The Medical Journal of Australia - Preprint only - Version 2, updated 1 April 2020

Consensus statement: Safe Airway Society principles of airway management and tracheal intubation specific to the COVID-19 adult patient group

David J Brewster[1], Nicholas C Chrimes[1], Thy BT Do[1], Kirstin Fraser[1], Chris J Groombridge[1], Andy Higgs[1], Matthew J Humar[1], Timothy J Leeuwenburg[1], Steven McGloughlin[2], Fiona G Newman[1], Chris P Nickson[1], Adam Rehak[1], David Vokes[1], Jonathan J Gatward[1]

[1]Safe Airway Society (SAS), Australia and New Zealand
[2]Australian and New Zealand Intensive Care Society (ANZICS)
Twitter: @SafeAirway
admin@safeairwaysociety.org

Free, open access resources to accompany this article can be found at:
https://www.safeairwaysociety.org/covid19/

Abstract

Introduction: On March 11, 2020, this statement was planned to provide clinical guidance and aid staff preparation for the COVID-19 pandemic in Australia and New Zealand. It has been widely endorsed by relevant specialty colleges and societies.

Main recommendations:

1. Generic guidelines exist for the intubation of different patient groups, as do resources to facilitate airway rescue and transition to the 'can't intubate can't oxygenate' (CICO) scenario. They should be followed where they do not contradict our specific recommendations for the COVID-19 patient group.
2. Consideration should be given to using a checklist which has been specifically modified for the COVID-19 patient group.
3. Early intubation should be considered to prevent the additional risk to staff of emergency intubation and to avoid prolonged use of high flow nasal oxygen or non-invasive ventilation.
4. Significant institutional preparation is required to optimize staff and patient safety in preparing for the airway management of the COVID-19 patient group.
5. The principles for airway management should be the same for all patients with COVID-19 (asymptomatic, mild or critically unwell).
6. Safe, simple, familiar, reliable and robust practices should be adopted for all episodes of airway management for patients with COVID-19.

Changes in management: Airway clinicians in Australia and New Zealand should now already be involved in regular intensive training for the airway management of the COVID-19 patient group. This training should focus on the principles of early intervention, meticulous planning, vigilant infection control, efficient processes, clear communication and standardised practice.

Background

An outbreak in Wuhan, China, in 2019 of the novel coronavirus named severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2, formerly HCoV-19) has led to a pandemic of COVID-19 (coronavirus disease 2019). More than 80% of confirmed cases report a mild febrile illness, however, 14-17% of confirmed cases develop severe COVID-19 with acute respiratory distress syndrome (ARDS) and 5% also develop septic shock and/or multiple organ dysfunction. (1-3) Like other patient groups with ARDS, patients with severe COVID-19 are likely to be considered for emergency tracheal intubation and mechanical ventilation to support potential recovery from their illness.

From recent reported data in Wuhan and Northern Italy, at least 10% of reported positive COVID-19 cases require ICU involvement, many requiring urgent tracheal intubation for profound and sudden hypoxia.(2) As the incidence of SARS-CoV-2 infection rises in the community, an increasing number of patients who have mild or asymptomatic disease as an incidental comorbidity but are nonetheless infective, may still present for urgent surgery.

Risks to healthcare workers

Transmission of COVID-19 is primarily through droplet and fomite spread. Droplets are larger particles of body fluid that are affected by gravity within a few seconds and can therefore travel only short distances through the air before landing on surrounding surfaces. Virus containing droplets may cause direct transmission from close contact or contribute to contamination of fomites.(4) Fomites are surfaces or objects (e.g. clothing, equipment, furniture) that can become contaminated by virus, where it may remain active for hours to days. In contrast, aerosols are composed of much smaller fluid particles that can remain suspended in air for prolonged periods. If a virus is able remain stable within aerosolised airway secretions, this increases the risk of transmission. Current evidence suggests that while it is plausible that coronaviruses can survive in aerosol form within fluid particles under certain conditions this is not the primary mechanism for transmission in the community. (5) (6) (7) (8)

Some events (see Table 1) can potentially lead to aerosolisation of virally contaminated body fluid.(9) The process of caring for severe COVID-19 patients and performing procedures associated with aerosol-generating events (AGEs) in this group thus presents a potential increased risk of infection to healthcare workers.(5) During the SARS-CoV-1 outbreak in Canada in 2003, half of all the SARS-CoV-1 cases were nosocomial transmission to healthcare workers (HCWs). In addition to the personal health risks to infected HCWs, illness and quarantine procedures can diminish the available resources to manage patients at a time of high demand. COVID-19 has now been classified as a high consequence infectious disease (HCID), emphasising the significant risk to HCWs and the healthcare system. (10)

