



Airway Management in the Operating Room

COVID-19

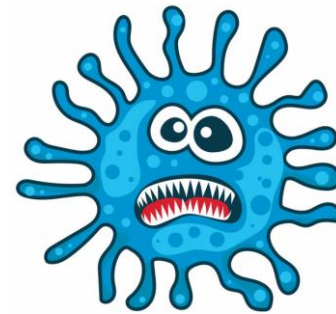
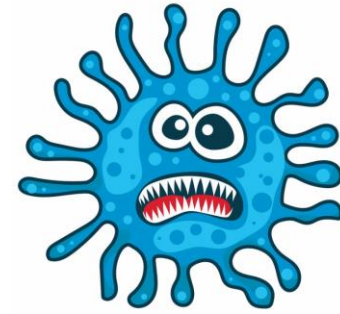
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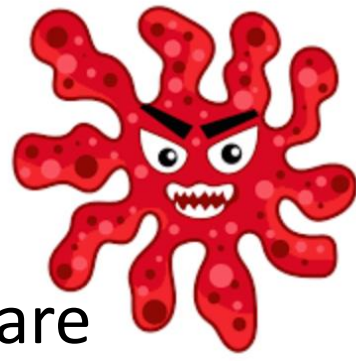
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OUTLINE

- Introduction
- Preparation for Intubation of the COVID + Patient
- The Unexpected Difficult Airway
- The Predicted Difficult Airway
- Recommendation Tips for Intubation
- Airway management during CPR
- Preparation for Extubation
- The Gray Zone: The asymptomatic carrier?
- Airway management in Pediatrics
- Links and References



Introduction



- **SARS-CoV-2** is highly contagious
- Airway management of patients with **COVID-19** is high risk for healthcare workers (HCWs)
- Development of principles for airway management to encourage safe, accurate and swift performance
- International recommendations on best practices to prevent the contamination of HCWs, the choice of staff involved, the training required and the selection of equipment
- Adoption with regards to local workplace policies, equipment/PPE/resources availability



Introduction

- Transmission → predominantly by droplet spread and direct contact with the patient or contaminated surfaces, rather than airborne spread
- BUT Tracheal intubation/extubation are Aerosol-Generating Procedures (AGPs) → higher viral load → increased risk of transmission and more severe illness
- As the epidemic increases → many asymptomatic patients or with mild disease will present for emergency surgery for unrelated conditions

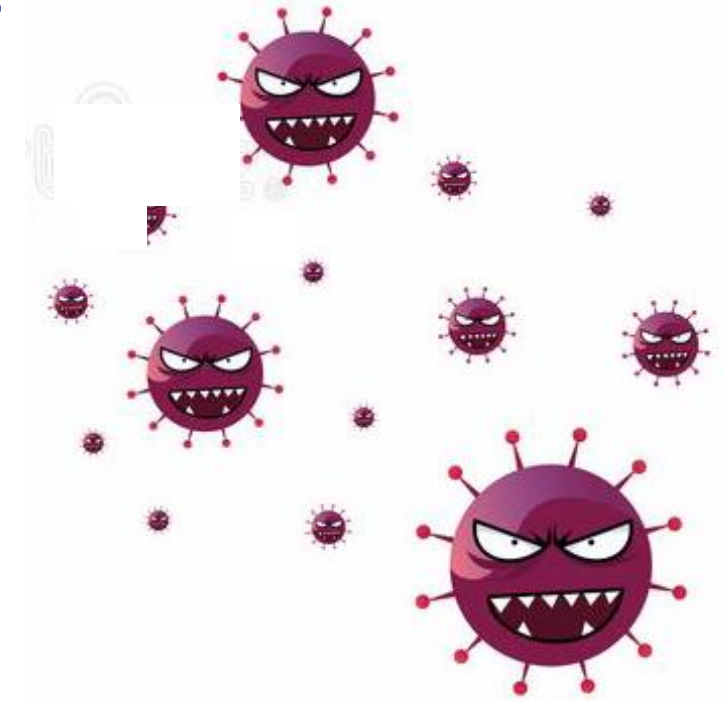


Aerosol Generating Procedures (AGPs)

