LONDON'S AIR AMBULANCE
roadside intensive care

Pre-hospital Care Standard Operating Procedure

Rapid Sequence Intubation [RSI]

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RELATED DOCUMENTS:	SOP Scene Safety	
THIS DOCUMENT REFERS TO:	☑ PHC Clinical Practice PHC Non-clinical Practice PHC Operational Procedure	Ref: CP-8

Aims:

- Define indications for pre-hospital anaesthesia
- Describe the procedure for performing rapid sequence induction (RSI)
- Describe the procedure for failed intubation
- Define the training plan and final assessment for RSI

Background:

London HEMS carries out approximately one RSI a day. This equates to a service experience of approximately 4000 pre-hospital inductions. The algorithm has been developed to be straightforward and safe. For many years the algorithm consisted of RSI and surgical airway for failed intubation. This led to a surgical airway rate of around 2% - approximately half of which followed failed intubation and half performed as primary procedures (where intubation was not attempted). This compares well with emergency room surgical airway rates for severely injured patients. We have added alternatives in the latest algorithm following developments in airway management. We still expect the vast majority of our patients with airway compromise to either be intubated or get a surgical airway. We have no recorded cases of patients dying as a result of failed airway management after induction of anaesthesia. We mainly see two types of patients who require drug assisted intubation – those who can have a controlled procedure with a few minutes of preparation and a small group who require immediate intervention with little or no time for preparation. Training should prepare the pre-hospital Doctor for either situation.

Basic information on the drugs that we use can be found in the resource file. Etomidate is used as an induction agent, Suxamethonium and Pancuronium as muscle relaxants and Midazolam and Morphine for sedation, maintenance and analgesia. Ketamine with Midazolam is used for procedural sedation and analgesia. These particular drugs are used because of their relative haemodynamic stability and their relatively wide therapeutic margin – a 10 or 20% overdose is unlikely to cause significant problems (which is relevant in a working environment where patient weight is usually estimated). Pancuronium is used for it's

sympathomimetic actions and relatively long duration of action (the vast majority of patients will only require one dose of Pancuronium to transport them to hospital).

Policy:

Indications for RSI

1. Actual or impending airway compromise
2. Ventilatory failure
3. Unconsciousness
4. Humanitarian indications
5. Injured patients who are unmanageable or severely agitated after head injury
6. Anticipated clinical course

The decision to anaesthetise patients should be made on the basis of an 'on-scene risk : benefit assessment' in every case i.e. in each specific situation do the potential benefits of RSI outweigh the potential risks?

Intubation Algorithm [appendix 1]

- Scene safety issues should be addressed as described in the scene safety SOP before RSI is considered.
- Access to the patient should be optimised prior to RSI. Where possible establish 360 degrees of access to the patient. Even for patients in near or absolute cardiac arrest this may be the first manoeuvre. This may involve moving the patient to another part of the scene or onto an ambulance trolley. Do not attempt intubation or RSI in confined or cramped conditions unless there is simply no alternative - it is preferable to perform RSI outside or on a trolley in an ambulance.
- Monitoring should be commenced with the Propaq (Encore). Remember the Nonin monitoring device provides a reserve SpO2 and end tidal CO2 monitoring capability. Standards of monitoring satisfy the recommendations of the Association of Anaesthetists for in-hospital anaesthesia.
- Preparation for RSI: This should be automatic and absolutely standard. Everything should be aimed at optimising the first attempt at intubation. The flight paramedic should establish monitoring and rapidly provide a standard, laid out 'kit dump' **[appendix 2]** of equipment. Before commencing induction the doctor and flight paramedic should rapidly run through the 'challenge / response' RSI checklist. **[appendix 3].**
- After administration of induction agent and Suxamethonium the trachea is intubated and tube position is checked by the following: direct vision (tube seen passing through cords, 'Easi-Cap' colourimetric CO2 detector / continuous sidestream CO_2 detection and auscultation in both axillae and over the stomach.
- Where an adequate view of the vocal cords cannot be obtained the '30 second' drills should be carried out. They are named to indicate that they should be easily completed long before a normal pre-oxygenated patient starts to desaturate.

