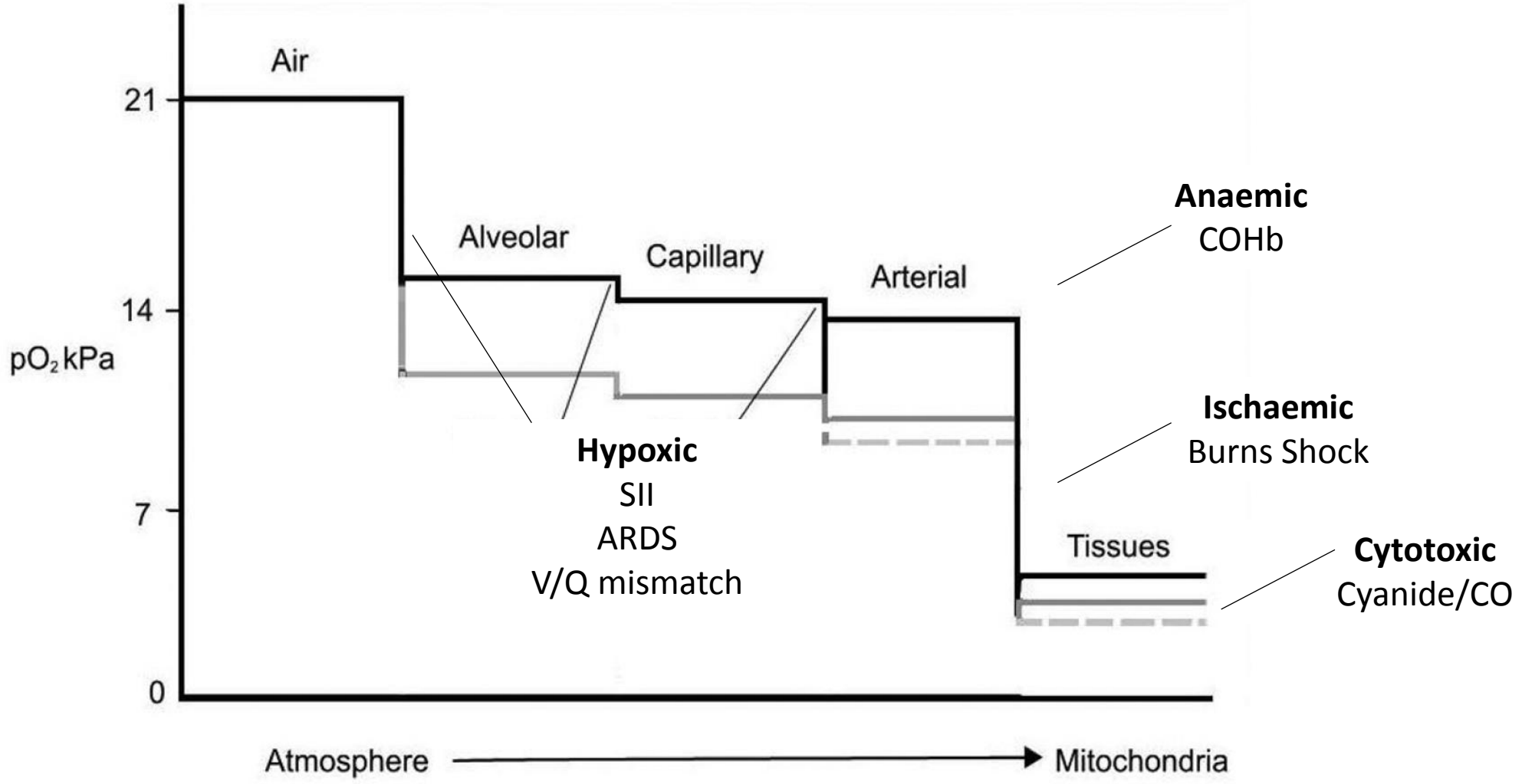
- Reintubation may be impossible

Is your tube secure?

