

Tayside Mastery Learning Programme

ANSWER BOOKLET

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Anatomy

1. At what level is the larynx?
 - a. **3rd to 6th cervical vertebrae**
 - b. 2nd to 5th cervical vertebrae
 - c. 4th to 7th cervical vertebrae
 - d. 2nd to 6th cervical vertebrae
 - e. 3rd to 5th cervical vertebrae

The larynx is at the level of the 3rd to 6th cervical vertebrae and extends from the epiglottis to the inferior border of the cricoid cartilage.

2. During direct laryngoscopy where should the tip of the laryngoscope be placed to lift the epiglottis?
 - a. Piriform fossa
 - b. **Vallecula**
 - c. Rima glottidis
 - d. Vestibular fold
 - e. Base of tongue

During laryngoscopy the epiglottis can obstruct a clear view of the vocal cords. If a laryngoscope is placed in the vallecula and drawn anteriorly the epiglottis will lift and reveal the glottis.

3. Which of the following is NOT a laryngeal cartilage?
 - a. Thyroid
 - b. Cricoid
 - c. **Hyoid**
 - d. Corniculate
 - e. Arytenoid

There are 9 cartilages of the larynx (3 single, 3 paired). The single cartilages are the thyroid, cricoid and epiglottis. The paired cartilages are the arytenoid, corniculate and cuneiform. The hyoid is the only bone.

4. Regarding the larynx, which of the following statements is false?
 - a. Cricothyroid muscle is the only muscle to tense the vocal cords
 - b. Blood supply for the larynx is derived from the external carotid and subclavian artery
 - c. The intrinsic muscles control the vocal cords
 - d. Motor and sensory innervation to the larynx is supplied by the vagus nerve
 - e. **The recurrent laryngeal nerve supplies all the intrinsic muscles of the larynx**

The recurrent laryngeal nerve supplies all the intrinsic muscles of the larynx, apart from cricothyroid, which is innervated by the external branch of the superior laryngeal nerve.

5. Which of the statements regarding the trachea and bronchial tree is false?
- a. The trachea extends from the 6th cervical vertebrae to the 4th thoracic vertebrae
 - b. The trachea is joined posteriorly by the trachealis muscle
 - c. The trachea divides into left and right bronchi at the carina
 - d. The carina is the most sensitive area for triggering the cough reflex
 - e. **The right main bronchus is longer, narrower and more horizontal compared to the left**

The right main bronchus is shorter (only 3cm in length before it gives off the bronchus to the upper lobe), wider and more vertical. The left is longer (5cm), narrower and more horizontal.

Pre-Oxygenation and Basic Airway Management

1. The oxygen reservoir of the lungs is the:
 - a. **FRC**
 - b. TLC
 - c. RV
 - d. ERV
 - e. IRV

During apnoea, the FRC provides the reservoir for ongoing oxygenation of the blood. When breathing air, the gas present in the FRC is composed of approximately 14% oxygen, 5% carbon dioxide and 71% nitrogen. In the average 70-kg patient, this equals less than 300 ml of oxygen ($14/100 \times 30 \times 70 = 294$ ml). Therefore, when a patient becomes apnoeic, the oxygen in the lungs is rapidly absorbed and the blood oxygen content falls resulting in hypoxaemia after approximately 60 seconds or less. This time to hypoxaemia is affected by the composition of gas within the FRC, the volume of FRC and oxygen consumption of the patient.

2. Pre-oxygenation:
 - a. Decreases ETO_2
 - b. Increases ETCO_2
 - c. **Decreases lung nitrogen content**
 - d. Increases lung nitrogen content
 - e. Increases gas exchange

Pre-oxygenation is the principle in which the percentage of oxygen within the FRC is increased in anticipation of apnoea. This is done by giving the patient an increased inspired oxygen concentration and replacing the nitrogen within the FRC with oxygen (a process also known as de-nitrogenation).

3. Pre-oxygenation is most effectively achieved by?
 - a. 1 minute of tidal volume breathing with good face mask seal using 100% O_2
 - b. 30 seconds of vital capacity breathing with good face mask seal using 100% O_2
 - c. **3 minutes of tidal volume breathing with good face mask seal using 100% O_2**
 - d. 10 seconds of vital capacity breathing with good face mask seal using 100% O_2
 - e. 100% oxygen via Hudson mask

In the absence of gas analysis, effective pre-oxygenation can be achieved by either:

- 3 minutes of tidal volume breathing with good face mask seal using 100% O_2 OR
- 1 minute of vital capacity breathing with good face mask seal using 100% O_2 .

