Clinical Practice Procedures:
Airway management/Oral endotracheal tube insertion

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Date	September, 2024
Purpose	To ensure a consistent procedural approach to oral endotracheal tube insertion.
Scope	Applies to Queensland Ambulance Service (QAS) clinical staff.
Health care setting	Pre-hospital assessment and treatment.
Population	Applies to all ages unless stated otherwise.
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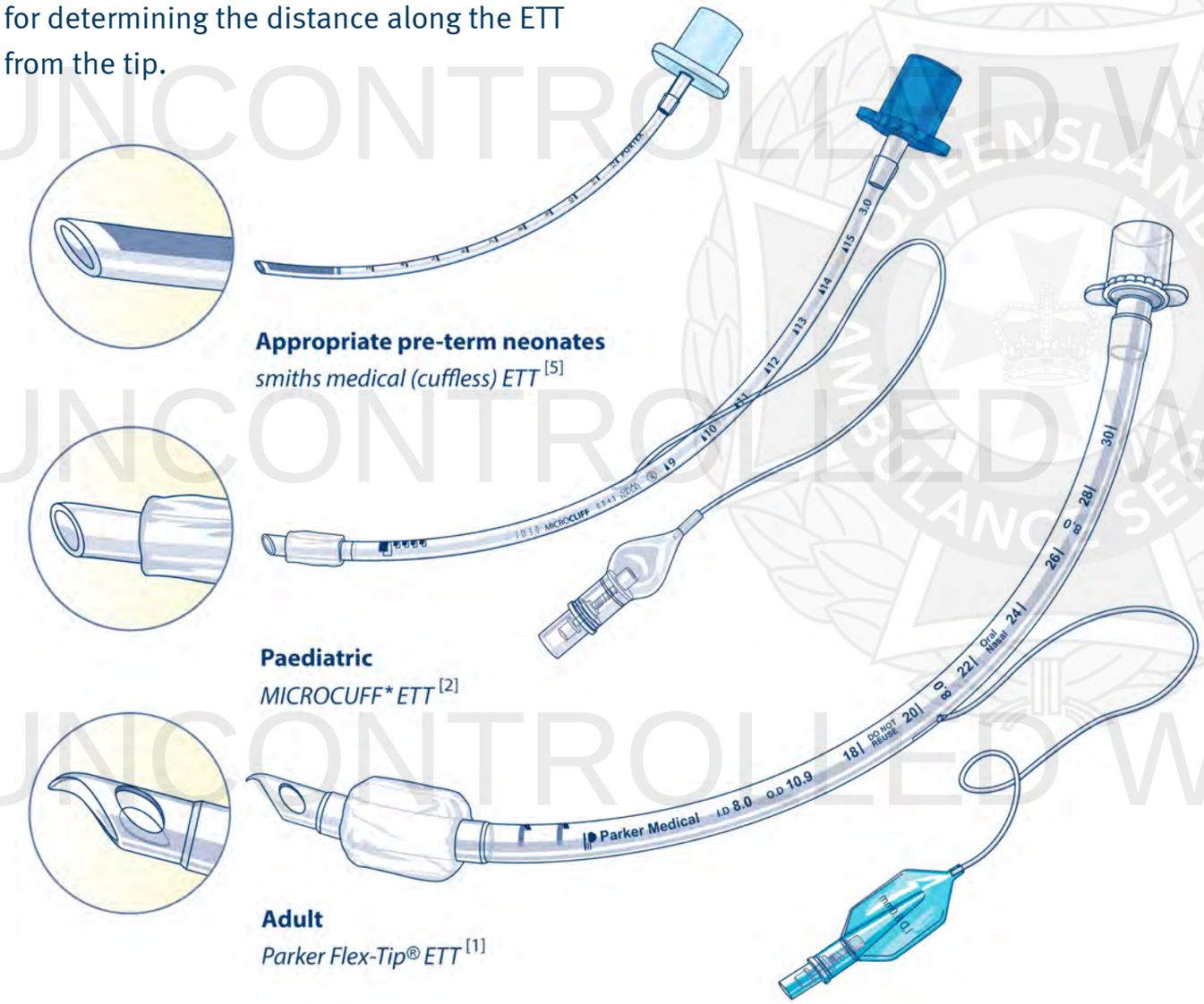
Oral endotracheal tube insertion

September, 2024

ENDOTRACHEAL INTUBATION

Oral endotracheal intubation is an advanced airway procedure involving the insertion of an endotracheal tube (ETT) under laryngoscopy into the trachea.

ETT sizing is measured according to internal diameter (millimetres). Additionally, as a reference during intubation, each ETT has a scale in centimetres for determining the distance along the ETT from the tip.



The QAS supplies three (3) designs of ETT:

- *Cuffed Parker Flex-Tip® ETT* [1] *(Adult)* – specifically designed for use with an intubating catheter.
- *MICROCUFF* ETT* [2,3,4] *(Paediatric)* – supplied without a Murphy eye.
- *smiths medical (cuffless) ETT (appropriate neonates)* – used for pre-term neonates, supplied without a Murphy eye.[5]