Systematic review of infection risk to HCW (Tran et al):

1. Tracheal intubation
2. Tracheostomy
3. Non-invasive ventilation (NIV)
4. Mask ventilation

- *Others:* disconnection of ventilatory circuits during use; Tracheal extubation; cardiopulmonary resuscitation (before tracheal intubation); bronchoscopy; and tracheal suction without a 'closed in-line system'

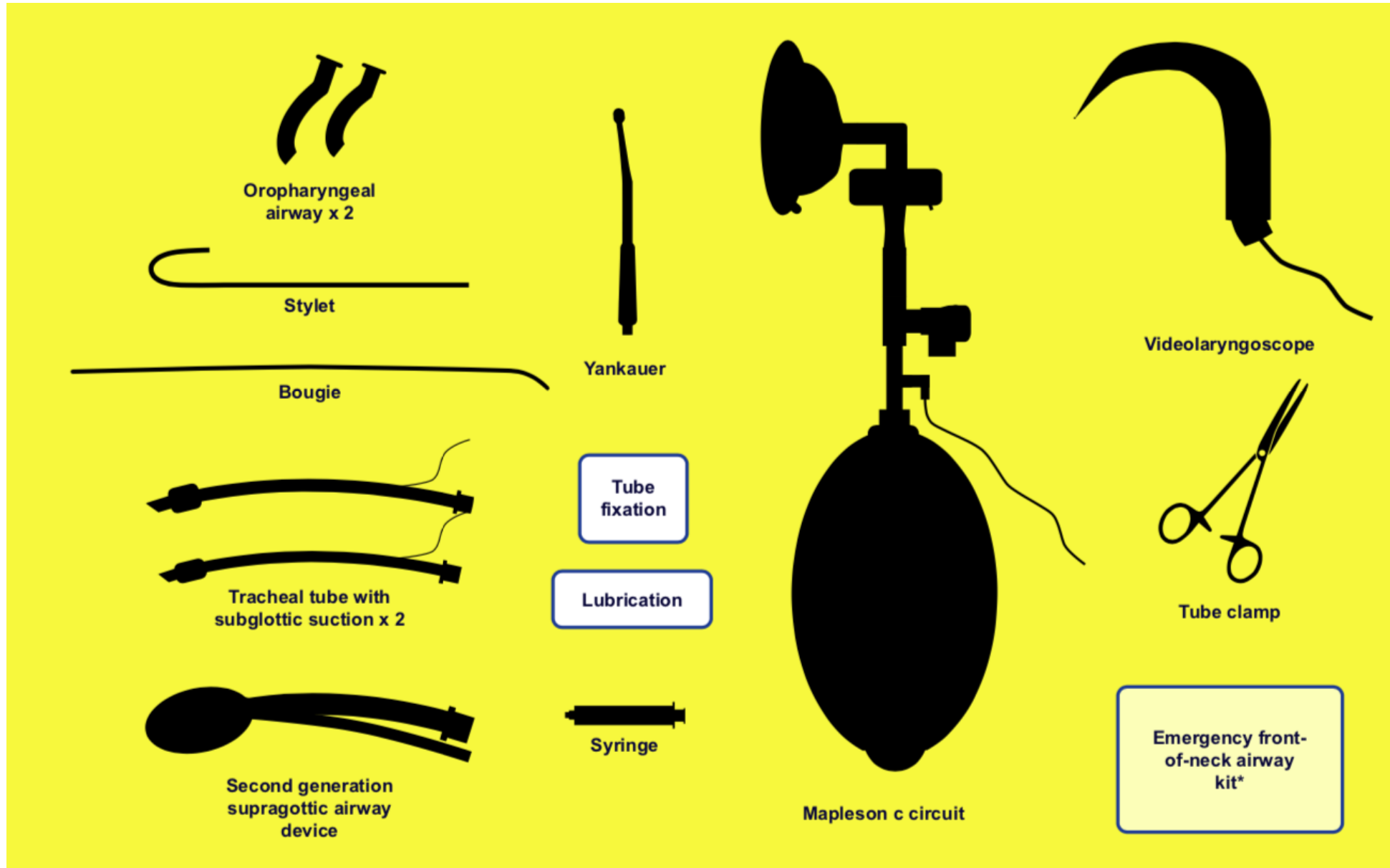


Room Preparation

- Team debriefing and closed loop communication
- Checklist:
 - ✓ Negative pressure room with > 12 air changes/hr
 - ✓ Setup: Machine checked, covered with plastic drape, HME filters between mask and circuit, on expiratory (and preferably inspiratory) limbs, new capnography line, D-Fend, Soda Lime
 - ✓ Medications (Trolley outside the room)
 - ✓ Airway equipment: VL, ETT, stylet, syringe, standby airway, suction if needed (closed system preferred), wet gauze
 - ✓ Disposal bins