Table 1: Sources of potential aerosol generation during airway management

Aerosol generating events (AGEs)
• Coughing/sneezing/expectorating • NIV or positive pressure ventilation with inadequate seal* • High flow nasal oxygen (HFNO) • Jet ventilation • Delivery of nebulised/atomised medications via simple face mask • Cardiopulmonary resuscitation (prior to tracheal intubation) • Tracheal extubation
Procedures vulnerable to aerosol generation (increased risk of association with AGEs)
• Tracheal suction (without a closed system) • Laryngoscopy • Tracheal intubation • Bronchoscopy/gastroscopy • Front-of-neck airway (FONA) procedures (including tracheostomy, cricothyroidotomy)

*The reliability of seal is greatest with tracheal tube>supraglottic airway>face mask

Aerosol generating events are those that inevitably involve gas flow, especially high-velocity flow (Table 1). They potentially generate aerosols as well as increasing droplet

formation. Positive pressure ventilation during non-invasive ventilation (NIV) or when using a face mask or supraglottic airway (SGA) potentially generates droplets or aerosols as the seal obtained is usually inferior to that achieved with a correctly placed tracheal tube with its cuff inflated.

In contrast, procedures which are merely vulnerable to aerosol generation (Table 1) do not inevitably involve gas flow. Generation of aerosols from these latter procedures requires occurrence of an aerosol generating event. Laryngoscopy, tracheal intubation and bronchoscopy will only cause aerosolisation if coughing is precipitated or another aerosol generating procedure is performed. FONA may generate aerosol if the patient receives concurrent positive pressure ventilation from above. Many of these precipitating events can therefore be prevented by adequate neuromuscular blockade and avoiding concurrent aerosol generating procedures, such that, if performed properly and without complications, they may not be aerosol generating.

The process of airway management is an increased risk period for aerosol-based transmission for the following reasons:

- The patient may become agitated or combative due to hypoxia.
- The patient's mask must be removed.
- Clinicians are near the patient's airway.
- Laryngoscopy and intubation are vulnerable to aerosol generation.
- Aerosol generating events are more likely.

It is crucial to minimise the risk of aerosol generating events during airway management. Table 2 outlines the risk factors for aerosol generation during airway management and associated protective strategies that can be adopted to mitigate them.

Note that coronaviruses themselves are smaller than the minimum sized particles that most so-called 'viral' filters and masks are able to remove. However, the particles of respiratory secretions with which coronaviruses are associated when in aerosol form are larger and able to be filtered by these devices. As such, in this text, reference to 'viral' filters or masks refers to their ability to filter aerosolised respiratory secretions that potentially contain virus, rather than the ability to filter the virus itself.

Table 2: Risk factors for aerosol generation

Risk Factor	**Protective Strategy**
Coughing	▪ Close contact aerosol-protective PPE before entering intubation room and getting near patient's airway ▪ Minimise interval between removal of patient's protective mask and application of face mask with viral filter ▪ Good seal with face mask with viral filter ▪ Ensure profound paralysis before instrumenting airway (adequate dose and time for effect) ▪ Managing tracheal extubation (see section below)
Inadequate face mask seal during pre-oxygenation	▪ Well-fitting mask with viral filter ▪ Vice (V-E) grip ▪ Manual ventilation device with collapsible bag* ▪ ETO_2 monitoring to minimise duration for which face mask is applied by identifying earliest occurrence of adequate pre-oxygenation.
Positive pressure ventilation with inadequate seal	▪ Avoid PPV ▪ Good seal: o FM: as above o SGA: second generation, appropriate size, adequate depth of insertion, cuff inflation** o ETT: confirm cuff below cords, cuff manometry, meticulous securing of ETT. o Manual ventilation device with collapsible bag to gauge ventilation pressures* o Airway manometry to minimise ventilation pressures** o Minimise required ventilation pressures: neuromuscular blockade, 45-degree head elevation, oropharyngeal airway.

High gas flows	▪ Avoid HFNO

*Only beneficial for clinicians with prior familiarity with these devices.