Indications

- Actual loss of airway patency and/or airway protection

Contraindications

- Conscious breathing patients

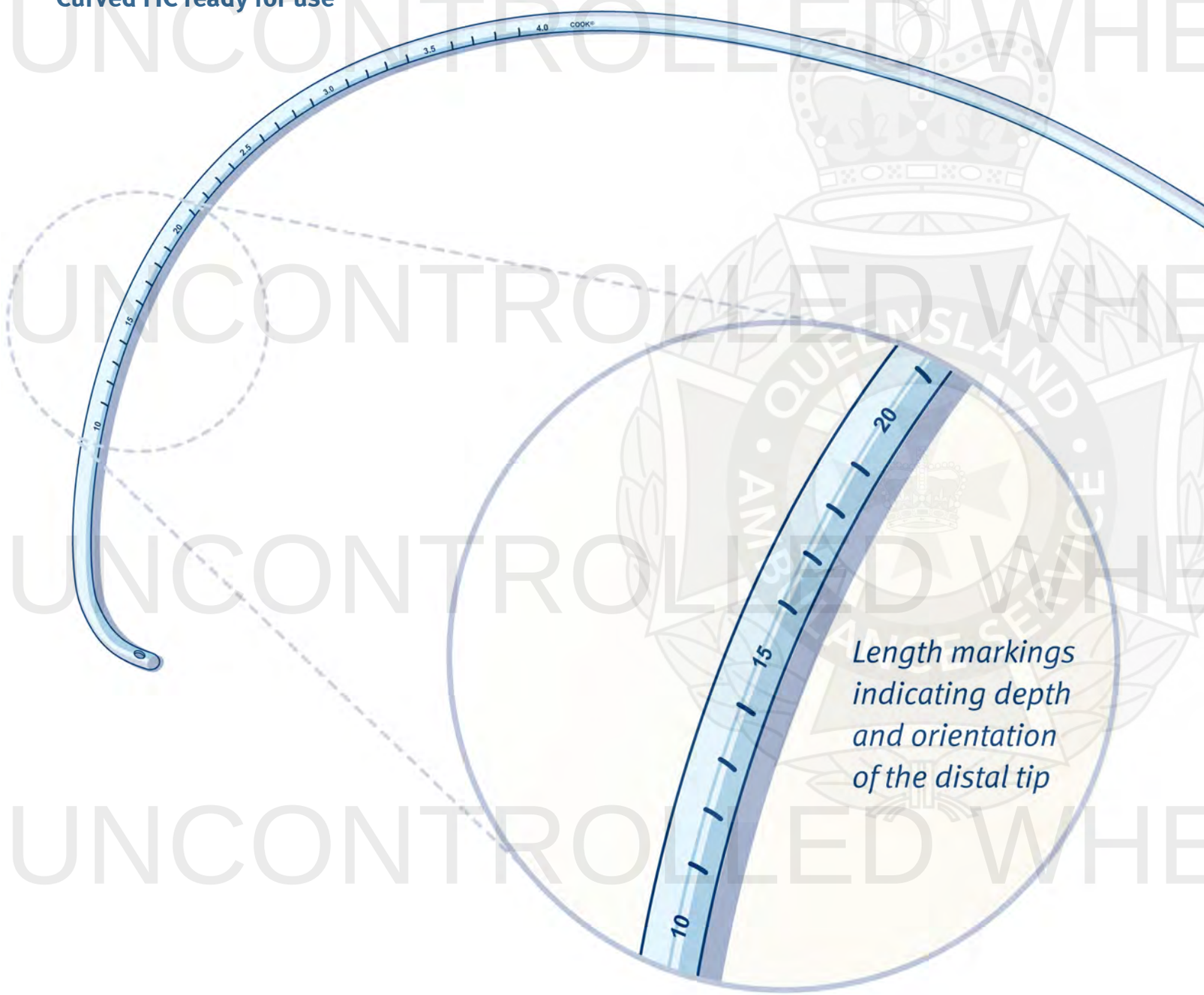
Complications

- Unrecognised oesophageal intubation
- Malposition
- Aspiration
- Hypoxia
- Laryngospasm
- Oropharyngeal trauma
- Vagal stimulation

INTUBATING CATHETER (bougie)

The **Frova Intubating Catheter (FIC)** is a 70 cm pre-curved 14 Fr (4.6 mm) airway introducer with a 30° angled distal tip designed to assist with oral endrotracheal tube placement.[6–9] It is recommended for routine or difficult intubations when using an ETT with an internal diameter (ID) of 6 mm or greater.

Curved FIC ready for use



The FIC's narrow diameter and angled tip enables targeted anatomical placement, maximising the accuracy of tracheal placement.

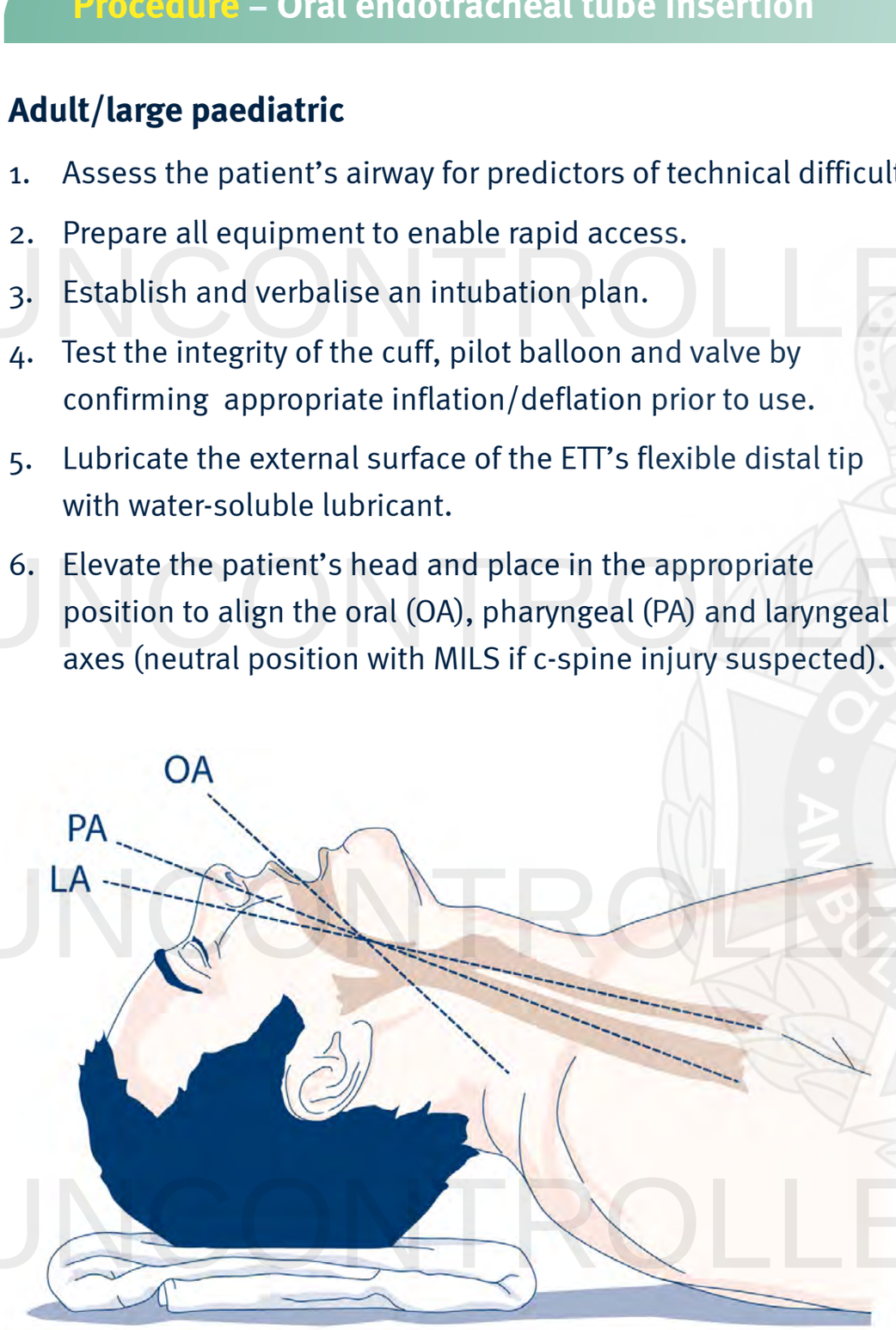
Care must be exercised to prevent trauma or perforation of airway structures during insertion.