Tracheal Intubation Kit



Preparation for Intubation

- Full PPE throughout the procedure
- Apply full monitors
- Limit the number of personnel present in the room: intubator, skilled assistant, team leader
- Runner - Outside
- Airway assessment
- Negative Pressure hood, Nylon drape, Airway Box



COVID-19 airway management: SAS

Safe	for staff and patient
Accurate	avoiding unreliable, unfamiliar, or repeated techniques
Swift	timely, without rush or delay



Preparation for Intubation

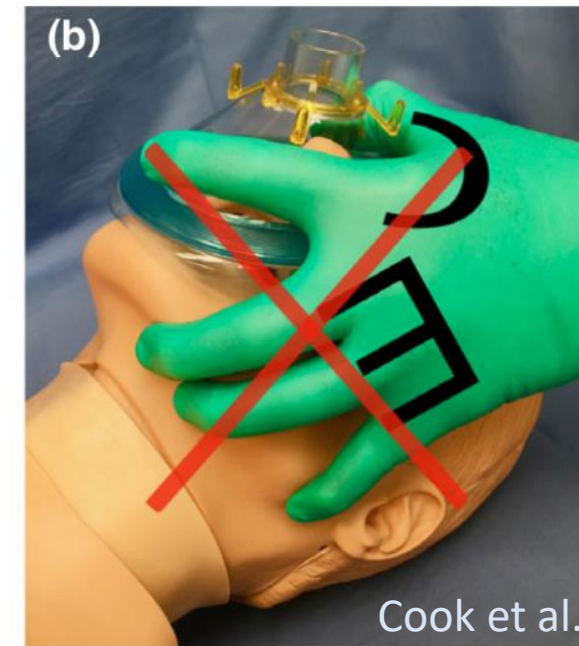
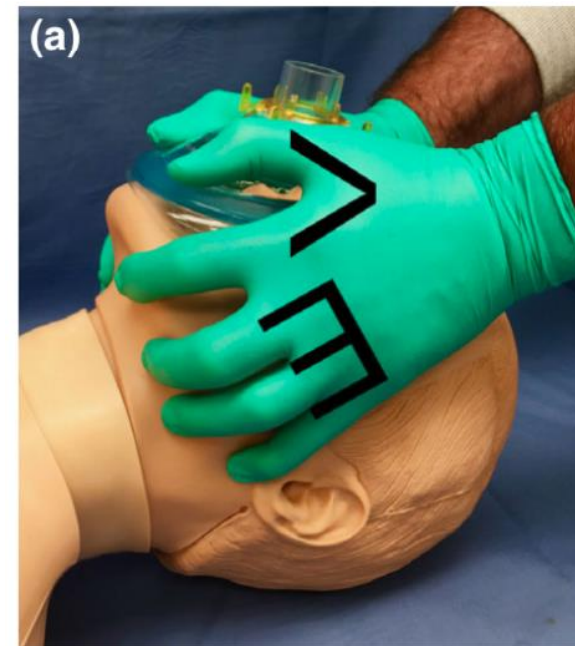
- Check IV access
- Optimize position
- Remove face mask

Preoxygenation:

- Well fitting mask
- Low flow < 5L/min
- 3-5min, 100% O₂

NO ventilation **UNLESS** needed:

- 2 person, 2 handed, with V-E grip
- Low flow, Low Pressure
- Airway
- Wet gauze
- 2nd generation supraglottic device for rescue



Cook et al.



