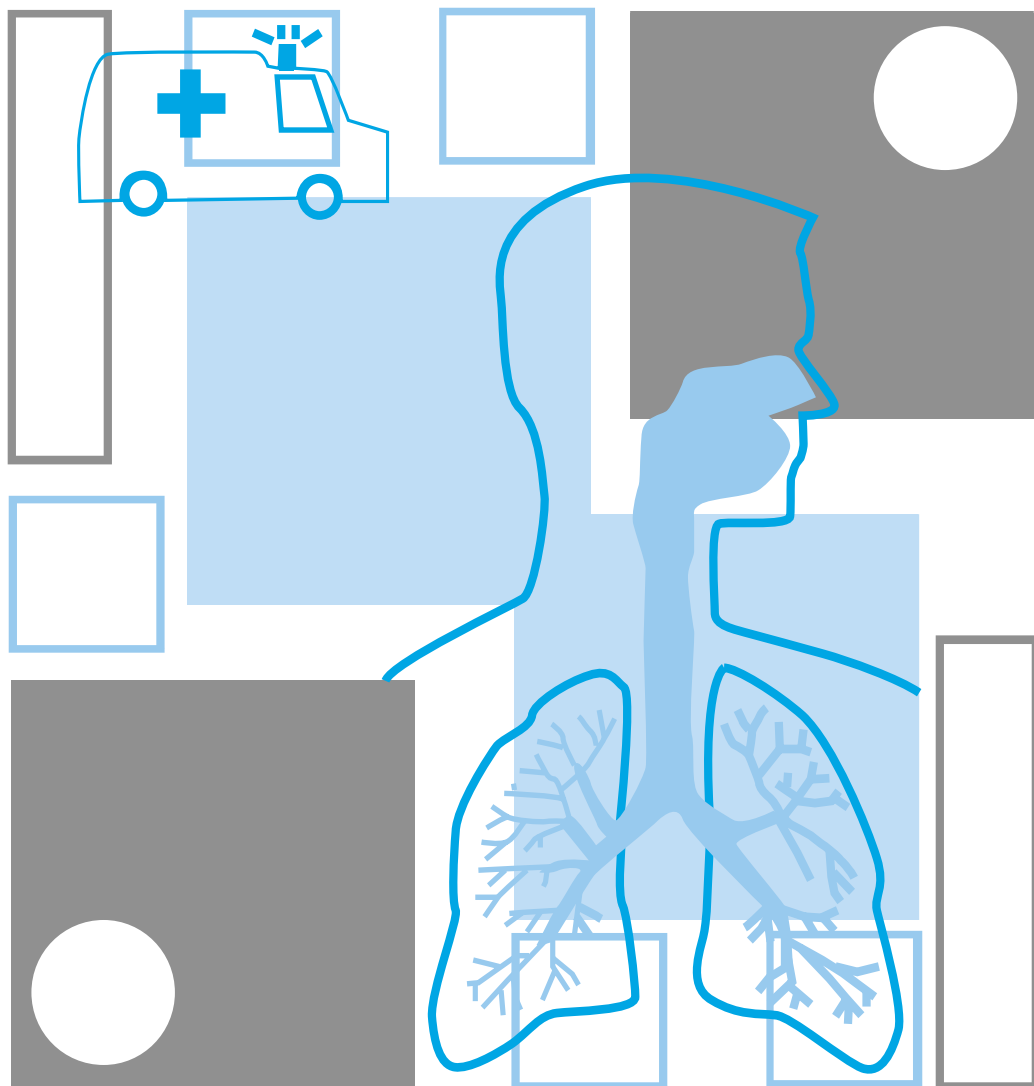


Emergency Airway Management in the Trauma Patient



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Author

Dr JE Ollerton, Trauma Fellow, Liverpool Hospital

Editorial team

NSW ITIM Clinical Practice Guidelines Committee

Mr Glenn Sisson (RN), Trauma Clinical Education Manager, NSW ITIM

Ms Joan Lynch (RN), Project Manager, Trauma Service, Liverpool Hospital

Assoc. Prof. Michael Sugrue, Trauma Director, Trauma Service, Liverpool Hospital

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Michael Parr, Ken Harrison, Bernie Hanrahan, Michael Sugrue, Scott D'Amours, Zsolt Balogh, Erica Caldwell, Alan Giles, Peter Wyllie, Joan Lynch, Bill Griggs, Peter Liston, Arthus Flabouris.