Length markings are displayed on the internal curvature of the FIC indicating the depth and orientation of the distal tip.

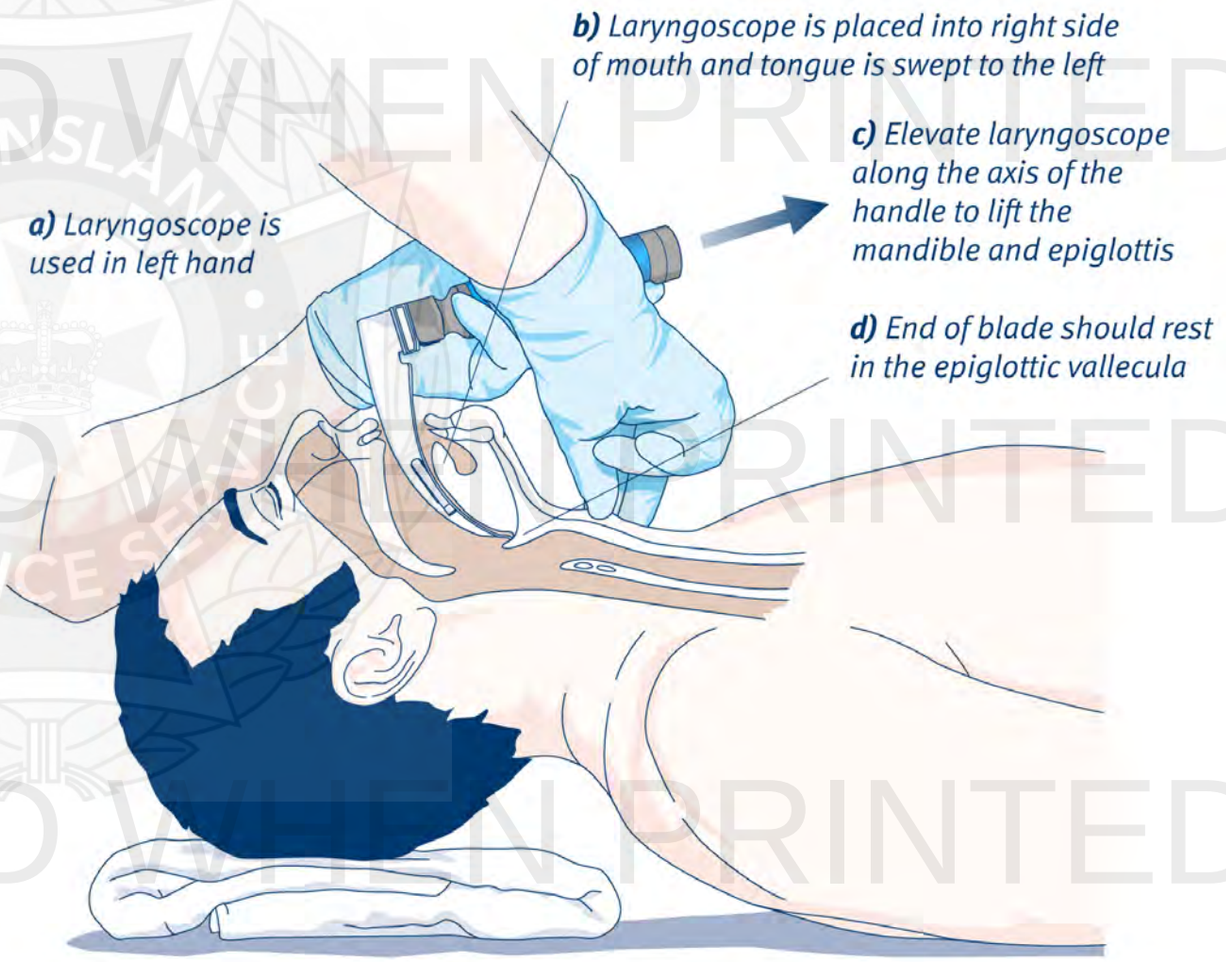
Although traditionally designed to assist with Cormack-Lehane grade III and IV views, bougie use is mandatory for all adult patient intubations by QAS paramedics.

