Advanced Airway Management Guidelines

Contents:

WMAS Clinical Guidelines

CG - XX I Version - 1

Guideline ID	CGXX
Version	1
Title	**Advanced Airway Management Guideline**
Approved by	**Immediate Care Governance Group**
Date Issued	May 2017
Review Date	May 2019
Directorate	**Immediate Care Governance Group**
Clinical Category	**Green – Deviation permissible for registered healthcare professionals with application of clinical judgement**

Authorised staff for this section:

HEMS CCP + Consultant paramedic	**X**
Advanced practitioners as approved by ICGG	**X**
Doctor	**X**

Maxillofacial Trauma Management:

Introduction

1.1 Severe facial trauma (Abbreviated Injury Score >2) occurs in 9% of severely injured patients. The commonest cause is road traffic collisions, followed by assaults, falls, suicide attempts and industrial accidents. Associated head and cervical injuries are common.

1.2 Airway obstruction and hypovolaemia resulting from severe facial haemorrhage are the main problems associated with this type of injury. Airway maintenance with cervical spine protection and haemorrhage control are therefore key interventions in this patient group.

Airway Management

2.1 Airway obstruction can occur in the patient with maxillofacial trauma as a result of skeletal distortion, soft tissue disruption, bleeding or pooled secretions. 30% of mid-face (Le Fort) fractures will require emergent airway control.

2.2 **Positioning**;

2.2.1 Conscious patients will maintain themselves in the optimum position to maintain their own airway and drain secretions and blood. This position should be

maintained where possible during transfer. Patients should not be forced to lay supine.

2.2.2 Obtunded or unconscious patients with significant facial bleeding and pooling of secretions should be maintained in a position to allow postural drainage. The lateral trauma position is the preferred position and can be maintained on a scoop stretcher during transfer.

The Lateral Trauma Position

2.3 Suction

2.3.1 Postural drainage is more important than suction.

2.3.2 Suction should not be applied continually in the spontaneously ventilating patient.

2.3.3 When suction is required (e.g. during pre-hospital anaesthesia) a wide bore suction catheter (e.g. Yankaur) should be used. Where bleeding is torrential the suction tubing can be cut off and used directly to suction the airway in place of the narrower diameter Yankaur.

2.3.4 A second powered suction unit should always be available when undertaking pre-hospital anaesthesia in this patient group.

2.4 Fracture Reduction

2.4.1 Bilateral mandibular fractures can result in an unstable anterior segment that can displace backwards obstructing the airway. This may be managed by manually lifting the displaced fragment forward to relieve the obstruction. A suture through the tongue can be used to apply forward traction to the anterior segment and soft tissues if required.

2.4.2 Maxillary (Le Fort) fractures can result in a mobile segment that may displace backwards obstructing the airway. To reduce, the mobile segment should be grasped between the thumb and the index/middle finger (inserted into the patients mouth) and pulled forwards.

2.5 Supraglottic Airway (e.g. I-Gel)

Careful insertion of a supraglottic airway in patients with severe facial injury and/or haemorrhage can help protect the airway and allow ventilation (spontaneous or assisted) whilst awaiting definitive airway control. They particularly useful in the trapped patient where definitive airway control is not possible and for transfer in combination with the lateral trauma position when PHRSI is not available.

2.6 Pre-Hospital Anaesthesia

2.6.1 A systematic well-practised standardised RSI technique with a simple rescue plan will be sufficient to deal with most facial trauma patients

2.6.2 Pre-oxygenate and induce conscious patients in the position they are most comfortable.

2.6.3 Pre-oxygenate and induce obtunded/unconscious patients in the lateral trauma position.

2.6.4 Ensure adequate working and spare powered suction units.

2.6.5 Prepare failed airway kit (I-Gel / Surgical Airway should be unpacked/out)

2.6.6 Eye protection should be worn.

2.6.7 Move the patient and intubate in the supine position following induction.

2.6.8 Use a tie to secure the endotracheal tube (Not the Thomas ETT Holder).

3 Emergency Control of Traumatic Maxillofacial Bleeding

Torrential haemorrhage from damaged branches of carotid artery (usually maxillary artery) can occur following severe maxillofacial trauma. Most will present with a degree of airway obstruction (real or impending) and require emergent definitive airway protection. Ongoing blood loss can result in haemorrhagic shock if left unchecked.

The following technique of emergency control of maxillofacial haemorrhage may only be undertaken when the patient is completely unresponsive or anaesthetised and has a definitive airway in place (ETT or surgical airway).

3.1 **Indications**;

- Torrential traumatic maxillofacial haemorrhage in a patient that is completely unresponsive or anaesthetised, and has a definitive airway in place (ETT or surgical airway).
- For use in ADULTS only. Not for use in paediatric patients.

3.2 **Equipment**

- The contents of the Maxillofacial Haemorrhage Control Pack are shown below:
  - 2 x Nasal Epistat
  - 2 x Large bite blocks
  - 2 x Medium bite blocks
  - 2 x Small bite blocks
  - 1 x Fluid Dispensing Pin
  - 2 x 20ml Syringe
  - 1 x 0.9% Saline 100m bag
  - Sachet of lubricant gel

3.5 **Technique**

3.5.1 The patient must be intubated or have a surgical airway in place. Ensure any ET Tube is secured well with ties (NOT a Thomas Tube holder).