Do you have an airway plan for displacement/extubation?

Breathing

Burn Injury may result in all 4 forms of Hypoxia



Breathing

Pre-transfer

- Chest physiotherapy & suction/bronchoscopy
- Set up and establish patient on transfer ventilator early
- Lie the patient flat to assess response to change of position

- ABG once stabilized
  - Note MV, Ventilation Pressures & Volumes
  - Note $PaCO_2$ – $ETCO_2$ difference
  - K^+/Ca^{2+}/Hct

- Nebulisation not possible - ?alternatives

Circulation

Systemic Inflammatory Response to burn injury - dependent on TBSA

Early - Hypovolaemic Burns Shock

- Capillary leak and reduced intravascular osmotic pressure
- Hypovolaemia with oliguria and acidosis
- Tachycardia and vasoconstriction
- Normo/Hypertension but reduced cardiac output
- Hypothermia

Late – Hyperdynamic Response

- Catecholamine driven hypermetabolic stress response
- Sustained resting tachycardia with increased cardiac output
- Increased metabolic and myocardial oxygen requirements

Circulation

Distinct challenges dependent on timing of Secondary Transfers

EARLY	**DELAYED**
Ongoing initial fluid resuscitation	Capillary leak sustained
Parkland Formula is only a guide Cautious fluid boluses as required	Concerns with fluid over load ARDS Abdominal Compartment Syndrome
Vasopressor when hypovolaemic may worsen M&M	Increasing vasopressor requirement
Urine output best marker of CO	MOF & AKI may make urine output unreliable
Increased Haematocrit suggests hypovolaemia	Lungs vs Kidneys?

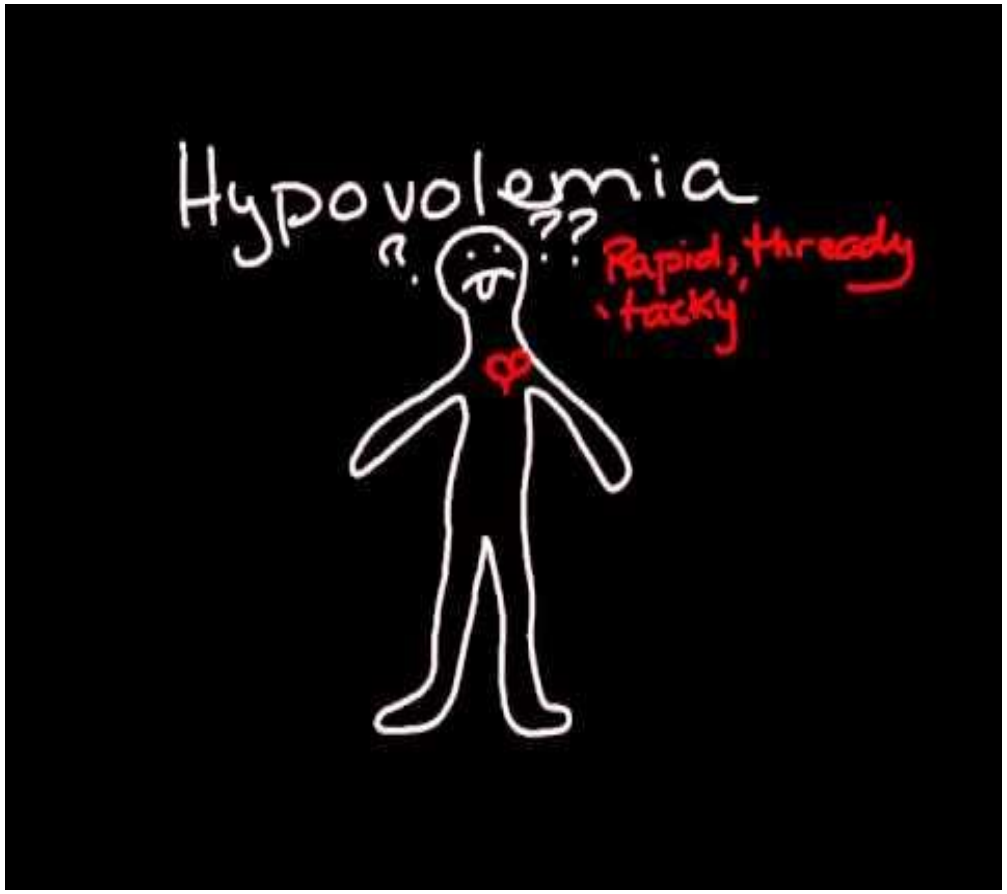
Tachycardia is not a good guide to volume status