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For further copies contact:

NSW Institute of Trauma and Injury Management

PO Box 6314, North Ryde, NSW 2113

Ph: (02) 9887 5726

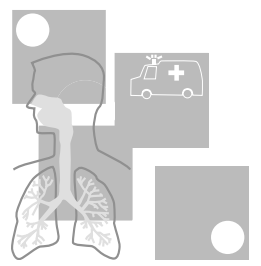
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January 2007



Important notice!

'Emergency Airway Management in the Trauma Patient' clinical practice guidelines are aimed at assisting clinicians in informed medical decision-making. They are not intended to replace decision-making. The authors appreciate the heterogeneity of the patient population and the signs and symptoms they may present with and the need to often modify management in light of a patient's co-morbidities.

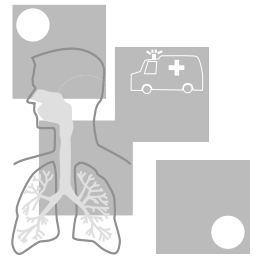
The guidelines are intended to provide a general guide to the management of specified injuries. The guidelines are not a definitive statement on the correct procedures, rather they constitute a general guide to be followed subject to the clinicians judgement in each case.

The information provided is based on the best available information at the time of writing, which is December 2003. These guidelines will therefore be updated every five years and consider new evidence as it becomes available.

These guidelines are intended for use in adults only.

All guidelines regarding pre-hospital care should be read and considered in conjunction with NSW Ambulance Service protocols.

