

6. Emergency anaesthesia and airway management

Most paediatric airways are straightforward to manage, and intubation is easy after neuromuscular blockade; however airway management in major trauma may be very challenging.

Difficulties may be increased by

- The unfamiliar environment
- Time pressure
- Multiple simultaneous interventions
- C spine stabilisation
- Trauma to face and neck with oedema and soiling of the airway with blood
- Agitated uncooperative child due to pain and hypoxaemia

Have a low threshold for seeking senior assistance. If difficulty is anticipated either due to underlying difficult anatomy or to airway trauma, and time allows, get senior anaesthetic and ENT assistance and assemble equipment before attempting to secure the airway.

Oro-tracheal rapid sequence induction is the method of choice for securing the airway in paediatric major trauma, however effective pre-oxygenation may not be possible. Young children desaturate rapidly and this may be exacerbated by major trauma leading to a significant risk of hypoxia during intubation. **Gentle** ventilation with 100% O₂ post induction prior to intubation will allow for optimal relaxation and oxygenation prior to intubation.

Indications for **IMMEDIATE** intubation

- Airway obstruction
- Airway protection
- GCS<8
- Traumatic cardiac arrest

Consider **EARLY** intubation

- Hypoventilation
- Airway protection
- Burns, smoke inhalation
- Persistent hypoxaemia
- Haemorrhagic shock
- Severely injured child needing intervention in theatre/radiology
- To perform therapeutic and diagnostic procedures if uncooperative despite analgesia
- Stabilisation prior to transfer/retrieval
- Respiratory distress
- Cervical cord injury with evidence of respiratory insufficiency

Induction drugs

The drugs used for induction and their quantities will be based upon clinical assessment and the practitioner's experience of their use. **This must include consideration of drugs recently given for analgesia and procedural sedation** in the pre-hospital phase of care.

It is strongly recommended that ketamine is used as the induction agent of choice in major trauma. It provides relative haemodynamic stability and a wide therapeutic margin (10-20% context specific overdose is unlikely to cause problems).

The following regimes are strongly recommended:

Standard 3:2:1

Fentanyl **3 microgram/kg**, Ketamine **2mg/kg** and Rocuronium **1mg/kg**

Hypovolaemic 1:1:1

Fentanyl **1 microgram/kg**, Ketamine **1mg/kg** and Rocuronium **1mg/kg**

If **severe hypovolaemia** is suspected fentanyl may be omitted. In some very exceptional circumstances it may be appropriate to administer a paralysing agent alone.

Top tips

- Remove the front of the collar for intubation
- Have a low threshold for using a bougie or a stylet to minimise neck movement
- Consider a cuffed tracheal tube if there is airway soiling or the need for high pressure ventilation
- Use an uncut tube in burns and facial trauma
- Gastric distension can significantly compromise ventilation. Decompress the stomach with an orogastric or nasogastric tube
- Post intubation ventilate to normocarbia of 4.5 - 5kPa. Don't rely on the absolute value of EtCO₂, check a blood gas

See Appendix 2 – Airway Algorithms including Surgical Airway

[**2a. Paediatric emergency anaesthesia - drugs**](#)

[**2b. Paediatric trauma intubation checklist**](#)

[**2c. Paediatric RSI kit dump**](#)

[**2d. Emergency anaesthesia flow chart including failed intubation / failed oxygenation**](#)

[**2e. Needle cricothyroidotomy**](#)

[**2f. Surgical cricothyroidotomy**](#)

Appendix 2a

Child with major traumatic injury – drugs for emergency anaesthesia in the ED

INDUCTION AGENT

Ketamine 1-2mg/kg
+/- Fentanyl

musCLE RELAXANT

Rocuronium 1mg/kg or
Suxamethonium 1.5mg/kg

Use lower dose range if
cardiovascularly unstable.
Ketamine can be used in traumatic
brain injury.

