Airway Management in the Operating Room

COVID-19

Carine Foz, MD
Instructor of Clinical Anesthesiology
American University of Beirut Medical Center
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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

- Oropharyngeal airway x 2
- Stylet
- Bougie
- Yankauer
- Videolaryngoscope
- Tube clamp
- Tracheal tube with subglottic suction x 2
- Tube fixation
- Lubrication
- Syringe
- Mapleson C circuit
- Emergency front-of-neck airway kit
- Second generation supraglottic airway device
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

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<th>COVID-19 airway management: SAS</th>
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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

**Diagram:**

1. **Assistant**
   - Pause Gas flow
   - Hand off airway equipment

2. **Intubator**
   - VL
   - Pass the cuff 1-2 cm below cords

3. **Assistant**
   - Inflate cuff
   - Reconnect circuit
   - Resume gas flow
   - Confirm ETT placement (capnography)

4. **Intubator**
   - Remove outer set of gloves
   - Discard contaminated equipment adequate in disposal bins
**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

Plan A: Tracheal Intubation

Laryngoscopy
Maximum three attempts

Maintain oxygenation
- May use low flow
- Full neuromuscular
- Videolaryngoscopy
- External laryngeal
- Remove cricoid

Fail

Plan B/C: Rescue oxygenation

Second-generation supraglottic airway
Facemask
- Two person
- adjuncts

Maximum 3 attempts each
Change device / size / operator
Open front of neck Airway set

Fail
Declarer 'cannot intubate, cannot oxygenate'

Plan D: Front of neck airway: FONA

Use FONA set
Scalpel cricothyroidotomy
- Extend neck
- Neuromuscular blockade

Stop, think, communicate
Options
- Wake patient if planned
- Intubate via supraglottic airway x1
- Front of neck Airway
Unexpected Difficult Airway!

**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 airway

**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

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 > Remifentanil > 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

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

Anesthesiologist
• Prepare suction/syringe
• Move the ETT to the side of the mouth – closest to assistant
• Attach 2nd airway filter to facemask and apply to patient’s face (2 hands seal)

Assistant
• Pause gas flow
• Deflate cuff
• Extubate
• Waste ETT into disposal bin
• Connect circuit to 2nd mask filter
• Resume gas flow

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

D’Silva et al
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 asymptomatically, 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

- AUBMC PPE-intubation-extubation protocol: [https://youtu.be/CLJGHsDs3Jg](https://youtu.be/CLJGHsDs3Jg)


- Peter M. Odor, Maximilian Neun, Sohail Bampoe, Sam Clark. Anaesthesia and COVID-19: infection control. BJA 2020


- Alan Tung, Nicholas A. Fergusson, Nicole Ng. Medications to reduce emergence coughing after general anesthesia with tracheal intubation: a systematic review and network meta-analysis. BJA 2020.