**Where applicable

Non-invasive ventilation (NIV) and High Flow Nasal Oxygen (HFNO) Therapy

It is beyond the scope of this document to discuss the efficacy of NIV and HFNO for the treatment of respiratory failure in the COVID-19 patient group. We recommend seeking guidance from the current version of the *Australian and New Zealand Intensive Care Society (ANZICS) COVID-19 Guidelines*.(11)

We have, however, considered the risks and benefits of these therapies as an adjunct to tracheal intubation, in order to make the recommendations below. During the SARS outbreak, there were reports of significant transmission secondary to NIV.(12) Manikin studies suggest that dispersal of liquid from HFNO at 60L/min is minimal, and significantly less than that caused by coughing and sneezing, providing that nasal cannulae are well fitted.(13,14) The risk to healthcare workers of aerosolisation, however, remains unclear, and will depend on many variables, including flow rates, ventilator pressures, patient coughing and cooperation, and the quality and fit of staff personal protective equipment (PPE).

Until further data become available, it should be assumed that NIV and HFNO are aerosol generating. Patients receiving these therapies should be cared for in airborne isolation rooms and staff should wear close contact aerosol protective PPE (including N95/P2 masks) while in the patient room.

Methods

This statement was planned on March 11, 2020, when an urgent need for guidance in Australia and New Zealand with both clinical practice and staff preparation for the COVID-19 pandemic was identified. It was decided to prepare and publish within one week in order to help all hospitals prepare their staff.

The Safe Airway Society (SAS) board assembled 14 national experts to prepare the statement. They first conducted a review the current literature from the COVID-19 relevant to airway practice, as well as relevant publications from the SARS epidemic

of 2003. All recommendations were debated extensively. Some of the endorsing societies were consulted during the development of the document to allow external opinion. The recommendations in this document were primarily guided by expert opinion. It must be acknowledged that only weak evidence was available from the current COVID-19 pandemic at the time of the statement. Most articles reviewed were either observational data or opinion.

Recommendations

In recent weeks, a small number of articles, guidelines and flow diagrams have appeared to aid the airway management of the COVID-19 patient group, based mainly on recent experiences in China, Hong Kong and Italy.(15,16) We aim to rapidly distribute clear local recommendations to clinicians in emergency medicine, intensive care, anaesthesia and prehospital care in Australia and New Zealand to guide airway management of the adult COVID-19 patient group (patients with known or suspected COVID-19 disease).

Specifically, we aim to:

1. Recommend routine airway management practices that should also be adopted in the COVID-19 patient group.
2. Recommend principles specific to the airway management practices of the COVID-19 patient group.
3. Recommend standard airway rescue practices that should also be adopted in the COVID-19 patient group
4. Recommend a consistent but flexible approach to planned airway management practices in the COVID-19 patient group regardless of their location (prehospital, emergency department (ED), intensive care unit (ICU) or operating theatre (OT)).
5. Recommend safe practices for unplanned episodes of airway management (e.g. cardiac or respiratory arrest, other resuscitation scenarios) which may arise in any area.
6. Seek endorsement and distribution of these guidelines by all relevant Australian and New Zealand societies and speciality colleges with an interest in airway management. A common approach will allow early education and simulation training for all staff. Early education is paramount to improving compliance with

the techniques, particularly the use of PPE. A consistent approach will also improve safe and effective clinical practice during episodes of airway management involving collaboration between clinicians from multiple clinical disciplines, as well as for clinicians working between different sites.

This statement should be viewed as a living document that may need to be updated and revised as more information is acquired on the best practice of airway management in the COVID-19 patient group. Complementary resources such as cognitive aids, checklists and educational videos will be published in the coming weeks. Implementation of the guidance provided in this statement and its adjunctive materials may need to be adapted to local policies and resources.

The challenges to the staff involved in the airway management of patients from this COVID-19 pandemic should be acknowledged. Examples are included in table 3.

Table 3: Staff challenges

▪ Variations to normal workflow
• Unfamiliar working environments
• Unfamiliar interprofessional teams
• Potential resource depletion
• Critically ill patients with limited physiological reserves
• Clinician stress and fatigue

General comments

7. Generic guidelines already exist for intubation of the critically ill patient and other patient groups.(17) The appropriate guidelines should be followed where they do not contradict specific recommendations for the COVID-19 patient group, outlined below.
8. Generic resources already exist to facilitate airway rescue and transition to the 'can't intubate can't oxygenate' (CICO) scenario.(18,19) Many of these algorithms are similar in content.(20) These should be followed where they do

not contradict the specific recommendations for the COVID-19 patient group, outlined below.