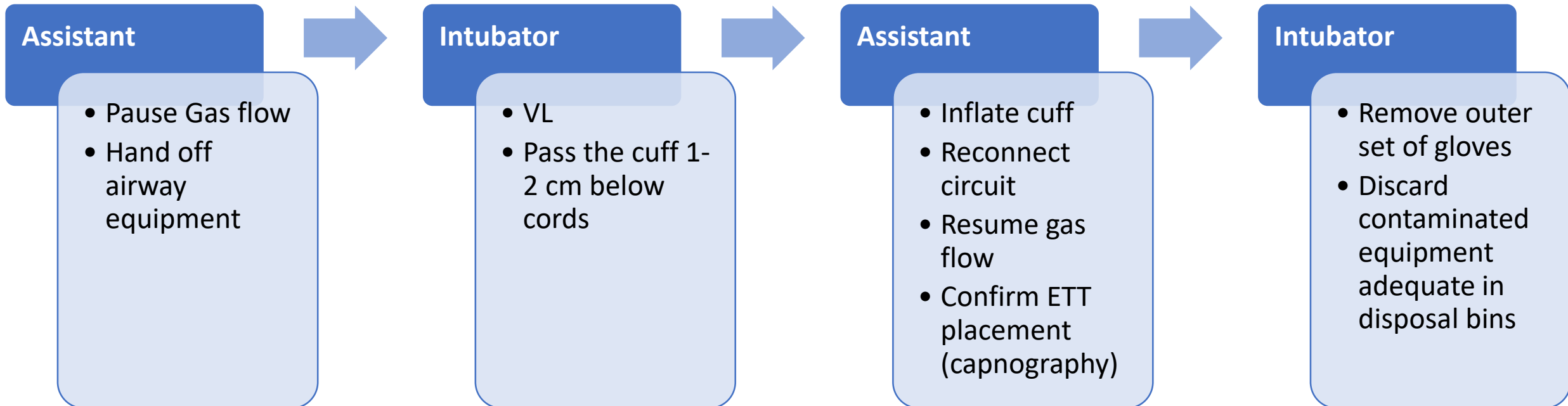
Intubation

- Video Laryngoscopy on 1st attempt
- Most experienced laryngoscopist → Maximize success

RSI (+/- cricoid):

- Propofol or Ketamine (1-2 mg/kg)
- Rocuronium (1.2 mg/kg) or Succinylcholine (1.5 mg/kg)
- Lidocaine 1.5mg/kg, Opiates after NMB
- Prophylactic vasopressor

✓ Full NMB before intubation



Circuit

- AVOID disconnections – push/twist all connections
- IF disconnection is necessary (ex: Patient presents intubated):
Pause gas flow, Clamp ETT, Disconnect **beyond filter**

Video Laryngoscopy

- Stay as DISTANT as possible
- Mac Blade → Bougie
- D-Blade → Stylet
- Be CAREFUL with secretions