Adult/large paediatric

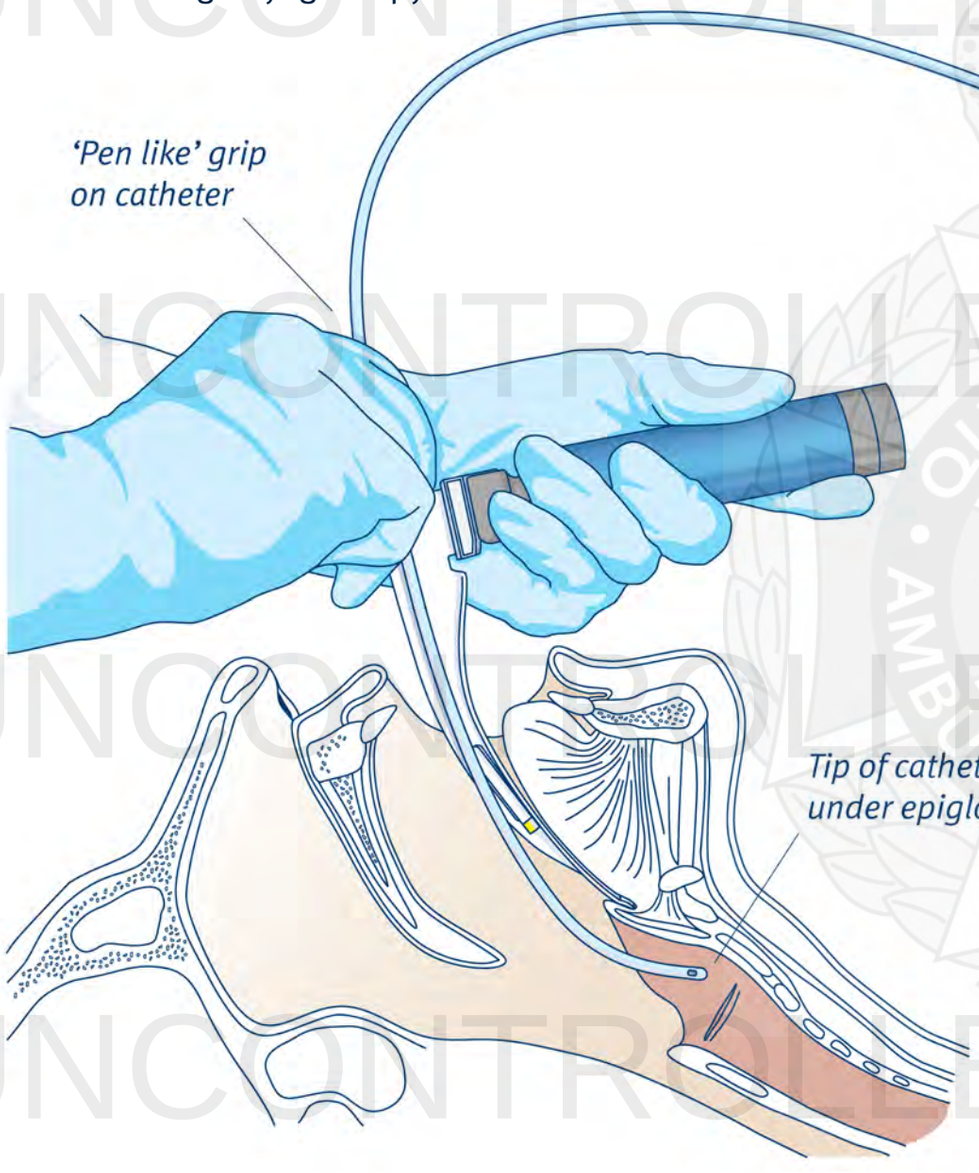
1. Assess the patient's airway for predictors of technical difficulty.
2. Prepare all equipment to enable rapid access.
3. Establish and verbalise an intubation plan.
4. Test the integrity of the cuff, pilot balloon and valve by confirming appropriate inflation/deflation prior to use.
5. Lubricate the external surface of the ETT's flexible distal tip with water-soluble lubricant.
6. Elevate the patient's head and place in the appropriate position to align the oral (OA), pharyngeal (PA) and laryngeal (LA) axes (neutral position with MILS if c-spine injury suspected).
7. Open the mouth and inspect the oral cavity.
8. Remove any dentures or removable plates from the mouth as required.
9. Perform laryngoscopy.
10. Suction as required.
11. Consider laryngeal manipulation to optimise visualisation of the larynx.



LEGEND: oral axis (OA), pharyngeal axis (PA), laryngeal axis (LA)