3.5.2 Anatomical reduction of displaced facial fractures should be undertaken and maintained.

3.5.3 A cervical collar should be sized and fitted to the patient to fix the mandible.

3.5.4 Lubricate and insert the epistats along the floor of the nose with the same technique as insertion of a nasopharyngeal airway. Do not inflate at this stage.

3.5.5 Hold the Bite Block between the thumb and fingers with the handle curving away from the mouth. Insert it between the incisors so that the teeth sit between the grooves. Slide the bite block towards the back of the mouth so that it lies between the molar teeth. Repeat on the opposite side. The bite blocks will brace the maxilla against the fixed mandible.

3.5.6 Fill two 20 ml syringes with normal saline.

3.5.7 Inflate the balloon in the posterior nasal space (white valve) with approximately 10ml of fluid, enough to prevent the epistat being pulled out with light traction. The epistat may migrate anteriorly or posteriorly at this point.

3.5.8 Now inflate the middle balloon [clear valve] with 20 - 30 mls of fluid until haemorrhage is controlled.

3.5.9 Try to inflate the balloons on both epistats simultaneously or alternately (a little at a time) to avoid causing deviation of fractures.

3.5.10 NB Both epistats must be inserted even if haemorrhage is only from one side.

3.5.11 If distraction occurs the balloons should be deflated, repositioned and slowly re-inflated.

3.5.12 IMPORTANT: Clear instructions should be given to hospital staff regarding the importance of not removing the collar and bite blocks whilst the epistats remain inflated. Epistat deflation should only occur in the operating theatre or interventional radiology suite.

3.6 Complications

3.6.1 If epistats are inflated before the collar and bite blocks are applied the mobile maxilla can be forced off the base of the skull increasing the space for bleeding.

3.6.2 Midpalatal distraction may occur during epistat inflation. This can be reduced by rotating the bite blocks in position so their superior surface is angled medially. If this fails to prevent distraction, epistat inflation should cease and the patient should be transferred to hospital with maxillofacial surgery where transpalatal circumdental wire can be placed.

3.6.3 Balloon migration is common and can be minimised through slow and simultaneous inflation of the balloons until resistance is felt. If inward migration is a problem, use a pair of forceps to clamp the epistat at the nares.

3.6.4 Intracranial placement (as per nasopharyngeal airways).

4 Triage

All patients with severe maxillofacial trauma should be triaged to a Major Trauma Centre with a maxillofacial service (QEHB, UHNS or UHCW).

Authorised staff for this section:

Paramedic	**X (Needle cric only)**
HEMS CCP + Consultant paramedic	**X**
Advanced practitioners as approved by ICGG	**X**
Doctor	**X**

Emergency Airway Techniques:

Introduction

Surgical cricothyroidotomy and needle cricothyroidotomy are methods of providing rescue oxygenation and/or ventilation to patients when all other methods have failed to secure the airway. Needle cricothyroidotomy is the preferred technique for airway rescue in children under 10yrs.

Needle Cricothyroidotomy

1.1 Needle cricothyroidotomy is a means of delivering emergency oxygenation to a patient who cannot be oxygenated or ventilated by any other means and in whom:

- a surgical cricothyroidotomy is contraindicated (e.g. children under 10 yrs old)
- a surgical cricothyroidotomy is unavailable through lack of trained personnel.

1.2 Ventilation through a needle cricothyroidotomy is not possible without a high-pressure jet-insufflator – Do not use a bag and valve attached to the cannula.

1.3 The best that can be achieved without a jet-insufflator is temporary oxygenation whilst rapidly transporting the patient to a facility that is able to provide a definitive airway (surgical airway / RSI). Expiration occurs through the larynx not the cannula. It is therefore essential to ensure that gas is escaping via this route to avoid barotraumas from over-inflation.

1.4 **Indications**

- Needle Cricothyroidotomy is indicated where there is upper airway obstruction unrelieved by other airway management techniques and where surgical cricothyroidotomy is unavailable or contraindicated.

- It is the method of choice for airway rescue in failed intubation for children under 10 years, when simple adjuncts and LMA have failed.

1.5 Equipment

- MERIT West Midlands uses a WMAS pre-packaged Needle Cricothyroidotomy set.
- The contents of the set are shown below:

WMAS Cricothyroidotomy Kit

Contents:

1 x 14G safety cannula

1 x 3-way tap

1 x 5ml syringe

1 x oxygen tube

1.6 Technique

- Assemble the insufflation apparatus by attaching the oxygen tube to the 3-way tap connector (the end of the oxygen tubing can be forced over the 3-way tap port). Ensure the tap is set with all 3 ports open. The free end of the oxygen tube should be attached to an oxygen supply. The oxygen flowmeter should be set to 15 litres per minute in adults and 1 litre/min per year of age (to a maximum of 15 lpm) in children.
- Connect the 14G cannula to a 5ml syringe
- Where possible the patient should be supine with the head in the neutral position
- Stabilise the thyroid cartilage with one hand.
- Identify the cricothyroid membrane by palpation.
- Insert the cannula through the skin and cricothyroid membrane in the midline, angled at 45º to the skin towards the feet. Aspirate during insertion.
- On penetration of the trachea a ‘give’ should be felt and air aspirated easily into the syringe.
- The cannula should be slid over the needle and into the trachea and the needle removed.

- The cannula should then be re-aspirated to confirm position before being secured in position using tape or a dressing ensuring that the cannula does not kink.
- Attach the insufflation apparatus to the cannula via the 3-way tap extension.