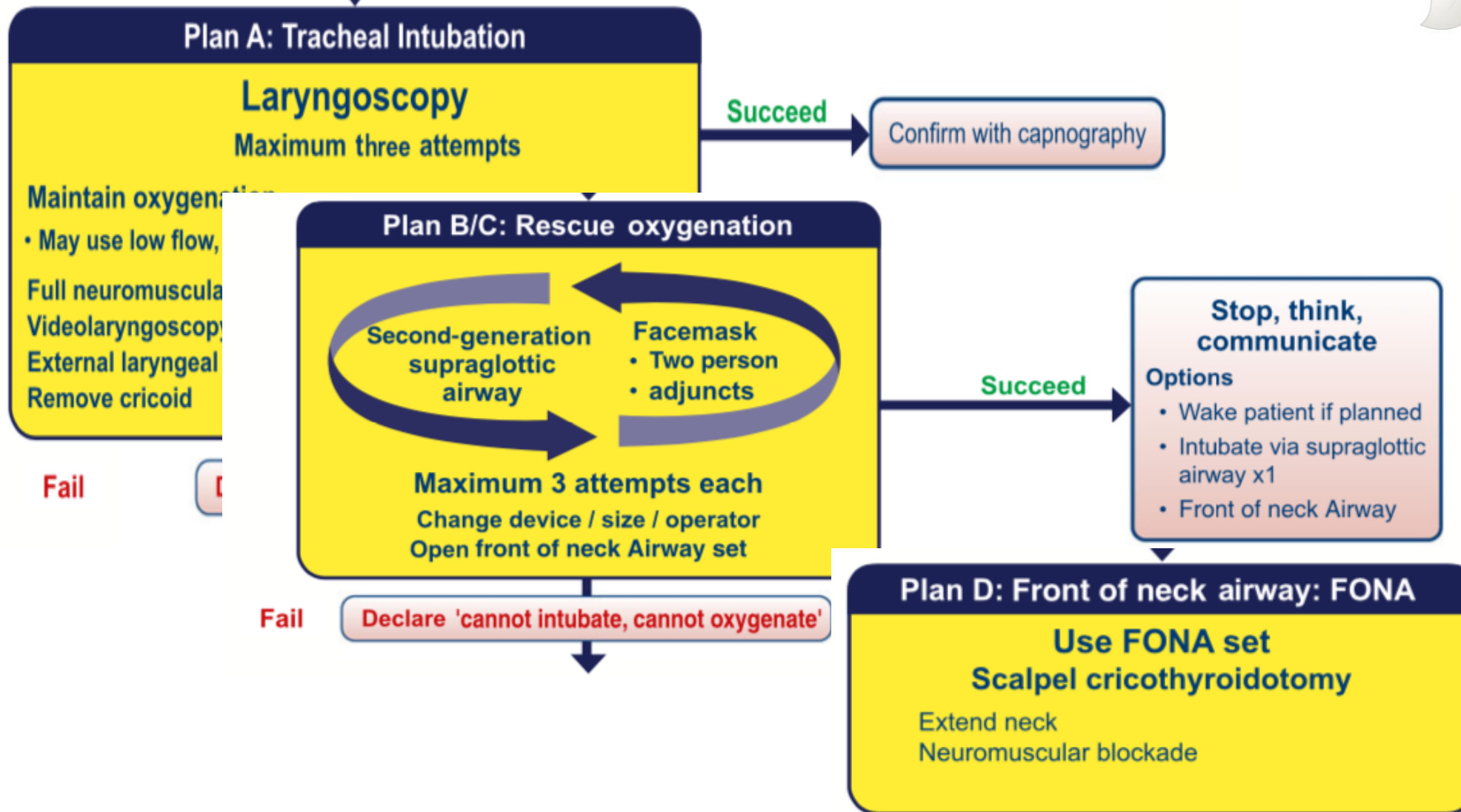
Tube placement confirmation

- Auscultation NOT recommended
- Bilateral chest wall expansion
- IF in doubt → Lung US
- No leak
- Insert an NG and decompress stomach



Tracheal intubation of critically ill adults

Adapted for COVID-19



Cannot Intubate, Cannot Oxygenate (CICO) in critically ill adults

Adapted for COVID-19



Plan D: Front of neck Airway: FONA

Extend neck

Ensure neuromuscular blockade

Exclude oxygen failure and blocked circuit

Personnel and PPE

New staff **must** don full checked PPE

Most appropriate airway manager to perform

Scalpel cricothyroidotomy

Equipment:

1. Scalpel (wide blade e.g. number 10 or 20)
2. Bougie (≤ 14 French gauge)
3. Tube (cuffed 5.0-6.0 mm ID)

Laryngeal handshake to identify cricothyroid membrane

Palpable cricothyroid membrane

Transverse stab incision through cricothyroid membrane

Turn blade through 90° (sharp edge towards the feet)