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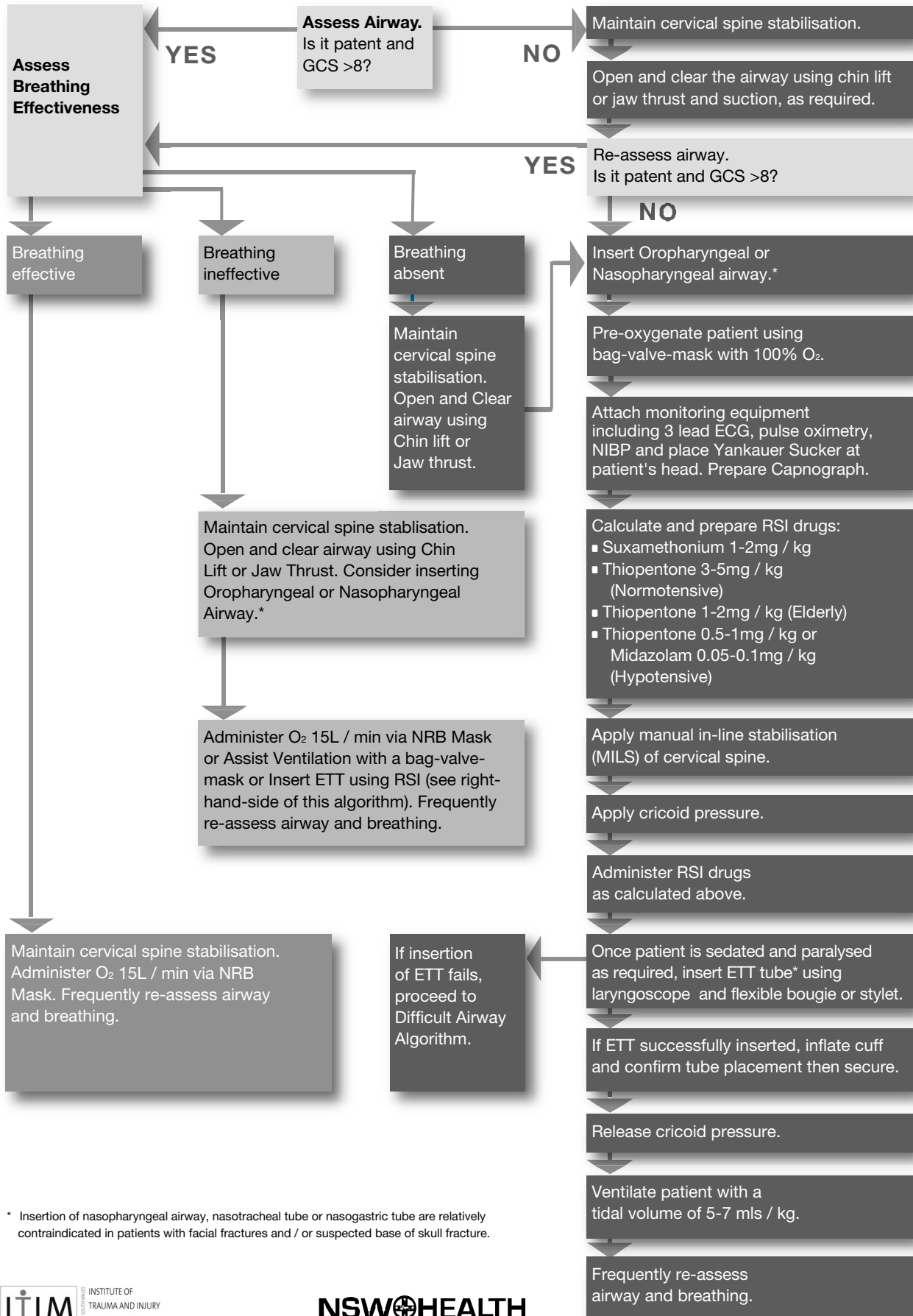
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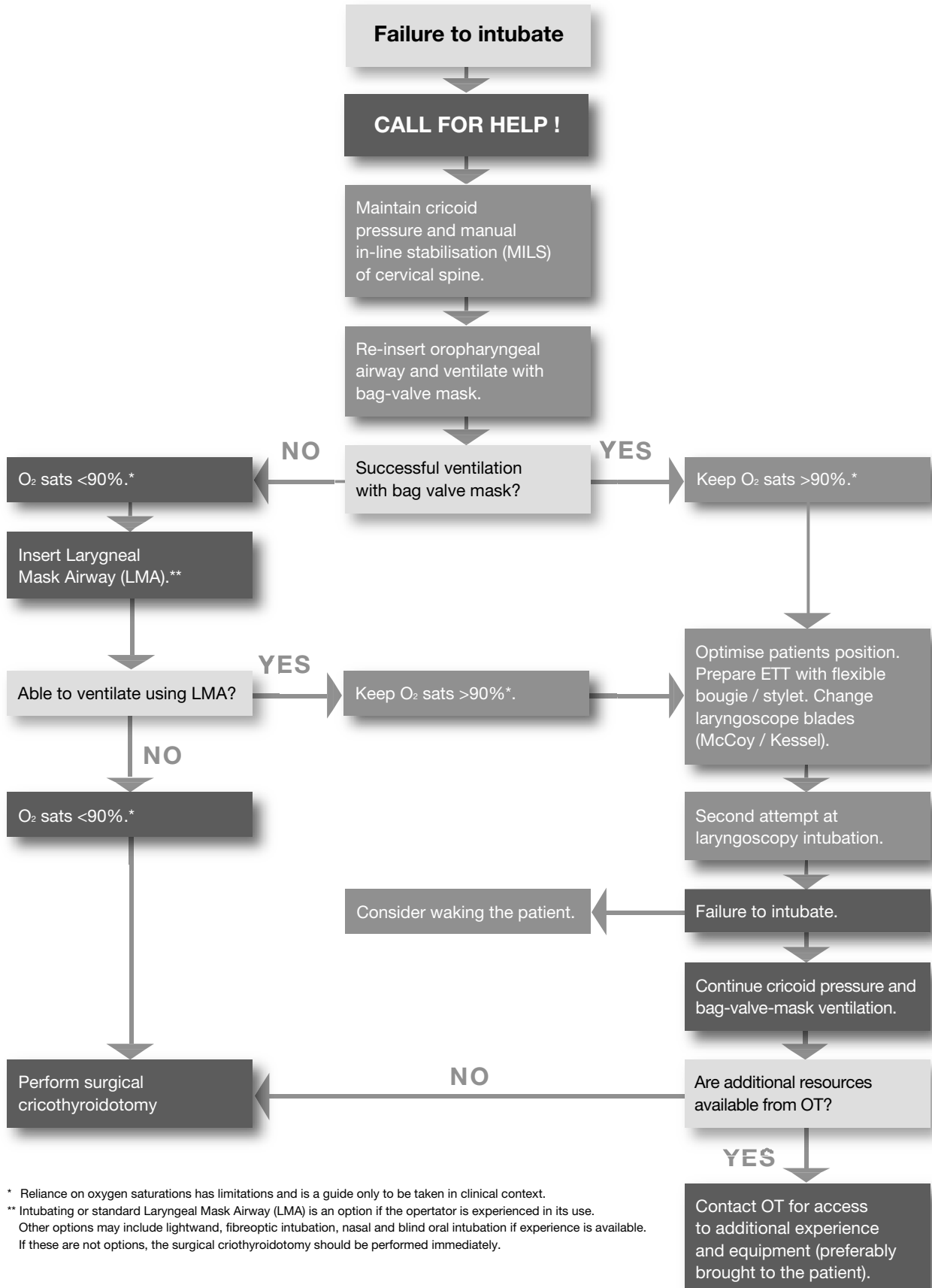
Algorithm 1 :: Airway Management