CONTINUED SEDATION

Morphine 20-80 microgram/kg/hour and
Midazolam 120-360 microgram/kg/hour

OR

Propofol 2-5mg/kg/hour

Avoid suxamethonium in

- Renal failure
- Rhabdomyolysis
- Burns >12 hours
- High spinal cord injuries >12 hours

CONTINUED MUSCLE RELAXATION

Rocuronium boluses 1mg/kg
or infusion
300-600microgram/kg/hour

Consider propofol if cardiovascularily
stable and expected to be woken in a
few hours

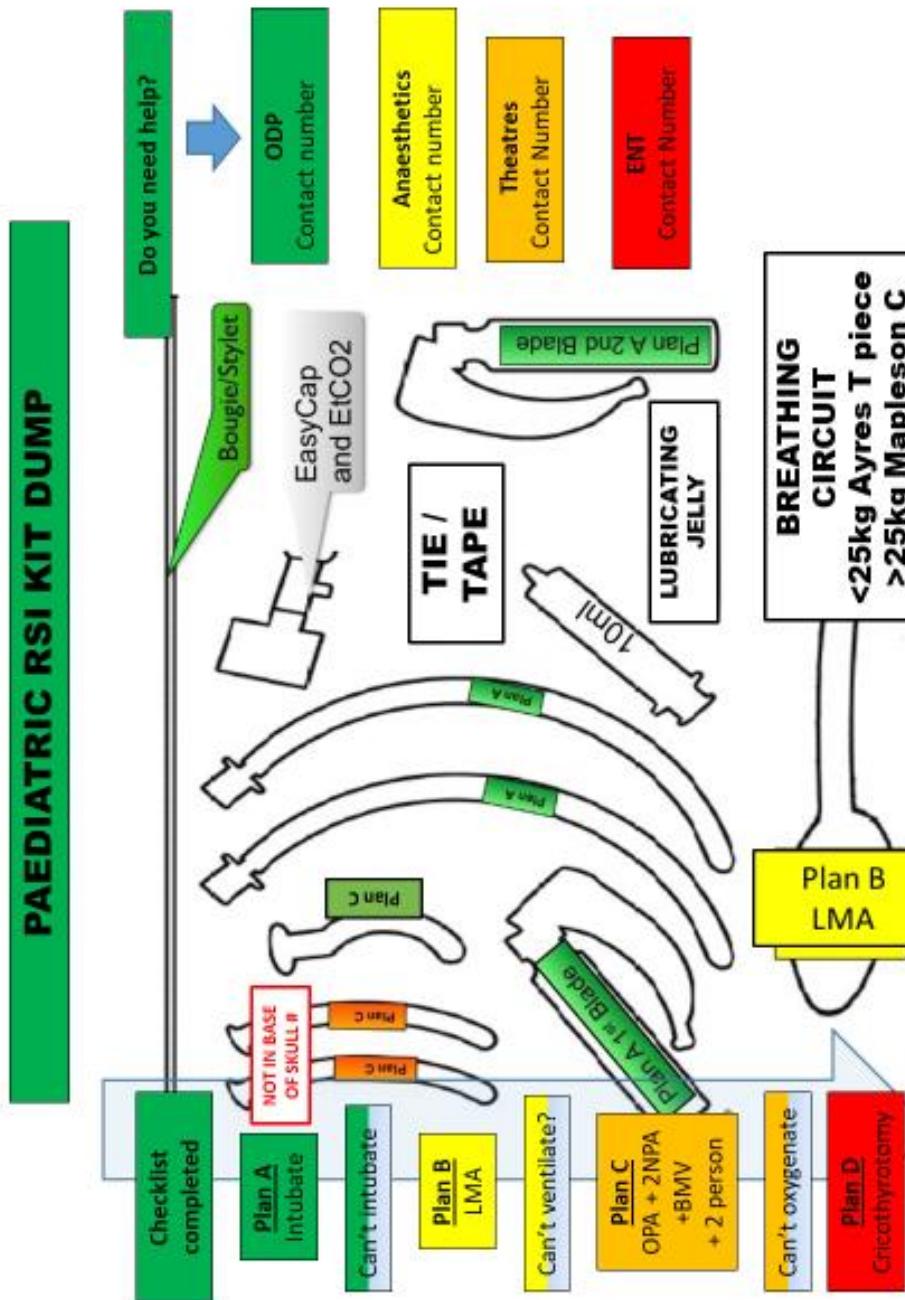
Appendix 2b

Paediatric Trauma Intubation Checklist

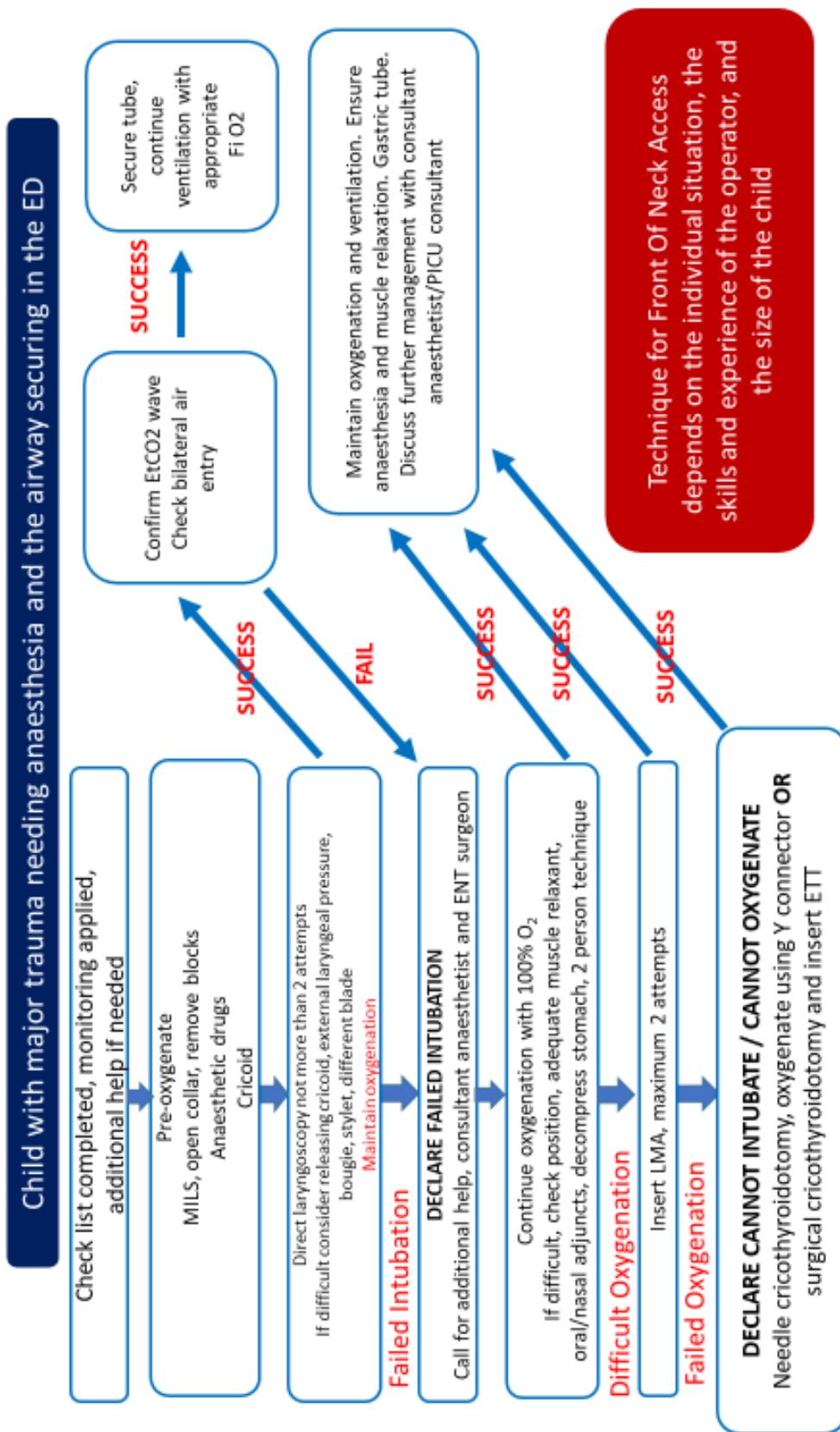
For team leader to use before every trauma intubation