- Attempt to oxygenate the patient by occluding the 3 way tap by occluding the open port until the chest rises, then release for sufficient time to allow expiration (via the pharynx). This equates to 1 second inspiration and 4 seconds expiration on average. In adults, chest movement may not be obvious, and in this event a rising SpO2 should be accepted as success of oxygenation. Where the chest fails to rise on insufflation in children increase the flow rate by 1lpm increments (to a maximum of 15 lpm) until the chest rises.
- Hypercapnia reaches dangerous levels after about 30 minute of this treatment. The aim should be to evacuate to the nearest emergency department for definitive airway care within this timeframe.

1.7 **Complications**

- Bleeding
- Subcutaneous emphysema
- Cannula misplacement
- Barotrauma
- Oesophageal perforation
- Inadequate ventilation (hypercapnia)

1.8 **Alternative needle cricothyroidotomy kits**:

- Purpose designed kits exist for needle cricothyroidotomy utilizing a tube over needle insertion technique. Many of these kits will allow insertion of a sufficiently large tube to allow more formal ventilation as well as oxygenation of the patient.
- Once suitably evaluated by WMAS these kits may be used as an alternative to the current needle cricothyroidotomy kits that us an intravenous cannula. An appropriate training and sign off package will be required which will be overseen by the Immediate Care Governance Group.
-

Surgical Cricothyroidotomy

2.1 Surgical Cricothyroidotomy provides a definitive airway by means of placing a cuffed tube in the trachea. A 6mm diameter tube will offer minimal resistance to airflow and permit spontaneous ventilation or IPPV. It should not be performed on patients under 10 years old because of the higher risk of misplacement and also subsequent risk of subglottic stenosis.

2.2 Indications for performing a surgical airway include:

- Failed intubation
- Swelling or trauma to the face or neck making endotracheal intubation impossible e.g. burns, facial fractures, angioedema.
- Inadequate airway access e.g. entrapments
- Progressive airway occlusion in a casualty with face and neck trauma or swelling, where the practitioner is unable to undertake pre-hospital RSI.

Surgical airway equipment should be unpacked as part of the RSI preparation process when it is anticipated that an airway will be particularly difficult including patients with:

- Airway trauma
- Difficult anatomy
- Burns to face and neck precluding jaw movement
- Possible airway burns
- Angioedema

Patients with severe facial injury may look alarming and difficult to intubate.

However, the vast majority can be intubated in the normal way by sticking rigidly to the RSI SOP. Pre-oxygenation and induction of anaesthesia should however be performed in the position where they are most comfortable and can maintain their own airway. Suction (with a back-up) should be readily available.

2.3 Equipment

The equipment for surgical cricothyroidotomy is kept in the failed intubation pouch in the primary medical bag.

- Scalpel (22 blade)
- Tracheal dilator forceps
- 6mm Tracheostomy tube or 6.5mm ET Tube
- Gauze swabs
- Syringe
- Tie / Suture

Appropriate sized bougie should also be made available.

An appropriate sized ambu bag should be prepared together with a means of connecting the patient to the bag (catheter mount, filter, with end tidal CO2 detector attached - sidestream and/or easycap).

2.4 Technique

The procedure may be performed using a single or two-person technique:

- If possible the patient should be supine with the head in the neutral position
- Stabilise the thyroid cartilage with one hand.
- Identify the cricothyroid membrane by palpation.
- Make a horizontal incision through the skin and cricothyroid membrane with a scalpel using a 'stab/rocking' technique. Where significant soft tissue or swelling obscures the normal landmarks in the anterior neck an initial midline vertical skin/subcutaneous incision may allow the cricoid membrane to be located and then entered under direct vision using a second horizontal incision. The initial vertical incision provides improved field of view and reduces the risk of bleeding at the incision site.

- Maintain the scalpel blade position within the incision and insert the tips of the tracheal dilator forceps into the airway incision on either side of the blade. The blades are then opened and held in position.

- The scalpel blade is removed and either a 6mm tracheostomy tube or a 6.5mm cuffed tracheal tube (over a lubricated intubating bougie if necessary) is inserted into the hole held open by the dilators. The dilators may need to be rotated 90 degrees to admit the tube. Aim downwards to avoid damage to vocal cords, but beware of inserting too far.
- Inflate cuff and confirm tube position in the normal way (beware endobronchial intubation).
- Secure the tube with a tie or suture – consider the use of celox gauze if bleeding is excessive.

If the patient is conscious use sedation (e.g. ketamine or midazolam) and/or infiltration of local anaesthetic along the anterior borders of both sternocleidomastoid muscles to facilitate insertion.

Where there is significant soft tissue, subcutaneous emphysema or swelling to the anterior neck then an ET Tube with bougie should be used instead of a tracheostomy tube (which may be of insufficient length to ensure the cuff remains within the trachea).

It should be noted that the 15Ch adult bougie does not pass easily through a 6mm ET tube. Use a smaller Paediatric 10Ch bougie or a larger 6.5mm ET tube instead to facilitate insertion.