Slide Coudé tip of bougie along blade into trachea

Railroad lubricated cuffed tube into trachea

Inflate cuff, ventilate and confirm position with capnography

Secure tube

Impalpable cricothyroid membrane

Make a large midline vertical incision

Blunt dissection with fingers to separate tissues

Identify and stabilise the larynx

Proceed with technique for palpable cricothyroid membrane

Trained expert only

Other FONA techniques

Non-scalpel cricothyroidotomy
Percutaneous tracheostomy
Surgical tracheostomy

Post-FONA care and follow up

- Closed tracheal suction
- Recruitment manoeuvre (if haemodynamically stable)
- Chest X-ray
- Monitor for complications
- Surgical review of FONA site
- Agree airway plan with senior clinicians
- Document and complete airway alert

Predicted Difficult Airway

- ☠ Topicalization of the airway
- ☠ Awake Flexible Bronchoscopy techniques



AGPs!



- Alternative difficult tracheal intubation techniques:
 - Intubation via an SGA including the intubating laryngeal mask airway (blind or flexible bronchoscope-assisted)
 - SGA with fiberoptic guided Aintree tube exchanger



Intubation tips



- When possible tracheal intubation should be performed **earlier** in the phase of the illness:
 - Avoid undertaking the procedure in the presence of severe hypoxemia → reduce overall mortality
 - Avoid increased risk of cardiovascular collapse during anesthesia and intubation: fluid bolus, vasopressor support
- Reduce the risk of pneumothorax, NIV with great caution
 - Both NIV and HFNO should be considered AGPs → Prolonged NIV (>2 h) is not recommended
- Large volume ventilation and recruitment maneuvers to correct hypoxemia immediately after tracheal intubation should be avoided
- Protective ventilation strategy with small tidal volumes (6 ml/kg), plateau pressure < 30 cm H₂O, target SaO₂ 88–95% and pH > 7.25, consider early prone ventilation



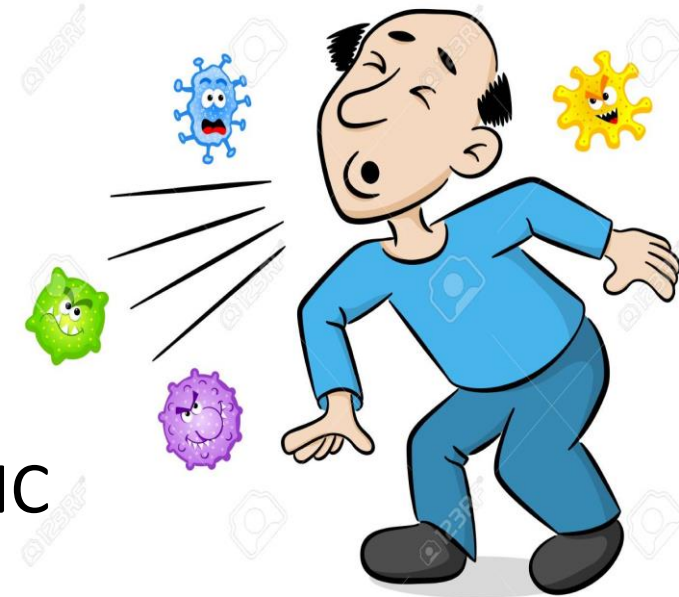
Cardiopulmonary Resuscitation

- PPE!
- Early tracheal intubation with a cuffed tracheal tube
- In the absence of an airway expert/difficult airway:
 - Intubator uses technique most comfortable with
 - 2nd generation SGA may enable ventilation of the lungs with less aerosol generation than facemask ventilation
- Hold chest compressions during intubation