Hypovolaemia can be unmasked by..

- Anaesthesia
- Warming and vasodilatation

High suspicion for…

- CVS decompensation
  - elderly
  - pre-existing CVS disease
  - cardiac ischaemia exacerbated by SII
- Myocardial depression secondary to acidosis



D's: Depth, Documentation & Destination

Depth

- Adequate Anaesthesia and Analgesia
  - Add in opiate for stability, Propofol sparing

- ALWAYS? use Neuromuscular Blocking Agents for transfers
  - Reduces anaesthesia and so vasopressor requirements

- Drugs - Norad

Destination

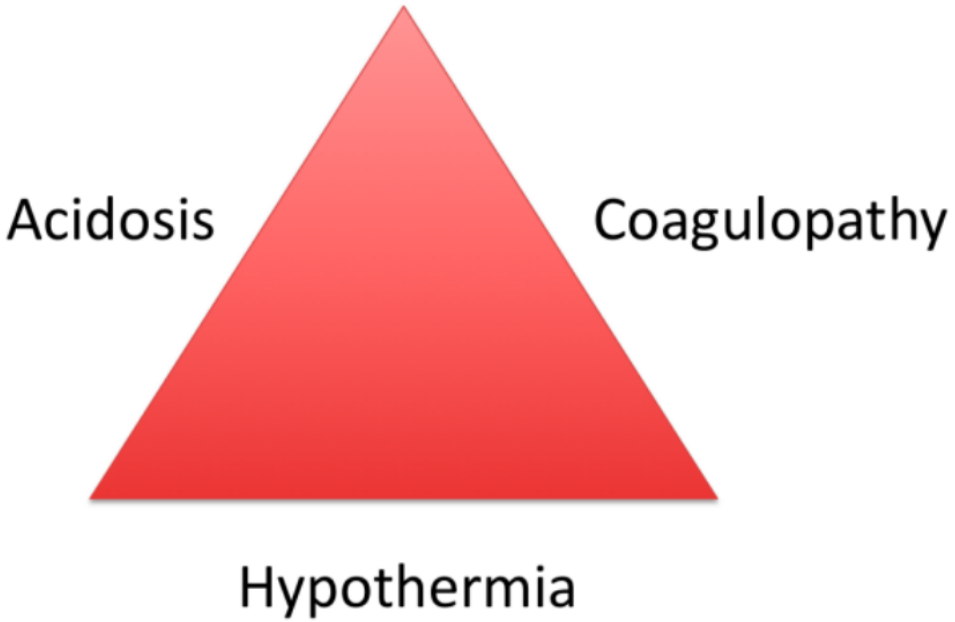
- Multiple patients = multiple comms
- Communicate with receiving burns centre in person
- Provide ATMISTER info initially
- Use again for handover on arrival
- Further detail can follow

A	**Age**
T	**Time of Incident**
M	**Mechanism**
I	**Injuries – TBSA Burn & Depth/SSI**
S	**Signs/Observations currently**
T	**Treatment & Interventions to date**
E	**ETA**
R	**Requirements - Airway issues/Escharotomies? - Infusions**