2.5 **Complications**

- Bleeding
- Surgical emphysema
- Oesophageal damage
- Endobronchial intubation
- Incorrect placement (wrong plane, oesophageal)
- Damage to nerves, vessels and other structures

Authorised staff for this section:

Paramedic (with RSI assist course)	**X (as team member)**
HEMS CCP + Consultant paramedic	**X (as team member)**
Doctor	**X**

Rapid Sequence Induction and Intubation:

Introduction and scope

1.1 This SOP is intended for all those personnel involved in the provision of prehospital anaesthesia. Not all of these personnel will have the competencies or authority from their governing organisations to perform all of the skills described within this document; the complete SOP is intended as information to allow a complete team approach. Readers should be guided by their appropriate professional organisations and should only work within their own documented competencies. The Association of Anaesthetists of Great Britain and Ireland (AAGBI) has published recent guidance that has been widely endorsed by those authorities concerned with the provision of prehospital anaesthesia. The reference for this is at the end of this document and it is strongly recommended that this safety guideline is adhered to in the application of this SOP.

1.2 Maintenance of an unobstructed airway and adequate ventilation are mandatory for effective resuscitation.

1.3 In some patients, it is possible to intubate the trachea easily without the use of drugs. These patients are usually in cardiac arrest or obtunded to such an extent that they are unresponsive (e.g. do not gag, cough, move) during laryngoscopy.

1.4 For all other patients in whom intubation is considered in the pre-hospital phase, rapid sequence induction is the gold standard. Drugs to provide anaesthesia and muscle paralysis are used.

2 Indications for RSI

2.1 Indications for RSI are:

- Airway obstruction (actual or impending)
- Anticipated airway problem during transport
- Risk of aspiration
- Oxygenation ± ventilatory failure
- Unconsciousness
- Neuroprotection
- Severe haemorrhagic shock

- Major cutaneous burns (>40%)
- Humanitarian reasons – analgesia, planned surgical intervention
- Anticipated clinical course
- Transport / management considerations
    - Aeromedical evacuation
    - Agitated/combative patient (GCS ≤ 15)
    - Anticipated clinical problems e.g. the need to amputate a limb

2.2 The use of sedatives without neuromuscular blockers to attempt to facilitate intubation is associated with a significantly higher complication and failure rate than RSI. It should not be undertaken.

2.3 Where RSI would pose increased risk to the patient or rescuer, i.e. limited access or compromised scene safety, oxygenation and ventilation can be provided with a bag/mask and airway adjunct or a suitable supraglottic airway. This may be facilitated with sedation titrated to effect. Do not attempt intubation or RSI in confined or cramped conditions unless there is no feasible alternative. It is preferable to perform RSI on a trolley with 360° access.

3 Algorithm for Emergency Anaesthesia

A pre-hospital RSI is best guided by the use of a checklist (example shown in appendix 1). Whilst not mandatory it should be considered in all cases especially for those less experienced in anaesthesia.

ACCESS

Confirm scene safety.

360º access with patient on ambulance trolley is desirable.
Move patient if necessary.

Anaesthesia in a confined space is hazardous (e.g. patient still trapped in vehicle). Consider airway adjunct (i.e. supraglottic airway) to relieve airway obstruction / respiratory distress until access is optimised.

Do not anaesthetise a patient in a confined space unless there is no alternative.

PATIENT OPTIMISATION: PRE-OXYGENATION (1)

All efforts must be made to pre-oxygenate the patient to prolong the time before life threatening desaturation occurs after induction of anaesthesia if problems occur. Adjuncts, sedation and assisted ventilation may all be required. Do not abandon patient optimisation unless there is no feasible alternative.

High flow O2 via tight fitting facemask with reservoir bag whilst preparing for RSI. Nasal cannula may also be applied and high flow oxygen (10-12l/min) administered via a separate oxygen supply (apnoeic oxygenation post induction)

Manual manoeuvres may be required to hold the airway open.
Insert airway adjuncts (oro- and/or nasopharyngeal) as required to achieve best possible airway opening.
Suction as necessary.

Support ventilation if required with bag & mask.

In some patients the supine position for pre-oxygenation may not be the best choice. Consider using the position where the patient is most comfortable and can maintain their airway themselves (e.g. severe maxillofacial injuries).

In most patients, a head up position will improve the efficacy of pre-oxygenation.

INTRAVENOUS ACCESS

Secure large bore IV access. (2 lines are preferable).
If IV access is not possible, site IO access.

Confirm correct placement with saline flush (especially if cannula not sited by you). Attach free running crystalloid infusion.

If patient too agitated for adequate pre-oxygenation, administer sedation:
Either midazolam 1 mg IV (titrated to effect)
Or ketamine 20mg IV (titrated to effect)
Reduce doses suitably for paediatric patients

MONITORING

Minimum monitoring standards apply as per the Association of Anaesthetists of GB and Ireland (AAGBI) recommendations.

Attach ECG, SpO2, capnography and non-invasive blood pressure (2-3 minute cycles). All should be applied every time unless to do so would compromise overall patient.

PREPARATION

The equipment that is prepared should be organised in a standardised layout on a 'kit dump'. This includes drugs, airway devices and adjuncts, bougie, suction, adequate oxygen, a breathing and ventilation system and monitoring equipment. An example of a kit dump layout is shown in appendix 2.

INTUBATING KIT	
Bag and mask attached to oxygen	
Laryngoscopes	For adult patients, begin with a size 4 Macintosh blade. Have an alternative laryngoscope available.
Endotracheal tube	Check size, patency, cuff and presence of 15mm attachment. Lubricate cuff
Bougie	Use bougie for every pre-hospital RSI
20 ml syringe	To inflate cuff
Suction device	Positioned to right of patient's head
Catheter mount and filter	Assembled
Tube tie	

DRUGS FOR INDUCTION – the following drugs are carried for induction:

Ketamine [up to 2 mg/kg IV/IO]
The drug of choice unless specific patient concerns exist (typically extreme hypertension)

Thiopentone [up to 4 mg/kg IV/IO (max dose of 500 mg)]
Useful in status epilepticus
Dose of hypnotic agents (particularly thiopentone) should be reduced where there is cardiovascular compromise including, for example, shock; sepsis; reduced GCS; metabolic disorder; toxaemia; or severe dehydration. Clinical judgement should be used to determine how far to reduce the dose (e.g. halving it) or whether to omit completely. Consider seeking consultant advice if time allows.