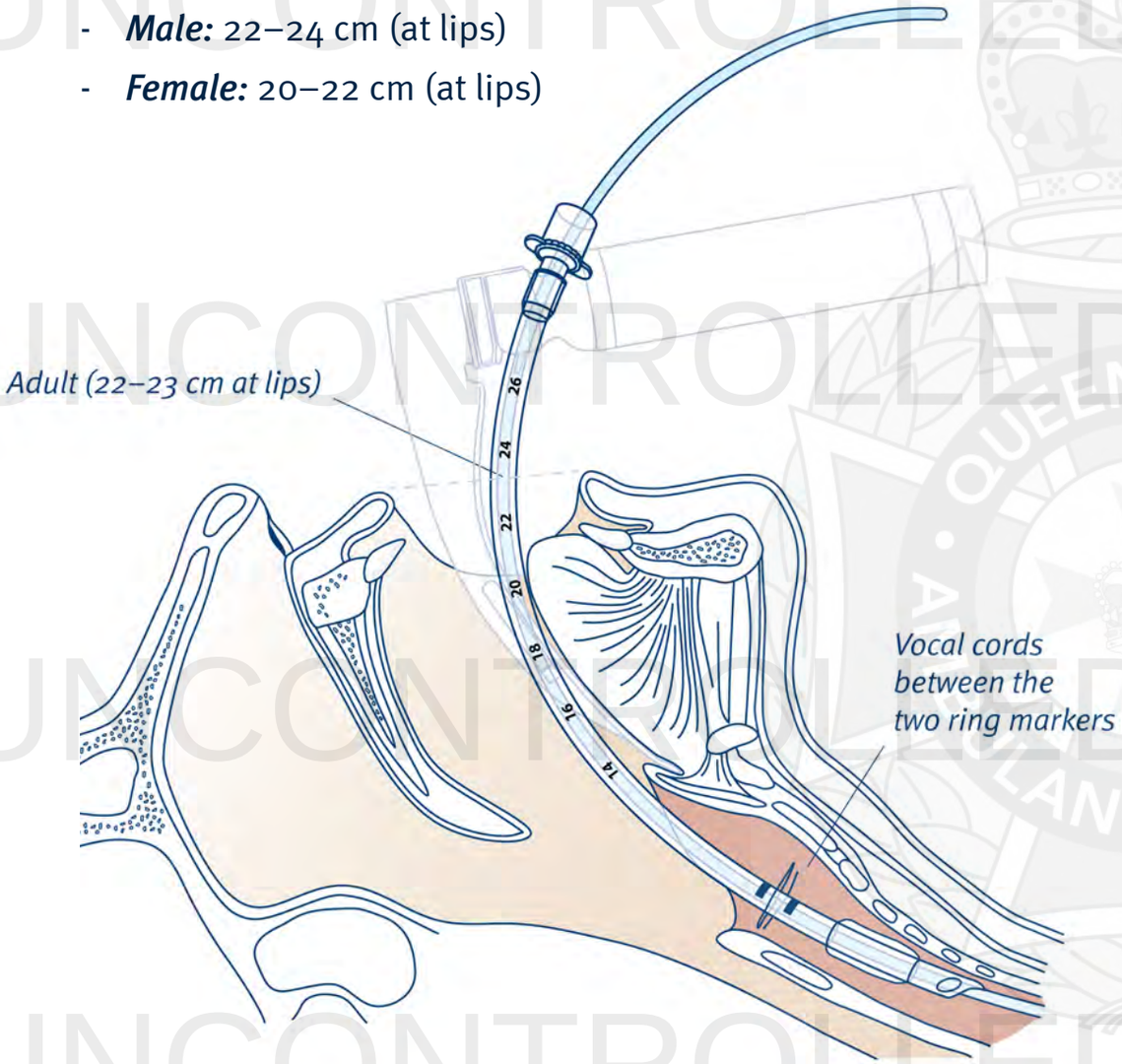


12. Gently extend the curve of the FIC to optimise controlled directional placement.
13. Visualise the the larynx under direct laryngoscopy.
14. With the right hand grasp the FIC with a 'pen like' grip while maintaining laryngoscopy.



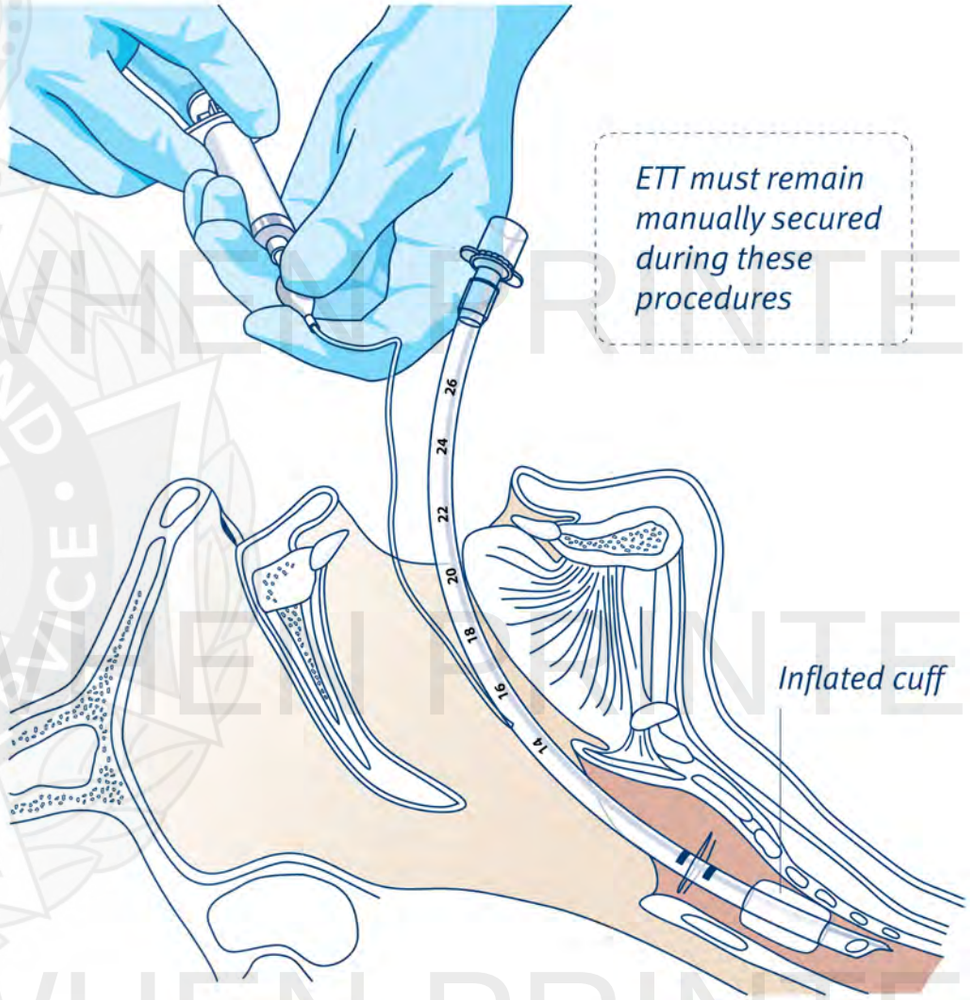
15. Gently insert the upturned distal tip of the FIC under the epiglottis and advance midline towards the glottis.
16. Gently advance the FIC into the trachea. If resistance is felt, do not force advancement but rather gently rotate the FIC anti-clockwise before reattempting advancement.
17. The 'clicking' of the tracheal rings or 'hold up' when the FIC contacts the carina may be identified and is an indicator of correct tracheal placement.
18. While maintaining visualisation of the larynx, request the airway assistant to place an ETT of the appropriate size over the intubating catheter.
    - ***Male:*** 8.0/9.0 mm
    - ***Female:*** 7.0/8.0 mm
19. Consider retraction of the corner of the patient's mouth to optimise unobstructed passage of the ETT.