Airway Management

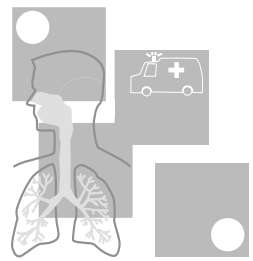


* Insertion of nasopharyngeal airway, nasotracheal tube or nasogastric tube are relatively contraindicated in patients with facial fractures and / or suspected base of skull fracture.

Difficult Airway Management



* Reliance on oxygen saturations has limitations and is a guide only to be taken in clinical context.
 ** Intubating or standard Laryngeal Mask Airway (LMA) is an option if the operator is experienced in its use.
 Other options may include lightwand, fiberoptic intubation, nasal and blind oral intubation if experience is available.
 If these are not options, the surgical cricothyroidotomy should be performed immediately.



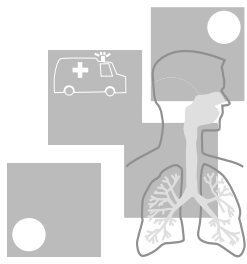
Summary of guidelines

In the patient with potential cervical spine injury requiring emergency intubation in the resuscitation room, what is the optimal method of achieving a secure airway?

| GUIDELINE | LEVEL OF EVIDENCE |
|---|-------------------|
| Rapid sequence induction and intubation (RSI) is the stepwise process to be undertaken for the intubation of this group of patients (see Appendix B on p.8 for description of RSI). Oral endotracheal intubation is the technique of choice. | Consensus |
| Patients stable enough to move to the operating theatre for intubation may have alternative options for achieving a secure airway including awake intubation. | Consensus |
| It is recommended that a tracheal tube introducer (ie flexible bougie or stylet) is immediately to hand whenever RSI is undertaken. The tracheal tube introducer should be considered for routine, first-line use in all cases to maximise rates of intubation on first attempt (19). | II |

In adults with severe head injury (GCS \leq 8) undergoing emergency intubation in the ED, what are the optimal induction agents to minimise secondary brain injury?

| GUIDELINE | LEVEL OF EVIDENCE |
|---|-------------------|
| Emergency department intubation in the severely head injured adult should be with: | |
| <ul style="list-style-type: none"> ⌘ suxamethonium 1-2mg / kg (57;58) ⌘ thiopentone 3-5mg / kg if normotensive. | II Consensus |
| There is no evidence to support the use of lignocaine or other adjuncts (59). | I |