Extubation

- Maintenance drugs to minimize coughing at emergence:
 - In a network meta-analysis using SUCRA:
Dexmedetomidine > Remifentanyl > Fentanyl > Lidocaine (TT) > Lidocaine (intracuff) > Lidocaine IV
 - Anti-emetics
 - Adequate analgesia
- Tracheal and oral suction before extubation
- Prepare and check all necessary equipment for extubation and post extubation oxygen delivery, i.e mask or low flow NC



Extubation

- Negative pressure room
- Minimize personnel in the room:
Anesthesiologist and Assistant
- FULL PPE
- Closed loop communication
- Recommended use of an extubation barrier
- 30° Head up position

Technique:

- SGA as a bridge to extubation??
- "Mask over tube" technique



“Mask Over Tube” Technique

- Anesthesiologist and assistant positioned behind the patient’s head, to avoid exposure to secretions
- Optimal mask size/seal



Anesthesiologist

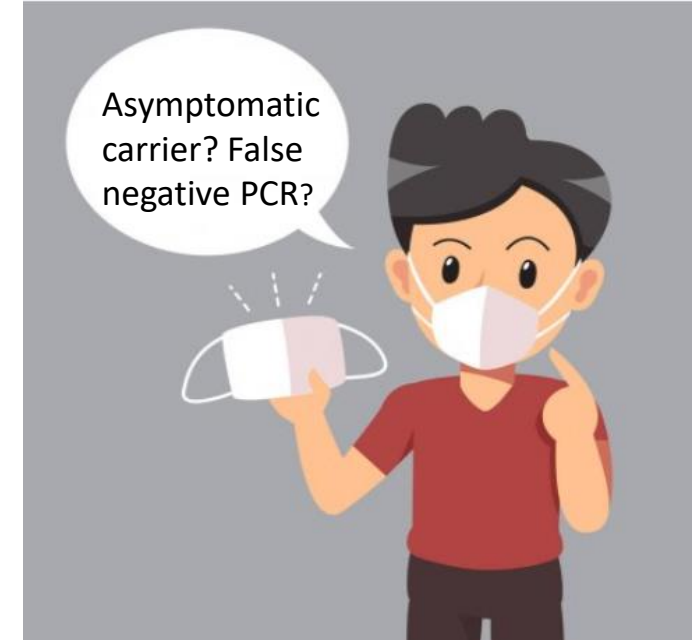
- Keep face mask with adequate seal (2 hands)
- Monitor breathing/capnography/vitals
- Place surgical mask
- Apply O2 face mask above surgical mask or NC below it

- Recovery in negative pressure OR, or transfer to COVID unit



The Gray Zone

- Potential transmission from asymptomatic carriers
- False Negatives?
- *IF* sufficient resources → clear benefit to extending testing for COVID-19 as widely as possible: patients presenting to OR (24-48hrs)
- PPE for intubation/extubation
- If high suspicion/high AGPs → recommended to keep full PPE throughout the procedure given the risk of accidental circuit disconnection/extubation/unquantified aerosolization
- Positive pressure rooms: Wait for at least one air change, ideally 15min
- Adequate disinfection between cases



The Pediatric Airway



- Children infected with SARS-CoV-2 could shed virus asymptotically, even in stools and infect others
- In the Chinese experience, asymptomatic transmission of the virus from children to HCWs emerged as a significant risk

PREMEDICATION:

- Oral Midazolam (0.5-1mg/kg up to 20mg)
- IV Midazolam (0.05-0.1 mg/kg) and titrated as needed
- IM Midazolam (0.1-0.2mg/kg) in the uncooperative child (fast onset and adequate sedation)



The Pediatric Airway

- **AVOID** PPI to minimize exposure and conserve PPE
- **IF NECESSARY**, one parent accompanies the child in suitable PPE and leaves the room before airway management
- IV induction is preferred over inhalational induction
- Child assessment → struggling to place a catheter → crying child → ↑ respiratory droplets
- **IF** mask induction → ensure adequate seal and use low flows
- RSI or modified RSI with muscle relaxants
- Consider deep extubation, TIVA/Precedex/Remifentanil
- Risk of laryngospasm → Backup airway equipment ready for use, not to delay reintubation



Links & References

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