4. Which of the following is NOT an airway optimising technique?
 - a. Ensuring the horizontal line from the tragus should be at a greater height than the patient's sternum
 - b. Lower cervical flexion, upper cervical extension with extension of the head on the neck
 - c. Lifting the chin
 - d. Displacing the mandible forward
 - e. **Depressing the jaw**

To provide anatomical advantage in maintaining the airway we can:

- Position in the 'sniffing air' position: lower cervical flexion, upper cervical extension with extension of the head on the neck ("flexion-extension").
- Lift the chin: increasing pharyngeal dimensions by tensioning pharyngeal muscles.
- Displacing the mandible forward: pulling the tongue/soft palate forward, thus increasing airway calibre retroplatally.
- Place oral or nasopharyngeal airways that bypass the obstruction in addition to the above.
- We can also apply positive airway pressure to the upper airway in order to pneumatically splint it at the collapsible segment.

5. Upper airway collapse is commonly seen at points of:

- a. Soft tissue tension and narrowing
- b. Soft tissue flaccidity and narrowing**
- c. Soft tissue flaccidity and widening
- d. Soft tissue tension and widening
- e. Soft tissue growth

The upper airway is a framework of bone and cartilage with attached soft tissue from the nose to the larynx. Where not supported by bone, the airway can collapse once the muscle tone, that provides a degree of support, reduces with anaesthesia. Collapse will occur at points of narrowing and flaccidity, and can be additionally affected by anatomical pathology (e.g. tonsillar hypertrophy, tumour).

Airway Assessment and Endotracheal Intubation

1. Mallampati score of 3 indicates the following can be identified:
 - a. Soft palate, fauces, uvula and tonsillar pillars seen.
 - b. Soft palate not visible at all
 - c. **Soft palate and only base of uvula seen**
 - d. Soft palate, fauces, some of uvula seen
 - e. Only tongue seen

Mallampati score is defined as follows:

- i. Soft palate, fauces, uvula and tonsillar pillars seen
- ii. Soft palate, fauces, some of uvula seen
- iii. Soft palate and only base of uvula seen
- iv. Soft palate not visible at all

2. Which of the following is not commonly used to assess the airway?
 - a. Mallampati
 - b. Ability to protrude lower jaw
 - c. Thyromental distance
 - d. **Centre of the lips to angle of the jaw distance**
 - e. Incisor gap

The distance between the centre of the lips to the angle of the jaw is used to size oropharyngeal (Guedel) devices.

3. Which of the following is the MOST important to confirm correct tube position:
 - a. Visualise tube position through cords
 - b. Bilateral chest movement when squeezing the bag
 - c. Misting of the ETT
 - d. **Continuous ETCO₂ capnography trace**
 - e. Air movement on auscultation

All of these are useful indicators however the ETCO₂ capnography trace is the MOST important.

4. A grade 2b view on laryngoscopy indicates:
 - a. **Only posterior elements (arytenoids or of the posterior commissure) of glottis visible**
 - b. Part of the vocal cords are visible
 - c. Most of the glottis is visible
 - d. No part of the glottis, but only the epiglottis, is visible
 - e. Not even the epiglottis can be seen

Cormack-Lehane scoring:

- Grade 1 - Most of the glottis is visible
- Grade 2 - Only the posterior extremity of the glottis is visible

- Grade 2a - Part of the vocal cords are visible
 - Grade 2b - Only posterior elements (arytenoids or of the posterior commissure) of glottis visible
 - Grade 3 - No part of the glottis, but only the epiglottis, is visible
 - Grade 4 - Not even the epiglottis can be seen
5. If no ETCO₂ is seen following intubation your first action should be to:
- a. Default to bag and mask ventilation (+/- adjunct)
 - b. Administer 100 % oxygen
 - c. **Remove ETT**
 - d. Call for senior help
 - e. Do nothing

Your first action should be to remove the endotracheal tube – if in doubt pull it out. Answers a, b and d should be considered after the ETT has been removed.

Supraglottic Airway (SGA) Devices

1. Which of the following is NOT a relative contraindication for an SGA device?
 - a. **Airway rescue device following failed intubation/cardiac arrest**
 - b. History of gastric reflux or hiatus hernia
 - c. Pregnancy
 - d. Morbid obesity
 - e. Autonomic dysfunction associated with diabetes (gastroparesis)

There are few true absolute contraindications. SGAs should not be used in cases in which the anaesthetist feels that there is a significant risk of aspiration. These include:

- History of gastric reflux or hiatus hernia
- Intra-abdominal pathology
- Pregnancy
- Recent major trauma or administration of opiates
- Morbid obesity
- Autonomic dysfunction associated with diabetes (gastroparesis)

Answer a is an indication for SGA device use.