Pre RSI sedation

- In agitated patients it may be necessary to use small amounts of sedation to facilitate pre-oxygenation. Small doses (1- 2mg of Midazolam) should be titrated to effect. In patients who are obviously hypovolaemic and hypotensive then even smaller doses should be used.
- In non head injured patients with severe limb trauma Ketamine (20 -30 mgs titrated to effect) can be used.

Pre-oxygenation

- In order to increase apnoeic time to desaturation all patients should be pre-oxygenated. The aim of pre-oxygenation is to maximise oxygen delivery to the circulation and to replace nitrogen in the lungs with oxygen.
  This is done by ensuring that the patient has a tight fitting face-mask with oxygen attached. A patent airway is essential to oxygen delivery and if necessary airway adjuncts should be used (nasopharyngeal, oropharyngeal, manual airway manoeuvres). Proper nasopharyngeal toilet should be performed with a soft suction catheter via the nasopharyngeal airways if required.

- Supplementary ventilation should be provided using a 2 person technique and BVM system if respiratory effort is inadequate or ineffective.

- In patients with severe facial injuries pre-oxygenation and induction of anaesthesia should be performed in the position where the patient is most comfortable and can maintain their own airway.

- Patients with a high BMI may benefit from pre-oxygenation in a slightly head-up position (with cervical spine protection maintained) or in the sitting position.

- If the patient desaturates to 92% during an intubation attempt, the assistant must inform the intubator and explicitly suggest that re-oxygenation should take place prior to a second attempt.

Failed intubation

- The i-Gel is the default device for ventilation following a failed intubation attempt. This device minimises gastric inflation and the risks of aspiration and is therefore preferable to BVM.
- If it is felt that no further changes can be made to improve the chances of successful intubation at a further attempt then a surgical airway should be considered. If anatomy / morphology of the neck suggest this will be difficult or the physician decides that the risks of surgical airway outweigh the possible benefits then the i-Gel should be left in place.
- In agitated patients with head injury and relatively high pre-induction GCS scores who were spontaneously breathing it may be appropriate to wake and transport to hospital spontaneously breathing. Cautious sedation may be required to maintain control of the situation. In our patient population even patients with GCS scores of 13 or 14 have a high rate of intracerebral pathology.

i-Gel Device

- Although we have added the i-Gel as an alternative airway device we expect it to be used rarely and expect the majority of failed RSIs in our system to receive a surgical airway.
- We have used it instead of a standard LMA because, even with adequate muscle relaxation, many of our patients require relatively high airway pressures. This device has been demonstrated to leak at higher airway pressures than the standard device.
- Insertion is straightforward. The device is inserted until the black line reaches the teeth. It is then tested and tied in place. It may ‘mould’ a little after insertion and improve the seal a few minutes after insertion. A size 4 i-Gel should fit patients from 40 – 90 kg +.
- It should be used in preference to BVM (Bag – Valve – Mask) ventilation to prevent gastric inflation and an increased risk of aspiration. It may rarely be inserted blindly into trapped patients in whom access is severely limited and augmentation of their ventilation is required.