Exposure/Environment: Packaging

- Trauma Triad equally applicable to Burns patients

- Hypothermia easiest to address
  - Ensure patient is dry
  - Warmed environ/Active warming prior
  - Warmed crystalloid
  - Keep the patient covered and wrapped
    - Thermal/Space Casualty Blanket
    - Direct Heating pads
  - Ambulance heating right up
  - Ensure core temp monitoring en-route




access patient via
front or side hook
& loop strip

Packaging Tips and Tricks

Intravenous Access & Monitoring

- Direct BP monitoring as priority
- Central line if possible – femoral sites often spared

Securing Lines

- Stitch wherever you can but can cut out of burned/oedematous skin
- Look to secure over healthy skin, multiple points
- Layers of clingfilm and tape to sandwich PVC lines

ECG & SpO_2

- Can be difficult to site – ear probe useful, get creative with ECG electrodes

Planning & Pockets

- Patient orientation in ambulance
- Tape, tourniquets, pillow cases to reduce snags and tangles
- Flushes, bungs, drawing up needles, M&Ms (peanut)

Pre-departure checklist for patient transfers

- Unfamiliar equipment and environment
- Multiple team members with different roles
- Complex task consisting of multiple clinical skills
- Human factor challenges
  - Communication
  - Situational awareness
  - Time pressure

Barriers to checklist use

- ‘Another piece of paperwork’
- ‘We do that anyway’
- Cultural
  - Anti-expert
  - Removes critical decision making
- Poor implementation and training
- Poor checklist design

‘Written for the least experienced member of the team at 3am’

Appendix 6 - Transfer checklist

Tick each task when completed

- [ ] Has the intensive care consultant/TTL in the receiving hospital accepted the patient?
- [ ] Has the consultant physician/surgeon at the receiving hospital accepted the patient?
- [ ] Has the receiving hospital ITU/ED been informed of time and date of arrival and accepted the patient?
- [ ] Has the appropriate mode of transport been arranged i.e. helicopter or ambulance? Has EMRTS been considered?
- [ ] Is the patient adequately resuscitated and intubated if necessary?
- [ ] Is the patient adequately sedated and paralysed if necessary?
- [ ] Do you have a spare tracheostomy tube, including inner tube (if relevant)?
- [ ] Is there full monitoring up to the minimum monitoring standards including capnography?
- [ ] Are the patient's eyes and ears protected, and measures taken to prevent heat loss?
- [ ] Does the level of experience of the transfer team comply with these Guidelines?
- [ ] Is the transfer team wearing appropriate clothing and footwear?
- [ ] Has the transfer team got money/credit cards and mobile phone in case of being stranded?
- [ ] Ventilator checked?
- [ ] Batteries checked?
- [ ] Adequate oxygen for the journey?
- [ ] Transfer bag checked?
- [ ] Letter to receiving consultant?
- [ ] Appropriate drugs? (Don't forget fridge drugs)
- [ ] Notes?
- [ ] X-rays (or hard copy on CD)?
- [ ] Blood results?
- [ ] Transfer form (documentation and observation chart)?
- [ ] Cross matched blood and blood transfer form if applicable?
- [ ] Ring receiving hospital just before leaving?

Re-check A,B,Cs again and check an arterial blood gas after 15 minutes on the transport ventilator before leaving.

Transfer Pre-departure Checklist

Patient

Airway
- ETT secured, depth _____ ◯
- C-Spine protection (if applicable) ◯
  (Consider removing hard collar – use blocks+tape+mat)

Breathing
- EtCO2 / SaO2 ◯
- HMEF ◯
- Check ventilator alarm parameters ◯
- Consider pre departure ABG ◯

Circulation
- Arterial line (secured, accessible) ◯
- NIBP in situ ◯
- IV access - min x2 (extensions accessible, flushing, secure) ◯
- Fluids – prepared ◯
- Catheter draining and emptied ◯
- CVC? – Verify position if applicable ◯