2. What guides the initial selection of SGA device size?
 - a. Height
 - b. Body mass index
 - c. **Weight**
 - d. Neck circumference
 - e. Age

Patient weight is used as a guide for selecting SGA device size. It is worth noting however that different SGA devices have different recommended weight ranges and it is always worth checking the manufacturer's instructions. In clinical practice it is worth having a range of sizes available as patients vary, and sometimes a size larger or smaller will provide a better fit.

3. What is the maximum pressure the cuff should be inflated to?
 - a. 30 cmH₂O
 - b. 30 mmHg
 - c. 60 mmHg
 - d. **60 cmH₂O**
 - e. 50 cmH₂O

Cuff pressure should not exceed 60 cmH₂O to avoid damage to surrounding structures.

4. Which of the following features distinguishes a second generation SGA device from a first?
 - a. **Integrated bite block**
 - b. Inflatable cuff
 - c. Pilot balloon

- d. 15mm connector
- e. Flexible tube

The main difference between first and second generation SGA device's is that the second generation has:

- A gastric lumen that allows for drainage of gastric fluids or secretions
- An integrated bite block to prevent damage/obstruction on emergence

The other features listed are present in first generation SGA device's.

5. Confirmation of correct SGA device position involves:
 - a. Feel of 'hold-up' on insertion
 - b. Ejection of lubricating gel placed on gastric port
 - c. **Absence of audible leak at pressures equating to just greater than that required to produce tidal volume ventilation**
 - d. Flat ETCO₂ trace
 - e. Ability to squeeze reservoir bag

Connect the anaesthetic tubing and gently ventilate under low pressure by hand to confirm successful placement of the SGA by checking for: adequate chest rise and fall, presence of ETCO₂ with a square-wave capnography tracing and the absence of audible leaks at pressures equating to just greater than that required to produce tidal volume ventilation.

Answers a and e do not confirm SGA device position.

Extubation

1. What Train of Four (ToF) ratio is ideally required prior to extubation?
 - a. **0.9**
 - b. 0.8
 - c. 0.7
 - d. 0.75
 - e. 0.6

Best practice includes the use of a quantitative neuromuscular blockade monitor such as a ToF-scan to ensure the return of the train of four (ToF) ratio to >0.9 prior to extubation.

2. Which of the following is NOT a risk factor at extubation?
 - a. Distorted anatomy as a result of surgery, haemorrhage, haematoma, oedema, trauma, etc
 - b. Those identified as having difficult airway access at or prior to induction
 - c. Neurological/neuromuscular impairment
 - d. Acid/base disturbance
 - e. **Patient positioned in the recovery position**

The recovery position is a recommended position for extubation.

3. Which of the following is NOT a recognised complication of extubation?
 - a. Post-obstructive pulmonary oedema
 - b. **Headache**
 - c. Airway obstruction
 - d. Hypoxia
 - e. Cardiovascular disturbance

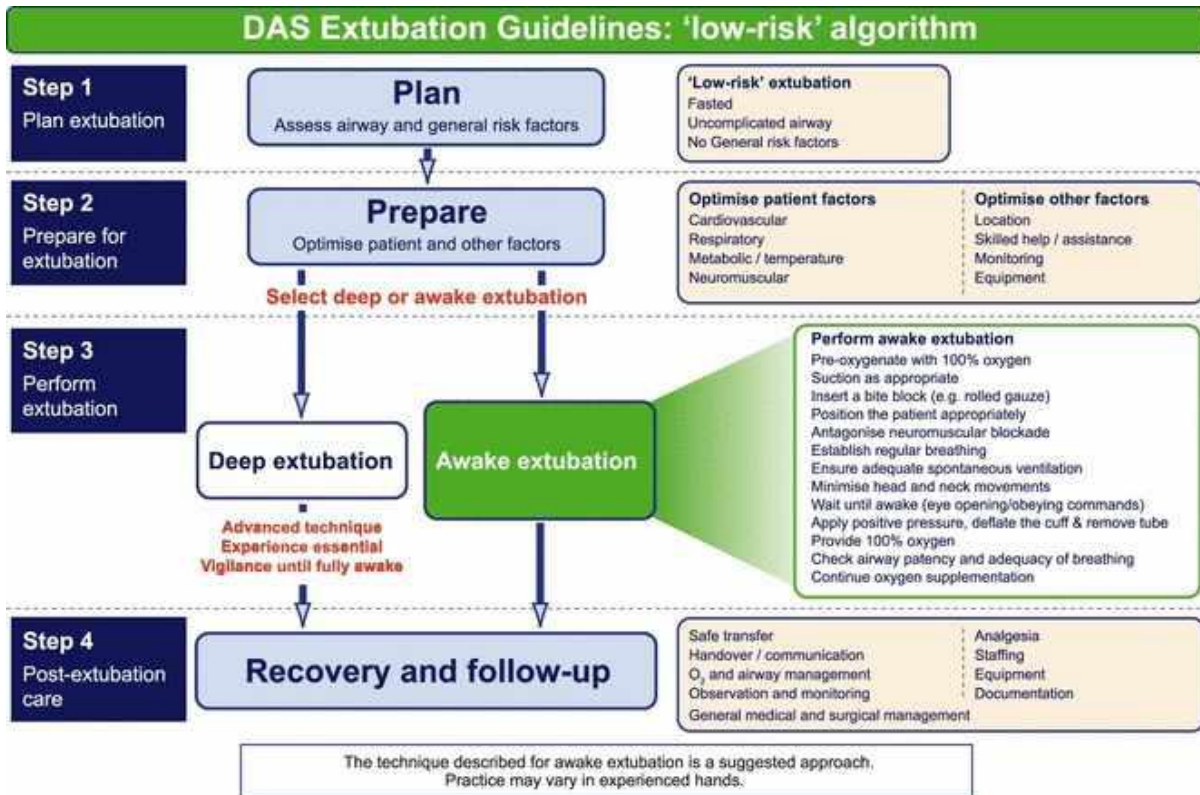
Potential complications of extubation include:

- Airway obstruction
- Post-obstructive pulmonary oedema
- Hypoxia
- Aspiration
- Airway trauma
- Cardiovascular disturbance

4. Which of the following should be completed prior to extubation (select all that apply)?
 - a. **Insertion of a bite block**
 - b. **Pre-oxygenate patient**
 - c. **Suction and clear the oro-pharynx under direct visualisation**
 - d. Minimum Alveolar Concentration (MAC) >1
 - e. **Ensure appropriate analgesia and anti-emetic prophylaxis**

All answers except d are correct. A MAC >1 would result in the patient being too deeply anaesthetised.

5. According to the Difficult Airway Society (DAS) extubation guidelines the steps are:
- Prepare, Plan, Extubate, and Recovery
 - Recovery, Extubate, Prepare and Plan
 - Plan, Prepare, Recovery and Extubate
 - Plan, Prepare, Extubate and Recovery**



Unanticipated Difficult Airway Management and Emergency Front-of-Neck Airway (eFONA)

1. What is the maximum number of attempts the first intubator should make at tracheal intubation?
 - a. 1
 - b. 2
 - c. 3**
 - d. 4
 - e. 5

The first intubator can have 3 attempts at intubation, this can be supplemented by one further attempt by a different practitioner.

2. What is the maximum number of attempts at SGA device insertion?
 - a. 1
 - b. 2
 - c. 3**
 - d. 4
 - e. 5

3 attempts can be made at SGA device insertion.

3. What size ETT should be used for eFONA?
 - a. 5
 - b. 6**
 - c. 6.5
 - d. 7
 - e. 7.5

A size 6.0 ETT should be used for eFONA with a size 10 blade scalpel.

4. The thyroid handshake allows identification of:
 - a. Cricothyroid membrane**
 - b. Thyrohyoid membrane
 - c. Cricothyroid muscle
 - d. Thyrohyoid muscle
 - e. Mylohyoid muscle

The cricothyroid membrane should be identified in all patients before induction of anaesthesia, awake intubation techniques or before extubation in ICU. DAS recommend the three-step "laryngeal handshake" technique to identify the cricothyroid membrane.

5. Which of the following were recommendations following the 4th National Anaesthetic Project (NAP 4) to reduce the likelihood of entering a Cannot Intubate, Cannot Oxygenate (CICO) scenario (select all that apply)?
- a. **Thorough airway assessment and planning**
 - b. **Effective pre-oxygenation to prolong the time prior to desaturation**
 - c. **Limiting the number of attempts at intubation**
 - d. Early attempts at eFONA
 - e. **Moving through the airway strategy in an appropriately timely fashion**

The 4th National Anaesthetic Project (NAP 4) made a number of recommendations to reduce the likelihood of entering a CICO scenario. These included:

- Thorough airway assessment and planning
- Effective pre-oxygenation to prolong the time prior to desaturation
- Limiting the number of attempts at intubation to prevent causing iatrogenic trauma and swelling to the airway
- Moving through the airway strategy in an appropriately timely fashion to maximise the chances of a rescue attempt succeeding prior to the development of life-threatening hypoxia.