Rocuronium [1mg/kg IV/IO]
First line muscle relaxant

Suxamethonium [1-2 mg/kg IV/IO]
Available if clinically indicated

Consider relaxant–only RSI for patients in extremis (deep coma with inadequate respiratory function or severe shock – volume loading before intubation is recommended for these patients. Inotropes are likely to be required).

Draw into syringes and label appropriately (use coloured stickers conforming to UK agreed standard)

For the entrapped patient with inadequate or absent respiratory function consider use of a supraglottic airway or a primary surgical airway.

VENTILATOR

Ensure ventilator turns on.
Set to 100% oxygen (no air mix).
Tidal volume 6-8ml / kg.
Respiratory rate 12 resps / minute.

Check capnography function

PERSONNEL

Ideally, 4 people are required although given operational constraints this may not be achievable at all times.

Intubation performed by an appropriately skilled operator.

Other crucial tasks to be completed by the team will include:

a. Cricoid pressure / laryngeal manipulation
b. Administration of drugs
c. Manual in-line stabilisation as indicated by clinical condition and history
d. Monitoring the patient
When MILS is performed, remove the front of the cervical collar.

PATIENT OPTIMISATION: PRE-OXYGENATION (2)

All efforts must be made to pre-oxygenate the patient to prolong the time before life-threatening desaturation occurs after induction of anaesthesia if problems occur. Adjuncts, sedation and assisted ventilation may all be required. Do not abandon patient optimisation unless there is no feasible alternative.

Continue pre-oxygenation via bag with reservoir and mask for at least 1 minute in addition to the time spent with a Hudson mask in situ. If the condition of the patient allows continue pre-oxygenation of the patient using oxygen at 15 l/min via a tight fitting non-rebreather mask for at least 3 minutes. If SpO_2 <95% after 60 seconds or there is poor respiratory effort / apnoea, assist with bag-valve-mask ventilation.

Consider use of nasal oxygenation (10-12 l/min) via a separate oxygen supply to perform apnoeic oxygenation post-induction.

Ensure that mask is tight fitting and airway unobstructed (use manual manoeuvres, adjuncts and suction as necessary). Attach capnography to BVM to ensure adequate ventilation during this phase and to establish baseline CO_2 trace.

During this time, complete the challenge-response checklist. (appendix 3)

INTUBATION

Ensure all of team are ready.

Identify correct anatomical position and apply cricoid pressure.

Administer induction agent STAT.
Flush line with running IVI.
Administer muscle relaxant STAT.

Wait for 45 seconds before commencing attempt at intubation. Fasciculations may occur if suxamethonium is used, but not if rocuronium is used.

Intubate the trachea.

This attempt must last no longer than 30 seconds (timed by team member)

Inflate cuff until air leak disappears.

If the trachea cannot be intubated on the first attempt (usually due to a poor view of the cords), undertake the '30 second drills'. (appendix 3)
Inability to intubate the trachea within 3 attempts despite performing the 30-second drills mandates using the failed intubation drill. (appendix 4)

CONFIRM TUBE POSITION

Watch for chest movement.
Auscultate in both axillae and over the epigastrium.

Attach catheter mount, filter and capnography.

Confirm presence of end tidal CO_2.

Remove cricoid pressure only on the instruction of the intubator.

Secure tube.

Repeat non-invasive blood pressure whilst securing tube.

ATTACH VENTILATOR

Ventilate with bag and mask for as little time as possible.

TRANSPORT

Secure all lines, tubes and tubing.

Administer	Morphine	0.1mg/kg in divided doses
	Midazolam	0.1mg/kg in divided doses
	Rocuronium	0.6mg/kg (if suxamethonium used at induction – not required if rocuronium used at induction)
	Metaraminol	0.5mg iv repeated to effect

Thiopentone (small doses titrated to effect) may be useful if the (head injured) patient remains very hypertensive.

Adjust ventilation to maintain $ETCO_2$ at 4.5 – 5.0 kPa.
If there is evidence of imminent coning, ventilate to $ETCO_2$ of 4.0- 4.5 kPa.
Avoid further hyperventilation completely.

Alert the receiving hospital.

Further details about management of the brain injured patient are included in a separate SOP.

4 References

Association of Anaesthetists of Great Britain and Ireland safety guideline. Pre-hospital anaesthesia. 2009. Available via:
http://www.aagbi.org/publications/guidelines/docs/prehospital_glossy09.pdf

British National Formulary (accessed June 2012) www.bnf.org

Moppett I. Traumatic brain injury: assessment, resuscitation and early management. BJA 2007 Jul;99(1):18-31. Epub 2007 Jun 1

Hulme J. Resuscitation of patients after traumatic brain injury. Trauma, January 1, 2008; 10(1): 55 – 63

Sehdev RS, Symmons DA, Kindl K. Ketamine for rapid sequence induction in patients with head injury in the emergency department. Emerg Med Australas. 2006 Feb;18(1):37-44

Morris C, Perris A, J.Klein and P Mahoney.Anaesthesia in haemodynamically compromised emergency patients: does Ketamine represent the best choice of induction agent. Anaesthesia 2009 64 532-539

Association of Anaesthetists of Great Britain and Ireland. Standards of Monitoring During Anaesthesia and Recovery 4th Edition (2007). Available via:
http://www.aagbi.org/publications/guidelines/docs/standardsofmonitoring07.pdf

Appendix 1 – an example checklist

Challenge-response checklist: prehospital emergency anaesthesia

Apply tight fitting oxygen mask or bag-valve-mask whilst this checklist is performed.