Summary of guidelines

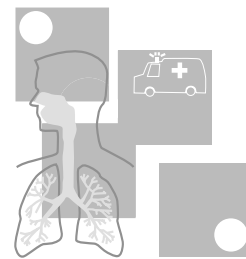
In hypotensive trauma adults requiring emergency intubation in the ED, what is the optimal induction technique to minimise further haemodynamic instability?

| GUIDELINE | LEVEL OF EVIDENCE |
|--|-------------------|
| <p>Rapid sequence induction (RSI) is the optimal basic technique to intubate hypotensive trauma patients (see Appendix B on p.8).</p> <p>The use of thiopentone by an experienced airway clinician results in the most optimal intubation conditions, but may also result in a significant decrease in blood pressure. Reduce dose to 0.5-1mg/kg for hypotensive patients.</p> <p>An alternative is the use of midazolam, which may result in a mild delay in adequate sedation, but may also result in a significantly less haemodynamic compromise. Reduce dose to 0.05-0.1mg / kg for hypotensive patients.</p> <p>Other options may include ketamine and etomidate (currently not available in Australia), but emphasis is given to the requirement for experience in its pharmacodynamic profile before use. It is recommended that propofol should be avoided in this group of patients. Doses in Table 4 (see full Airway Guideline).</p> | <p>Consensus</p> |
| <p>A fluid bolus should be administered at the time of induction to attenuate further haemodynamic compromise. Vasopressors are recommended second line to support the uncompensated hypotensive trauma patient. Recommended direct alpha agonists are phenylephrine or metaraminol in incremental boluses.</p> | <p>Consensus</p> |

In the trauma adult requiring emergency control of the airway, what is the best treatment algorithm to follow for management of a 'difficult airway'?

| GUIDELINE | LEVEL OF EVIDENCE |
|---|-------------------|
| <p>Management of adults with Difficult Airways should be as per Algorithm 2 on p.2 of this guideline.</p> | <p>Consensus</p> |

Preamble – Basic airway management



Before proceeding to read this document it is important that clinicians appreciate the importance of basic airway principles in the assessment and management of trauma patients. It is also equally important that clinicians recognise their own limitations and call for help from experienced airway clinicians early. Having sound basic airway management skills, teamed with experience, facilitates a safe and successful approach to airway management.

Prevention of hypoxia by maintaining a patent, protected airway with adequate ventilation takes priority over all other conditions the trauma clinician has to manage. Cervical spine stabilisation and immobilisation must be ensured by in-line immobilisation at all times.

Early recognition and appropriate management of the injured patient's airway and ventilation will avoid preventable deaths from airway problems after trauma. Initial assessment and management of the airway and ventilation in the injured adult is outlined below. Assessment of life threatening injuries is done simultaneously with the immediate institution of life saving interventions. Please see Algorithm 1 on p.1 of this guideline. The following is adopted from the Advanced Trauma Life Support (ATLS) course handbook.

1 Airway assessment

- ❑ Look to see if the patient is agitated, obtunded or cyanosed. Also look for accessory muscle use and retractions. Assess for deformity from maxillofacial, neck or tracheal trauma and airway debris such as blood, vomitus and loose teeth.
- ❑ Listen for abnormal breathing sounds, eg snoring, gurgling, stridor and hoarseness.
- ❑ Palpate the trachea to ascertain whether it is deviated from the midline.
- ❑ Consider the likelihood of encountering a difficult airway at intubation, eg small chin, protruding dentition, large body habitus, facial hair, pregnancy.

2 Airway management

Basic airway maintenance techniques:

- ❑ Tongue and soft tissue obstruction of the hypopharynx in the unconscious patient can be corrected by the chin lift or jaw thrust manoeuvre.
- ❑ Suction the airway with a rigid suction device to remove any blood, vomitus or debris.
- ❑ Following the above basic airway maintenance techniques, reassess the airway.
- ❑ On review of the airway, if it remains obstructed and/or patient remains unconscious, insert an oropharyngeal or nasopharyngeal airway to attain and/or maintain a patent airway (nasopharyngeal airway insertion is contraindicated in patient's with suspected base of skull fractures).