Disability
- Neuroprotection ◯
  (Tape tube, 20° head up, PaCO2 – 4.5, MAP 65-75, loosen hard collar)
- Neuro Observations ◯

Exposure
- Eye and ear protection ◯
- NG Tube ◯
- Pressure points protected (vac mat check?) ◯
- Temperature probe ◯
- Anti-emetic ◯

Drugs (Double Quantity Expected)
- Sedation ◯
- Muscle Relaxant ◯
- Oxygen ◯
- Vasoconstrictors/dilators ◯
- Consider Blood Products ◯
- Resuscitation drugs ◯

Equipment
- Spare Batteries (from ITU)/power cables ◯
- Monitoring ◯
- Syringe Drivers ◯
- Ventilator ◯
- Suction ◯
- Retrieval Bag ◯
- Intubation bag ◯
- BVM ◯
- Defibrillator ◯
- Secure wires/ lines – minimise snag risk ◯

Other
- Money ◯
- Coat ◯
- Phone ◯

Useful Phone Numbers
Morriston: Switch 01792 702222
ED Reception 01792 703428

UHW: Switch 02920 747747
ITU: 02920 748384

UHW Theatre SpR: Bleep 6000

Communication
- Destination/receiving team confirmed ◯
- Finalise transport plans/brief crew ◯
- Receiving hospital informed of departure ◯
- Relatives Briefed ◯
- Emergency phone numbers ◯
- Notes/ imaging ◯

Suggest use of checklist as part of pre departure brief with transport crew and travelling team.

How to use the checklist

- Prepare and package……THEN checklist
- Be inclusive - involve the whole team
- Check & Response process
- Complete each section, use breaks for action

Aim to make it integral to the transfer

Suggest use of checklist as part of pre departure brief with transport crew and travelling team.

Airway

ETT secured, depth _____ ◯

C-Spine protection (if applicable) ◯

(Consider removing hard collar – use blocks+tape+mat)

Breathing

EtCO2 / SaO2 ◯

HMEF ◯

Check ventilator alarm parameters ◯

Consider pre departure ABG ◯

Circulation

Arterial line (secured, accessible) ◯

NIBP in situ ◯

IV access - min x2 (extensions accessible, flushing, secure) ◯

Fluids – prepared ◯

Catheter draining and emptied ◯

CVC? – Verify position if applicable ◯

Disability

Neuroprotection ◯

(Tape tube, 20° head up, PaCO2 – 4.5, MAP 65-75, loosen hard collar)

Neuro Observations ◯

Exposure

Eye and ear protection ◯

NG Tube ◯

Pressure points protected (vac mat check?) ◯

Temperature probe ◯

Anti-emetic ◯

Drugs (Double Quantity Expected)

- Sedation ◯
- Muscle Relaxant ◯
- Oxygen ◯
- Vasoconstrictors/dilators ◯
- Consider Blood Products ◯
- Resuscitation drugs ◯

Equipment

- Spare Batteries (from ITU)/power cables ◯
- Monitoring ◯
- Syringe Drivers ◯
- Ventilator ◯
- Suction ◯
- Retrieval Bag ◯
- Intubation bag ◯
- BVM ◯
- Defibrillator ◯
- Secure wires/ lines – minimise snag risk ◯

Communication

Destination/receiving team confirmed	◯
Finalise transport plans/brief crew	◯
Receiving hospital informed of departure	◯
Relatives Briefed	◯
Emergency phone numbers	◯
Notes/ imaging	◯

A checklist can never be absolute

Critical Incidents will still happen

Critical Incident Action Card or Drill

Standard process for dealing with a problem

- Vital when you don’t have a wealth of experience
- Very useful if you are in an unfamiliar environment
- Very useful if you are using unfamiliar kit
- Useful when you do have a wealth of experience
- Useful when you are stressed

Transfer Critical Incident Drill