CONFIRMATION		
Are we agreed why we are anaesthetising this patient?		
Does any one have any questions?		
PREPARATION		
Is this the best place to perform this? ON TROLLEY? 360° ACCESS? NO DIRECT SUNLIGHT / WIND?		
Oxygen supply confirmed		
Oxygen mask on tight and reservoir bag moving with ventilation		
Capnograph trace with ventilation during pre-oxygenation		
BP monitor on cycle and baseline BP seen		
Pulse oximeter		
ECG		
Suction working		
Cricoid pressure ready		CONFIRM TECHNIQUE
In-line immobilisation person briefed / collar open (if indicated)		
Team member watching monitors		
IVI / IO DRUGS		
Cannula connected to fluid and runs easily		
Spare cannula in situ and flushed	(consider this)	
Induction agent:	drug / dose	SHOW ME
Paralysing agent:	drug / dose	SHOW ME
Long acting paralysis (if indicated):	drug / dose	SHOW ME
Resuscitation drugs:	(alpha and beta agonists)	SHOW ME
AIRWAY / VENTILATION		
Primary laryngoscope:	accessible and working	
Primary ETT:	size / cuff checked	
Alternate laryngoscope:	accessible and working	
Alternate ETT:	size / cuff checked	
Bougie		
Syringe		
Tube tie or holder		
Stethoscope		
Ventilator settings	confirmed & attached to O_2	
AIRWAY RESCUE		
Supraglottic airway and syringe available	accessible and working	SHOW ME
Surgical airway kit available	accessible and working	SHOW ME
OPA and NPA available		
Verbally confirm failed airway plans		
READY TO PROCEED?		
Does any one have any questions?		

Appendix 2 The Kit Dump – an example

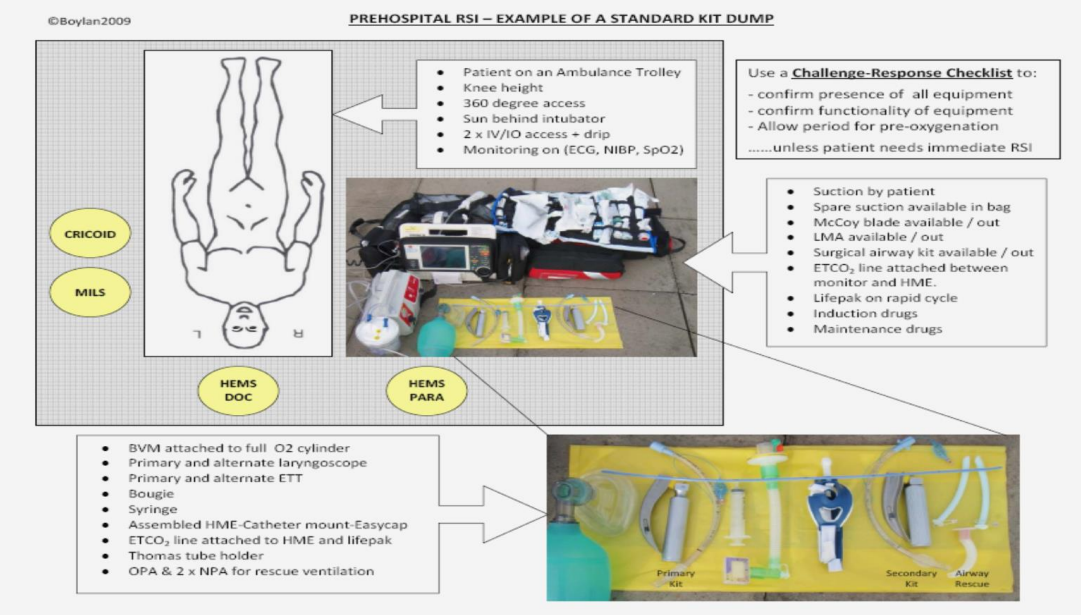
THE KIT DUMP

- Monitoring on – running on automatic setting at 2-3 minute intervals

- Spread out yellow disposable bag and lay out:
  - Laryngoscope [size 3 and 4 blade]
  - Bougie
  - ET tube [cuff tested]
  - Circuit: capnography, catheter mount, filter
  - 20ml syringe
  - Alternative smaller tube [cuff tested].
  - Alternative laryngoscope [alternative blade size].
  - 2 x nasopharyngeal airways
  - 1 x oropharyngeal airway

- Ensure availability of:
  - Bag-valve-mask connected to O_2 tubing.
  - Spare O_2
  - Difficult airway kit [supraglottic airway and surgical airway kit]

- Suction should be tested and placed to the right hand side of the patient's head.



Appendix 3 30 second drills

30 SECOND DRILLS
These are to be undertaken if the trachea cannot initially be intubated.

They must be completed within 30 seconds. A properly pre-oxygenated patient should not desaturate within this time.

Reposition yourself.