Surgical Cricothyroidotomy

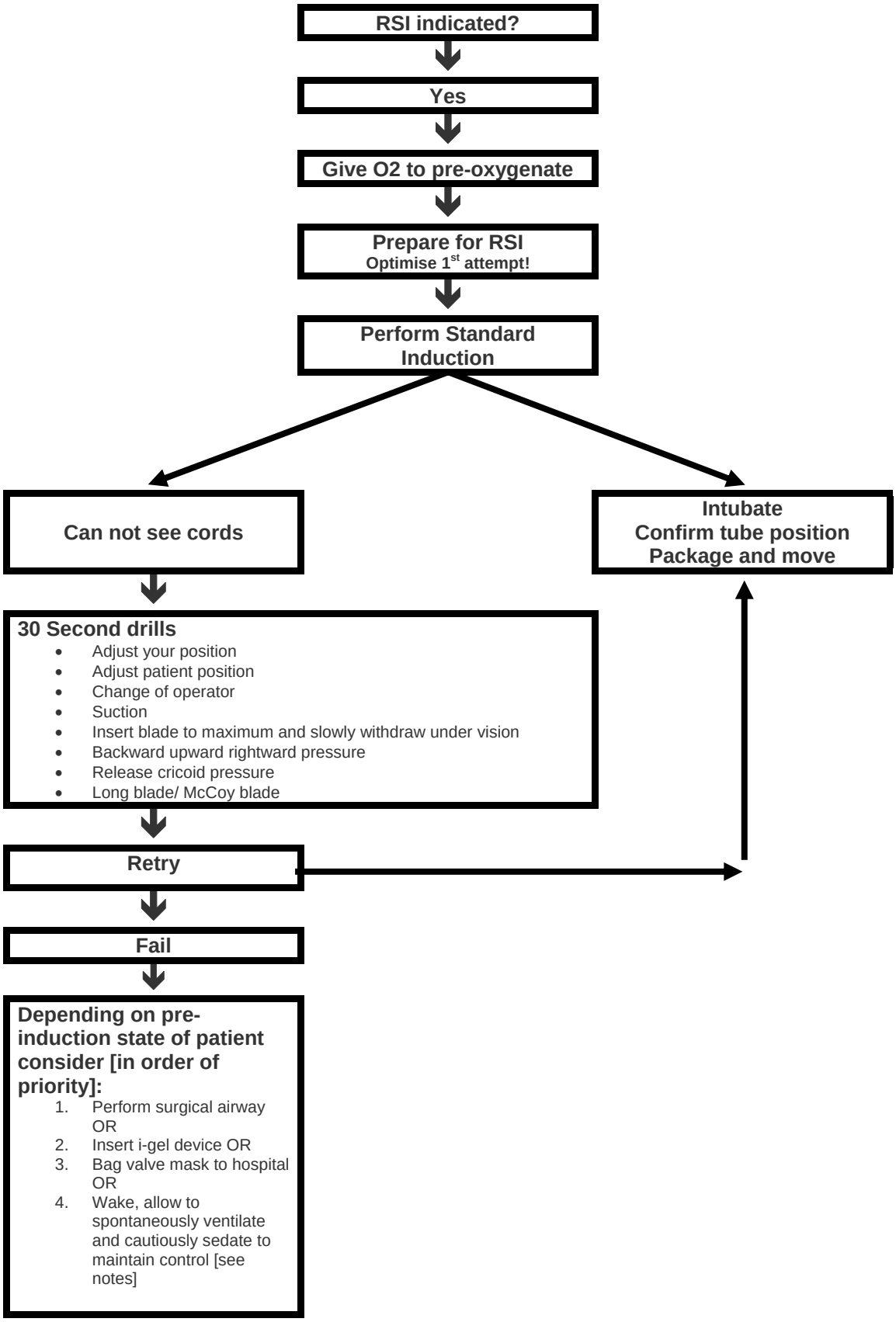
- The surgical airway equipment should be removed from its pouch when it is anticipated that an airway will be particularly difficult. For example:
    - Airway trauma
    - Difficult anatomy
    - Burns to face and neck precluding jaw movement
    - Possible airway burns

- The technique of surgical cricothyroidotomy we use is rapid, reliable and relatively easy. The Difficult Airway Society now recommends a very similar technique. It addresses two problems which we have commonly seen in the pre-hospital environment which make some of the 'standard' techniques less appropriate. These are bleeding from the incision and loss of the incision into the airway before or during tube insertion. A scalpel blade is carefully inserted horizontally into the cricoid membrane using a "stab / rocking" technique. Leaving the blade in position the tips of a tracheal dilator are pushed into the airway incision on either side of the blade and opened. The scalpel blade is removed and a **6.5mm** cuffed tracheal tube is inserted (over a lubricated intubating bougie if necessary) into the hole held open by the dilators. The dilators may need to be rotated 90 degrees to admit the tube. The cuff is inflated, tube position confirmed in the normal way and ventilation commenced. The tube is then fixed in position with a tie or elastoplast. The procedure should take around 30 seconds.