A definitive airway is defined as a cuffed tube secured in the trachea. This is required if:

- ❑ the patient is apnoeic
- ❑ inability to maintain a patent airway using the basic airway maintenance techniques described above
- ❑ risk of aspiration of blood or vomit
- ❑ impending or potential airway compromise
- ❑ closed head injury with GCS \leq 8
- ❑ inability to maintain adequate oxygenation with a face mask.

Definitive airway interventions include:

- ❑ orotracheal tube insertion
- ❑ nasotracheal tube insertion
- ❑ surgical airway (surgical cricothyroidotomy).

3 Ventilation assessment

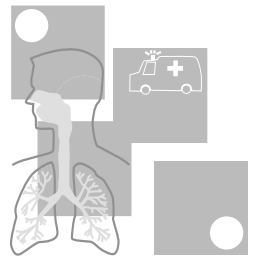
- :: Look for a symmetrical rise and fall of the chest. Asymmetry may suggest a flail chest or splinting.
- :: Listen for equal air entry on both sides of the chest.
- :: Feel the chest for injuries and percuss the chest for evidence of pneumothorax or haemopneumothorax.
- :: Adjuncts may include pulse oximetry, arterial blood gas and chest x-ray.

4 Ventilation management

- :: Supplemental oxygen is to be delivered to all trauma patients. If the patient is not intubated, deliver the oxygen via a high flow oxygen mask or bag-valve-mask device.
- :: If the patient is intubated, a volume or pressure regulated ventilator should be used if available.
- :: If a tension pneumothorax is suspected, an immediate needle decompression of the effected side is required.
- :: Ventilate patients with a tidal volume of 5-7mls / kg.

5 Reassessment

- :: Both airway patency and ventilation adequacy require frequent re-assessment in the trauma patient, especially if the patient does not have a definitive airway.



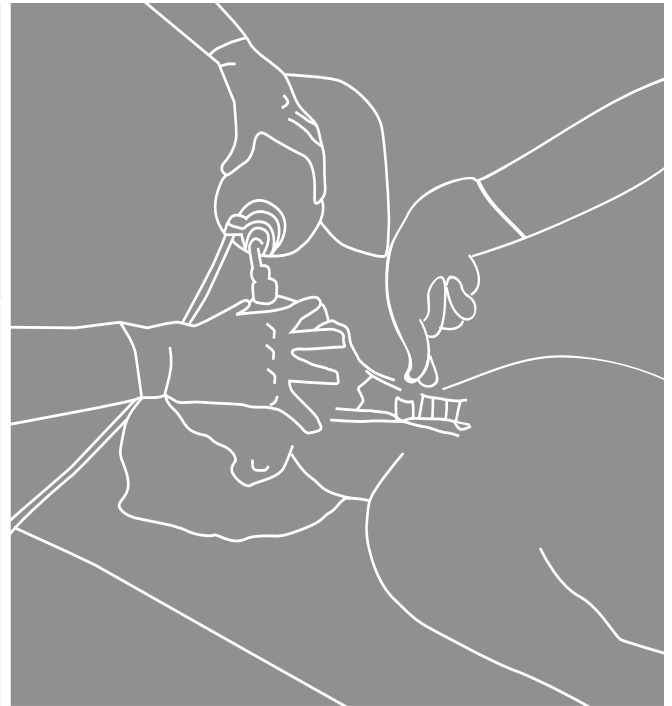
Cricoid pressure

Purpose

- ⚡ Prevention of gastric regurgitation.
- ⚡ Prevention of gastric insufflation during ventilation.
- ⚡ Aid to intubation.

Theory

Avoiding extension of the neck apply backward pressure on the cricoid cartilage. This complete cartilaginous ring transmits pressure to compress the upper oesophagus against the fifth vertebral body. Occlusion of the oesophagus prevents regurgitation of gastric contents and aspiration.