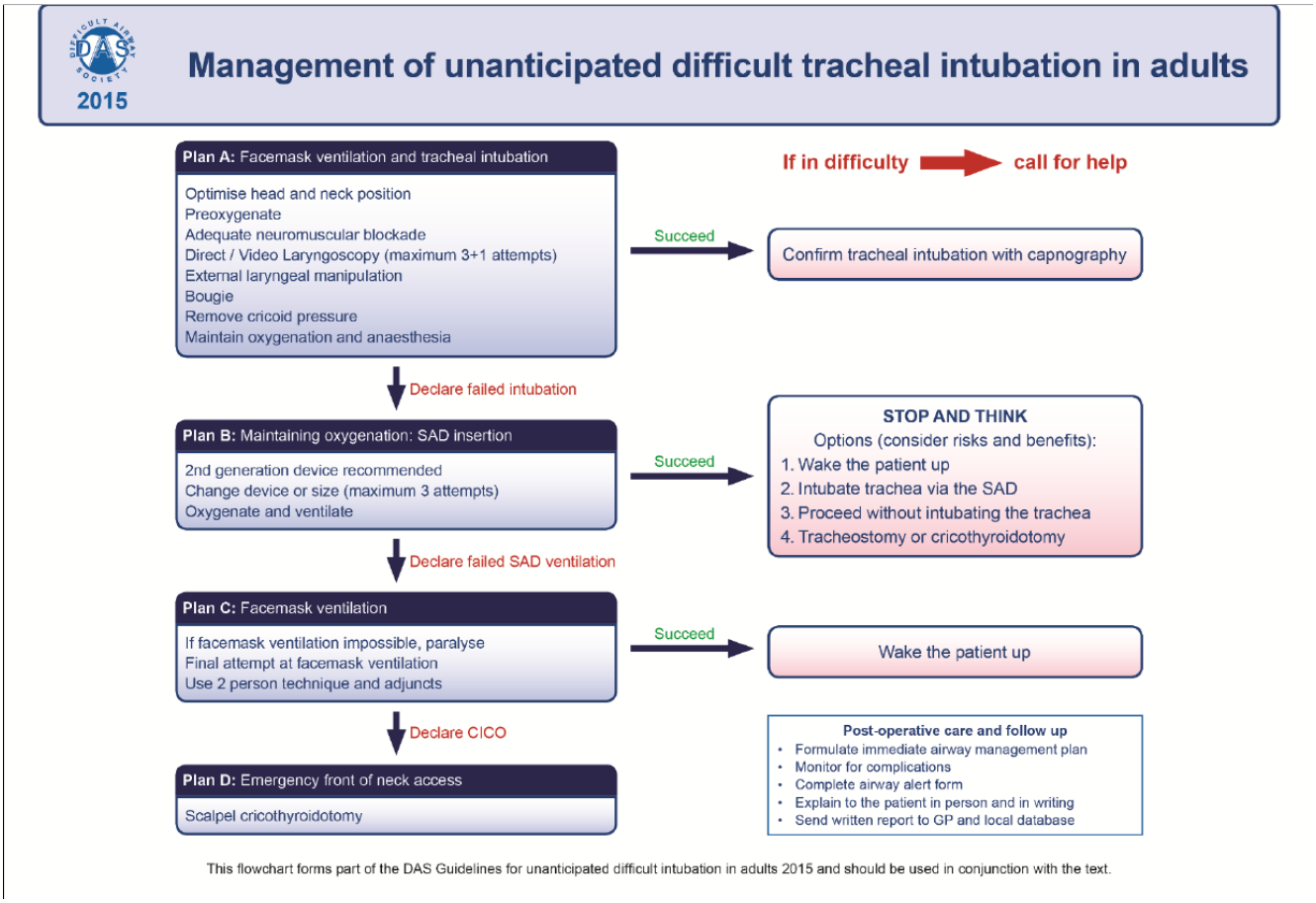
Reposition the patient.

Suction as necessary.

Reduce downward cricoid pressure in favour of BURP – backwards, upwards and right pressure to counter the opposing forces exerted by the laryngoscope.

Try an alternative laryngoscope blade.

Appendix 4 Failed intubation drill



The technique used to perform a surgical airway should be undertaken using the WMAS SOP

Appendix 1

Authorised staff for this appendix:

HEMS CCP + Consultant paramedic	**X**
Advanced Practitioners as approved by ICGG	**X**

Competency based process for autonomous surgical cricothyroidotomy

Introduction

This appendix describes the governance processes involved to train, approve (sign off) and maintain competence to undertake autonomous surgical cricothyroidotomy.

Eligible staff

- Advanced paramedics approved by Immediate Care Governance Group (ICGG)
    - Senior Trauma Paramedics
    - Consultant Paramedics
- Advanced Practitioners as approved by ICGG.

Initial training requirements

- Completion of a suitable post-graduate course involving advanced trauma management as approved by the ICGG
- Attendance at a surgical skills study day as approved by the ICGG.

Experience requirements

- Documented performance of at least 2 surgical cricothyroidotomies on a suitable training manikin under the observation of 2 different PHEM doctors (appendix 5.1).

Assessment

- A knowledge and skills assessment (appendix 5.2) by a PHEM consultant approved by the ICGG.
- Feedback from the 2 supervising PHEM doctors above.

Sign off process

- All documents related to the above process reviewed by consultant lead for the process, as approved by the ICGG.
- Advanced practitioner issued with sign off certificate (appendix 5.3)
- Details of sign off process entered onto a competency log (appendix 5.4) which will be held by the consultant lead for the process on behalf of WMAS.