20. Gently insert the ETT's flexible distal tip through the vocal cords to position the vocal cords between the two (2) ring markers. If resistance is encountered, gently rotate the ETT anti-clockwise and attempt re-insertion.
    - ***Male:*** 22–24 cm (at lips)
    - ***Female:*** 20–22 cm (at lips)



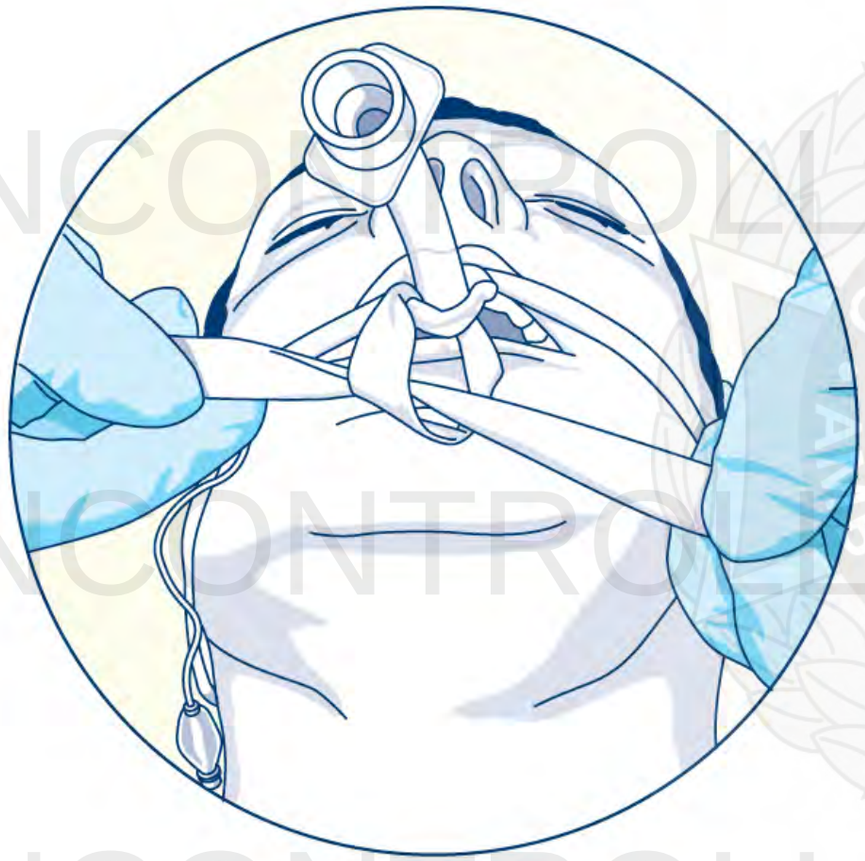
21. With the right hand hold the ETT firmly at the lips until correct placement (appropriate $EtCO_2$ waveform) is confirmed and the ETT is properly secured.

22. Remove the intubating catheter.
23. Remove the laryngoscope blade from the mouth.
24. Using a syringe, inflate the ETT cuff with the minimum amount of air required to provide an effective seal.



25. Remove the syringe from the ETT to effect the closing of the one-way valve. Confirm the pilot balloon remains inflated.
26. Connect a resuscitation bag and commence ventilation.

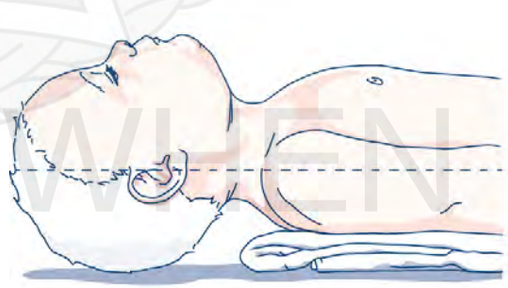
27. Confirm correct tracheal placement by observing an appropriate continuous EtCO2 waveform (a minimum of 6 ventilations of moderate tidal volume is required for confirmation) and equal air entry.
28. Secure the ETT with a cloth tie.
29. Consider insertion of a bite block.



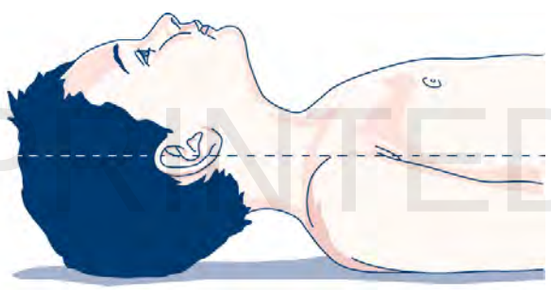
30. Administer post intubation sedation as required (titrated aliquots of morphine/fentanyl and/or midazolam).
31. Assess and adjust the ETT cuff pressure as required.

Paediatric

1. Assess the patient's airway for predictors of technical difficulty.
2. Prepare all equipment to enable rapid access.
3. Establish and verbalise an intubation plan.
4. Test the integrity of the cuff, pilot balloon and valve by confirming appropriate inflation/deflation prior to use.
5. Lubricate the external surface of the ETT's distal tip with water-soluble lubricant.
6. Consider placing a lubricated intubating stylet in the ETT
   - ETT 2.5–4.0 mm: 6 Fr (2.0 mm) stylet
   - ETT 4.5–5.5 mm: 10 Fr (3.3 mm) stylet
7. Position the patient in the optimal position to align the oral, pharyngeal and laryngeal axes (neutral position with MILS if c-spine injury suspected).
   - ***Infant*** *– slight elevation of the shoulders*
   - ***Small child*** *– slight extension of the head*
   - ***Older child*** *– extension of the head (elevation of the head may also be required). Open mouth and inspect oral cavity.*