Paediatrics

- Pre-hospital anaesthesia of small children is only rarely required. For most children the risks outweigh the benefits. Where actual airway compromise cannot be overcome with simple airway manoeuvres the risk : benefit equation may change and drug assisted intubation may become appropriate.
- Equipment for paediatric intubation is kept in the 'paediatric intubation pack'. Drug dose aide-memoires and Broselow tapes are available. If the age of the child is known initially, the drug doses should be calculated on the journey to scene.

Appendix 1 - HEMS Anaesthesia Algorithm



Appendix 2: The ‘Kit-dump’

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

- Spread out yellow disposable bag and lay out:
    - Laryngoscope [size 3 and 4 blade]
    - Bougie
    - ET tube [cuff tested]
    - Circuit: easicap, catheter mount, filter [side stream connected]. NB consider mainstream in older monitor.
    - 20ml syringe
    - Alternative smaller tube [cuff tested].
    - Alternative laryngoscope [alternative blade size].
    - 2 x nasopharyngeal airways
    - 1 x oropharangeal airway

- Ensure availability of:
    - Bag-valve-mask connected to O2 tubing.
    - Spare O2
    - Difficult airway kit [surgical cric./ surgical airway pouch]
    - McCoys
    - Spare drug roll

- Suction should be placed to the right hand side of the patient’s head. The ‘Yankeur’ suction catheter must be tested.

Appendix 3: The talk through

The purpose of the talk through is to:

- Allow a defined period of preoxygenation
- Check that all the necessary equipment is present and working
- Ensure the position of the patient is ideal for intubating
- Reduce the chance of failed intubation

Every step in the procedure should be addressed in the order equipment will be used. This way no piece of equipment is missed out. While talking through ensure the patient has a tightly applied reservoir mask and that the reservoir is moving with respiration.

Step in Talk through	Common problem	Benefits
Check baseline observations and cycle time for propaq.	Propaq slipped into manual mode and displaying old readings	
Check oxygen reservoir mask is tightly applied	No seal on mask, bag not working as reservoir, bag too cold and stiff to move in winter	Maximises pre-oxygenation
Check oxygen supply [where possible an E size cylinder]	Oxygen about to run out no reserves close at hand	Avoids hypoxia
Remove cervical collar		Jaw movement for laryngoscopy and cricoid / BURP
Check position of head and neck	Patient on scoop or floor with neck in extension, head in flexion, slight neck lat flexion	Maximises view.
Check drip is patent and easily flushed and not on side of BP cuff (or cuff down)	Drip not put in by you may never have been in or may have tissued	Avoids partial or non delivery of drugs, minimises chances of failed intubation
Check drugs and doses to be given. Check operator familiar with the doses to be given	Excess given though miscommunication [see sedation and analgesia SOP].	Avoids hypotension, ICP spikes or failed intubation through inadequate paralysis.
Check operator can perform cricoid pressure, is on left of patient & understands BURP	Most ambulance staff do not know how to perform either correctly. Operator usually on patients right and makes view worse with BULP	Better view at laryngoscopy Minimises chances of aspiration
Check laryngoscope functions and working spare is present	Weak battery, damaged bulb	Equipment presence Equipment failure
Check suction is present and working	Not present at scene Weak battery with poor function Wrong suction device	Equipment presence Equipment failure
Check bougie	In summer the bougie can become very soft	Equipment presence Equipment failure
Check tube is correct size and balloon does not leak	Tubes cuff balloon has small leak	Avoids need for tube change
Check presence of catheter mount, Easicap, filter and capnography		Ensures tracheal position of tube
Check valves in self inflating bag that reservoir and oxygen supply are attached		Equipment presence Equipment failure
Check tie		Equipment presence