Post sign off requirements

- All procedures performed must be recorded in a suitable personal logbook.
- All procedures must be registered on a suitable way to allow peer review.
- All signed off advanced practitioners must engage in an annual review process of their whole practice.
- All signed off advanced practitioners must attend one surgical skills study day per year and at least one revision session, utilising a suitable surgical airway training manikin, every 6 months

Appendix 1.1 – Autonomous surgical cricothyroidotomy experience record

Name:		**HPC Number**	

PART A – record of initial surgical skills training

Date of training

Location:

Trainer name (print):

Signed:

GMC number:

PART B – Observed training

- Perform at least 2 surgical cricothyroidotomies under the observation of a PHEM doctor
- **TWO** procedures should be observed by **TWO** different PHEM doctors

Practice	Date	Assessor Name	Assessor Signature	GMC Number
1				
2				
3				
4				

Appendix 1.2 – Knowledge and skills assessment

Name:		**HPC Number**	

To be completed by an approved PHEM consultant

- Candidate directly questioned on indications / complications / anatomy / challenges
- Candidate demonstrates the procedure on a chest model with commentary.

	Performance Criteria	Date	Sign
1	Lists the CCP indications for surgical airway: • Inability to establish a patent airway by any other means in an adult patient that is unconscious or in cardiac arrest. • Able to discuss the failed intubation drill and can't intubate/can't ventilate drills using example scenarios		
2	List the potential complications of surgical airway: • Bleeding • Surgical emphysema • Oesophageal damage • Endobronchial intubation • Incorrect placement (wrong plane, oesophageal) • Damage to nerves, vessels and other structures		
3	Describes the relevant airway anatomy		
4	Demonstrates awareness of potential challenges: • Bariatric: Difficult to identify landmarks – vertical incision, ETT • Trauma: Laryngeal trauma / expanding haematoma		
Demonstrate procedure on chest manikin			
5	Prepares equipment: Scalpel, Tracheal dilators (or hook), Trachy tube/6.0mm ETT, syringe, suture/tape, Gauze, Sharps bin		
6	Universal precautions followed - Gloves (ideally sterile) and eye protection minimum.		
7	Extends neck if no risk of neck injury. Correctly identifies the landmarks of the cricothyroid membrane. Preps insertion site with skin prep.		
8	While stabilising the cartilage, makes a horizontal incision (vertical incision if cricothyroid membrane difficult to identify) through the skin directly over the cricothyroid membrane.		

9	While continuing to stabilize the larynx, uses the scalpel to incise the cricothyroid membrane horizontally.		
10	Inserts tips of the haemostat/ tracheal forceps/hook through the opening and opens the jaws to dilate the opening.		
11	Method A: Size 6.0mm tracheostomy tube with obturator inserted between the jaws of the forceps into trachea. Tube fixed and obturator removed. Cuff Inflated. 6.0 ETT tube rail-roaded over the bougie into position. Fix tube and remove bougie. Cuff inflated.		
12	Ventilates using BVM and confirms correct placement – Auscultate axilla & epigastrium / Capnography		
13	Secures the tube – tape or suture.		
PHEM Consultant Name (PRINT)			

Appendix 1.3 – autonomous surgical cricothyroidotomy sign off certificate

This certificate confirms that

Has undertaken training, observation, practical experience and a skills/knowledge assessment and has been deemed competent to undertake surgical cricothyroidotomy autonomously providing they adhere to the post sign-off requirements stipulated in this document.

Name: Signature:

Date: GMC number:

Approved Consultant Lead

Appendix 1.4 – competency log

Name	Date of sign off	Date of 6-month revision	Date of year 1 review	Date of 6-month revision	Date of year 2 review

Change Control:

Document Number	ICGG-CLI-Guideline
Document	**Advanced Airway Management Guideline**
Version	5
Owner	WMAS Medical Director
Distribution list	All staff and relevant partner agencies
Issue Date	May 2017
Next Review Date	May 2019
File Reference	
Impact assessment	
Author	ICGG West Midlands

Change History:

Date	Change	Completed by
16.3.2012	Draft compiled from existing MAA SOP	Dr N Crombie
March 12	Reviewed and agreed by MERIT Clinical Leads	
March 12	Sent to WMAS Medical Director for Review and approval	
June 12	Addition of etomidate as induction agent due to supply problems with ketamine and need for cardiostable induction	Dr N Crombie
Feb 13	Added reminder to check NIBP once tube in situ, and added consideration of metaraminol 0.5mg iv in maintenance drugs to treat hypotension	Dr N Crombie
May 14	Reviewed – nasal apnoeic oxygenation added to pre-oxygenation and correction of some terminology	Dr N Crombie
September 2014	WMASNHSFT & MAAC Logo added prior to release of V4	AAOM – I Roberts
Nov 2014	Approved by WMAS Medical Director	Dr Carson
Nov 2014	Final review approval and distribution	B Tinsley
Oct 2016	Max dose of thiopentone reduced in accordance with BNF. Caution added to reduce dose of hypnotic agents in anaesthesia in cardiovascularly compromised patients. Etomidate removed.	Dr M Russell
Mar 2017	Review by ICGG and minor amendments made	Dr M Nash

May 2017	New guidelines format applied and merged with SOPs on surgical airway and maxilla-facial injuries. New competency pathway for autonomous surgical airway added	M Nash