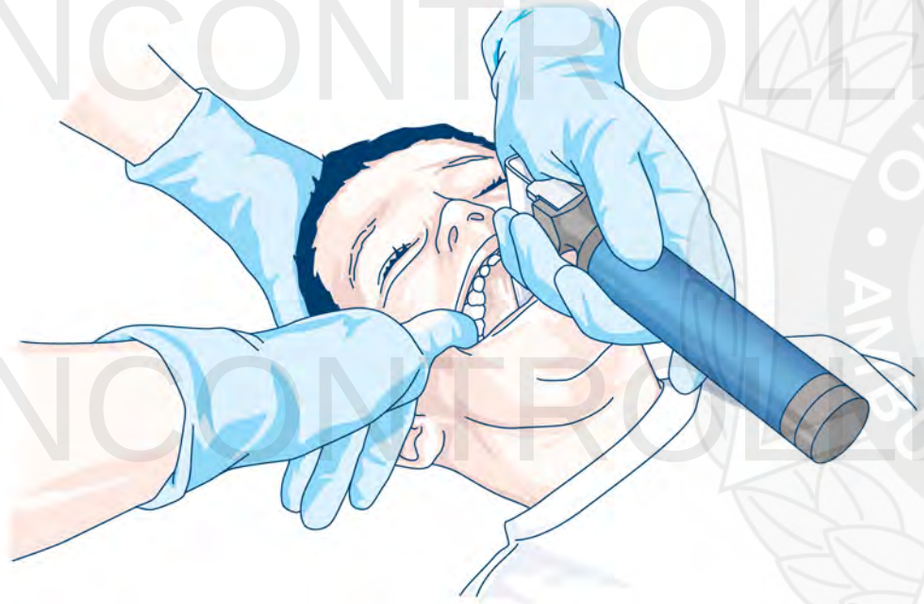


Infant *– slight elevation of the shoulders*

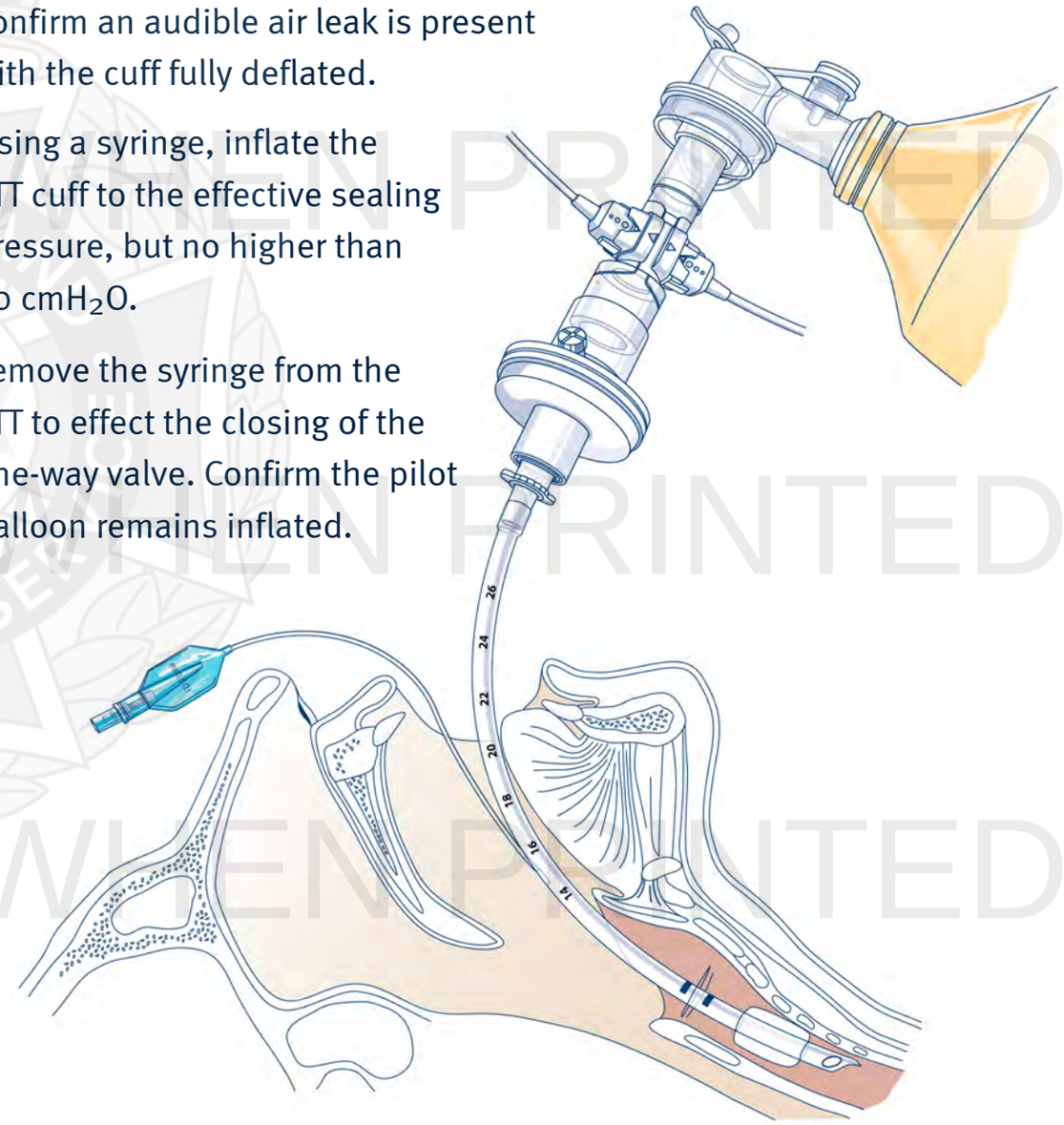


Small child *– slight extension of the head*

8. Open the mouth and inspect the oral cavity.
9. Remove any removable plates from the mouth as required.
10. Perform laryngoscopy.
11. Suction as required.
12. Consider laryngeal manipulation to optimise visualisation of the larynx.
13. Consider retraction of the corner of the patient's mouth to optimise unobstructed passage of the ETT.