Cricoid pressure

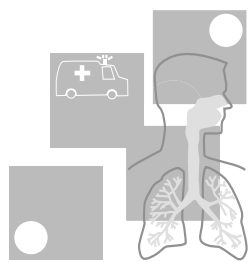
Method

- ⚡ In conscious patients the cricoid cartilage is palpated between the thumb and middle finger, with the index finger above.
- ⚡ The cricoid cartilage is located just below the prominent thyroid cartilage (Adam's apple).
- ⚡ As anaesthesia is induced the pressure is increased in a vertical plane onto the vertebral body of C5.
- ⚡ The amount of pressure needs to be approximate to 30 Newtons, comparable to the pressure that would feel uncomfortable if applied to the bridge of the nose.
- ⚡ Removal of cricoid pressure should only follow securing of the airway and the request of the person performing intubation.

Problems

- 1 Cricoid pressure may increase the difficulty of intubation, usually due to incorrect placement. The pressure needs to be applied in the vertical plane in the supine patient to avoid causing tracheal and laryngeal deviation. On request it may be necessary to adjust position or rarely remove cricoid pressure to facilitate intubation.
- 2 If vomiting occurs, cricoid pressure should be released.

Always ask if you want to remove cricoid pressure and have not been requested to do so.



Rapid Sequence Induction (RSI) in Trauma

Purpose

To achieve a secure airway, ie a cuffed tube in the trachea, whilst minimising the risk of aspiration of gastric contents in high risk individuals.

Theory

Induction of anaesthesia with a rapid onset sedating agent and neuromuscular blocking agent, application of cricoid pressure, and intubation of the trachea with an oral, cuffed endotracheal tube.

Method

- 1 Check equipment and draw up drugs.
Place wall suction under the pillow by your right hand and ensure a tracheal tube introducer is immediately available. Allocate staff roles (four experienced personnel required).
- 2 Loosen or remove anterior portion of the hard cervical collar while maintaining an immobile cervical spine with manual in-line stabilisation of the neck (MILS).¹
- 3 Pre-oxygenate patient for up to five minutes or as long as circumstances allow.
- 4 Rapid administration of induction agent followed by neuromuscular blocking agent and flush through peripheral venous line.
- 5 Application of cricoid pressure as anaesthesia is induced.²
- 6 When muscle fasciculation has stopped, there is other objective evidence of paralysis, or after 60 seconds, perform laryngoscopy and intubate the trachea.^{3,4}
- 7 Inflate the ETT cuff and check position of the tube by capnography, visualisation of chest movements, auscultation of bilateral axillae and epigastrium and observation of patient monitoring.⁵ Secure the ETT.
- 8 Remove cricoid pressure on instruction from the intubating physician.
- 9 Insert naso / orogastric tube.
- 10 Obtain a CXR to confirm tube position.



Manual In-Line Stabilisation (MILS)

photo courtesy of Trauma Department of Liverpool Hospital

Requirements

- ❑ Four trained staff
- ❑ Tight fitting transparent face mask and high flow oxygen
- ❑ Self inflating bag and mask (selection of sizes)
- ❑ Selection of laryngoscopes, blades and spare bulbs
- ❑ Selection of endotracheal tubes (ETT)
- ❑ Flexible bougie and long stylet
- ❑ Continuous monitoring of HR and Non-invasive BP
- ❑ Pulse oximetry
- ❑ Capnography
- ❑ Wall suction immediately available
- ❑ Tie to secure airway
- ❑ Drugs drawn up in pre-determined doses
- ❑ Saline flush

Notes

- 1 MILS technique is shown in the image above and described in the main text.
- 2 Cricoid pressure technique described at Appendix A.
- 3 Objective evidence may include use of a nerve stimulator.
- 4 It is recommended that a flexible bougie is always used in the trauma patient. As a minimal requirement it should be at the right hand of the operator during intubation attempts. A stylet is an optional adjunct.
- 5 Failure to correctly place the ETT should prompt the operator to follow the 'Difficult Airway Management' algorithm provided on p.1.