Team	Patient	Drugs	Equipment
Allocate roles	<ul style="list-style-type: none">Optimise haemodynamicsOptimise preoxygenationOptimise patient position and trolley heightOptimise AAGBI monitoring: BP on 2 min cycle away from IV and SpO₂ monitor	<ul style="list-style-type: none">Secure IV/IO accessInduction drug and relaxant dose drawn upEmergency drugsSaline flushesFluid bolus	<ul style="list-style-type: none">Airway equipment checklist completeSuction workingNG tube and syringeStethoscopeVentilatorDifficult airway equipment
	<ul style="list-style-type: none">IntubatorAssistantCricoidMILSDrugsConfirm plan and rescue planCall for help if difficulty anticipated	<ul style="list-style-type: none">Post intubation sedation/relaxant/analgesia	

Appendix 2c



Appendix 2d

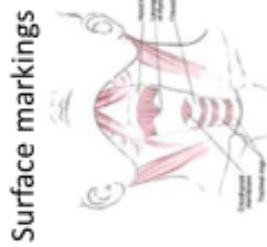


Appendix 2e

Needle Cricothyroidotomy

Equipment Required

- 16G IV cannula
- 5ml syringe containing 2ml saline
- Oxygen tubing + Y connector
- Rolled towel for under the child's shoulders



Procedure

- Patient anaesthetised and paralysed
- Place patient in supine position with a large shoulder roll to extend the neck
 - Stand on the child's left and locate the cricothyroid membrane
 - Attach a 5ml syringe containing 2ml saline to the cannula
 - Immobilise the trachea with your left finger and thumb
 - Insert the cannula through the cricothyroid membrane then aim 45° downwards towards the feet. STAY IN THE MIDLINE
 - Aspirate continuously. When you aspirate air the needle is in the trachea
- Immobilise the syringe DONT PULL BACK and slide the cannula down the needle into the trachea
 - Recheck air can still be aspirated from the cannula
 - Attach O₂ tubing on to the cannula
 - Run O₂ at 1 litre/min per year of age
 - Occlude the side hole of the Y connector for 1 sec, then release for 4 sec to allow expiration
- If this does not cause the chest to rise increase the oxygen flow rate in 1L increments until chest movement is seen
 - Check neck to exclude swelling from injection of gas into the subcutaneous tissues
 - Secure cannula and continue ventilation
 - Prepare for tracheostomy

Surgical Cricothyroidotomy

Procedure

- Patient anaesthetised and paralysed
- Place patient in supine position with a large roll under the shoulders to extend the neck
- Stand on the child's left and locate the cricothyroid membrane
- Immobilise the trachea with your left finger and thumb
- Make a VERTICAL incision in the skin (to avoid blood vessels)
- Bluntly dissect the subcutaneous tissues with your finger
- Palpate the cricothyroid membrane. Make a HORIZONTAL incision through it.
- Insert the handle of the scalpel through the incision and twist through 90° to open the airway
- Insert bougie
- Railroad an appropriately sized tracheal tube. Use a slightly smaller tube than would be used for an oral intubation
- Attach breathing circuit with capnography and confirm effective ventilation
- Secure the tube to prevent dislodgement and continue ventilation