14. While maintaining visualisation of the larynx, gently insert the ETT's distal tip through the cords to position the vocal cords at the ring marker.
    - Neonate: 9.5 cm
    - 6 months: 11 cm
    - 1 year: size 12 cm
    - > 1 year: age/2 + 12 cm
15. With the right hand hold the ETT firmly at the lips until correct placement (appropriate $EtCO_2$ waveform) is confirmed and the ETT is properly secured.
16. If used, remove the stylet.
17. Remove the laryngoscope blade from the mouth.
18. Connect the resuscitation bag and commence ventilation.
19. Confirm an audible air leak is present with the cuff fully deflated.
20. Using a syringe, inflate the ETT cuff to the effective sealing pressure, but no higher than 20 cmH_2O.
21. Remove the syringe from the ETT to effect the closing of the one-way valve. Confirm the pilot balloon remains inflated.



22. Confirm correct tracheal placement by observing an appropriate continuous EtCO2 waveform (a minimum of 6 ventilations of moderate tidal volume is required for confirmation) and equal air entry.
23. Secure the ETT with a cloth tie.
24. Consider insertion of a bite block.
25. Administer post intubation sedation as required (titrated aliquots of morphine/fentanyl and/or midazolam).
26. Assess and adjust the ETT cuff pressure as required.

Newly born

1. Assess the patients airway for predictors of technical difficulty.
2. Prepare all equipment to enable rapid access.
3. Establish and verbalise an intubation plan.
4. Lubricate the external surface of the ETT's distal tip with water-soluble lubricant.
5. Consider placing a lubricated 6 Fr (2.0 mm) stylet in the ETT.
6. Position the patient in the optimal position to align the oral, pharyngeal and laryngeal axes (neutral position with MILS if c-spine injury suspected).
7. Open the mouth and inspect the oral cavity.
8. Perform laryngoscopy.
9. Suction as required.
10. Consider laryngeal manipulation to optimise visualisation of the larynx.
11. Consider retraction of the corner of the patient's mouth to optimise unobstructed passage of the ETT.
12. While maintaining visualisation of the larynx, place the ETT directly into the larynx.
13. While maintaining visualisation of the larynx, gently insert the ETT's distal tip through the cords to position the vocal cords at the ring marker.
    - Oral tube length (cm) = 6 + weight (kg)
14. If used, remove the stylet.
15. Remove the laryngoscope blade from the mouth.
16. Connect a resuscitation bag and commence ventilation.
17. Confirm an audible air leak is present (if a cuffed ETT is being used the cuff must remain deflated).
18. Confirm correct tracheal placement by observing appropriate continuous EtCO2 waveform (a minimum of 6 ventilations or moderate tidal volume is required for confirmation) and equal air entry.
19. Secure the ETT with a cloth tie.
20. Administer post intubation sedation as required (titrated aliquots of morphine/fentanyl and/or midazolam).

Additional information

- Under no circumstances is an ETT to be cut to reduce its length.
- Airway management in the pre-hospital setting presents a unique set of challenges for clinicians.[10–15] It is important to have a defined procedure that can be reproduced each time intubation is employed, to maximise the chance of a successful first attempt.
- ETT insertion is typically performed on scene, either in the field or in the ambulance. The airway team should always consist of an airway clinician and airway assistant. In trauma, a separate person to stabilise the c-spine (by manual in-line stabilisation) may also be warranted.
- The clinician performing the intubation takes control of the patient's airway during the preparation phase. The airway assistant stands behind and to the right of the operator doing the intubating, and passes **ALL** intubating equipment.
- It is important to ensure that all equipment is laid out within easy reach of the airway assistant, prior to intubation being attempted. In the ambulance, this is best achieved by laying equipment out on the bench beside the left cabin compartment door. In the field, the equipment should rest to the right of the patient's head. Suction should be available, with the Yankeur catheter located under the right shoulder of the patient.
- If, on patient assessment, the airway appears particularly difficult, or there are patient factors that suggest the intubation will be very high risk (e.g. significant haemodynamic instability, hypoxia), the most experienced clinician should perform the intubation. In such circumstances consideration may be given to delaying intubation until arrival at the hospital.
- Paediatric patients may prove difficult to intubate in the pre-hospital setting. Challenging airway anatomy and the infrequency of intubating opportunities are thought to be the main factors accounting for the lower success rate in paediatric ETT insertion.[16] Specialised training in paediatric airways is important to acquire and maintain skills in this population.
- If a cuffed ETT is used to intubate a newborn, the cuff must remain deflated.
- If there is an absence of $EtCO_2$ sensing or inappropriate $EtCO_2$ waveform or quantative measurement, the ETT must be removed and the failed airway algorithm must be commenced.

Additional information *(cont.)*

- If intubation is unable to be achieved within 30 seconds OR two (2) attempts, the failed airway algorithm must be commenced.

The QAS supplies ETTs in the following sizes:

ETT size	Brand	Recommended Patients	Intubating catheter/stylet
2.5	smiths medical (cuffless)	Appropriate pre-term neonates	6 Fr intubating stylet
3.0	MICROCUFF*	≥ 3 kg to < 8 months	6 Fr intubating stylet
3.5	MICROCUFF*	8 months to < 2 years	6 Fr intubating stylet
4.0	MICROCUFF*	2 to < 4 years	6 Fr intubating stylet
4.5	MICROCUFF*	4 to < 6 years	10 Fr intubating stylet
5.0	MICROCUFF*	6 to < 8 years	10 Fr intubating stylet
5.5	MICROCUFF*	8 to < 10 years	10 Fr intubating stylet
6.0	Parker Flex-Tip®	Large child	Frova 14 Fr intubating catheter
7.0	Parker Flex-Tip®	Adult female	Frova 14 Fr intubating catheter
8.0	Parker Flex-Tip®	Adult female / male	Frova 14 Fr intubating catheter
9.0	Parker Flex-Tip®	Adult male	Frova 14 Fr intubating catheter