9. Generic checklists already exist for intubation of the critically unwell patient. These should still be used as a minimum, but consideration should be given to using a checklist which has been specifically modified for the COVID-19 patient group.
10. Early intubation should be considered to prevent the additional risk to staff of emergency intubation during severe hypoxia or cardiac/respiratory arrest, and to avoid prolonged use of high flow nasal oxygen or non-invasive ventilation.
11. Significant institutional preparation is required to optimize staff and patient safety in preparing for the airway management of the COVID-19 patient group. In addition to clinical and support staff in ICU, OT and ED, extensive liaison will be required with multiple other stakeholders, including but not limited to administration, infection control, engineering, sterilisation and equipment disposal services, procurement and education units.
12. The principles for airway management outlined below should be the same for both the COVID-19 patient group with mild or asymptomatic disease requiring urgent surgery and for critically unwell patients with ARDS.

Guiding principles

These recommendations have been developed according to the following general principles with the goal of maintaining staff safety while providing timely, efficient and effective airway management:

Table 4: Guiding principles for airway management of COVID-19 patients

1. Intensive Training
2. Early intervention
3. Meticulous planning
4. Vigilant infection control
5. Efficient airway management processes
6. Clear communication
7. Standardised practice

"Standardised practice" should be developed in accordance with the following criteria:

- *Safe*: choose options that will not expose patient or staff to unnecessary risk
- *Simple*: straightforward solutions that can be executed efficiently
- *Familiar*: where possible rely on existing techniques that are familiar to the relevant clinicians
- *Reliable*: choose options that are known to be successful in the hands of the relevant clinicians
- *Robust*: choose options that will continue to fulfil the above criteria in the face of foreseeable variations in patient characteristics, environment and the availability of personnel and resources

Recommendations (for airway management in the COVID-19 patient group)

Environment for airway management

- Negative pressure ventilation rooms with an ante-room are ideal to minimise exposure to aerosol and droplet particles. Where this is not feasible, normal pressure rooms with closed doors are recommended.
- Positive pressure ventilation areas (common in operating theatres) should ideally be avoided (see 'Urgent surgery in the COVID-19 patient group' below).
- Some hospitals have created dedicated spaces for planned airway management of the COVID-19 patient group (e.g. airborne infection isolation rooms). The potential resource and ergonomic advantages of this approach need to be balanced against the implications of transporting potentially infective patients around the hospital and room cleaning between patients.
- The decision to move a clinically stable patient between two clinical areas prior to airway management should primarily be based on whether the destination environment will provide a more controlled situation, better equipment and/or more experienced staff to make the process of airway management safer.

Equipment, Monitoring and Medications

General Principles

- Where an equivalent disposable item of equipment is available, this is always preferred over reusable equipment. Where disposable items are not considered

equivalent, the time, resource and infection risk implications of employing reusable equipment should be considered on a case-by-case basis.

- Allocation of dedicated items of reusable equipment for use in the COVID-19 patient group is preferred where feasible.

Oxygen delivery & ventilation equipment – during pre-oxygenation

- Pre-oxygenation should be performed using a well-fitting occlusive face mask attached to a manual ventilation device with an oxygen source.
- A viral filter **MUST** be inserted between the face mask and manual ventilation device to prevent circuit contamination and minimise aerosolisation in expired gas from non-rebreathing circuits. The viral filter should be applied directly to the face mask as an increased number of connections between the face mask and filter increase the opportunity for disconnection on the patient side.
- An anaesthetic machine with a circle system, a hand-held circuit (e.g. Mapleson circuit) or a self-inflating bag-valve-mask (BVM) attached to an occlusive face mask can be used as the manual ventilation device. While bag collapse when using Mapleson and circle systems provides a sensitive indication of face mask leaks (alerting to potential aerosolisation), this should only be a consideration in clinicians already familiar with these devices. For anaesthetists, manometry and ETO_2 monitoring are further advantages of using an anaesthetic machine for this purpose.
- Note that the rebreathing/non-rebreathing nature of the ventilation device should not be a consideration for any clinician group in choosing between these alternatives as once the viral filter is applied, no virus should enter the ventilation device. As such, the most important factor in choosing between these devices is prior familiarity.
- Non-rebreather masks (with a reservoir bag) provide sub-optimal pre-oxygenation and promote aerosolisation and are not recommended for this purpose.
- Nasal oxygen therapy (via standard or high flow nasal cannulae) should not be used during pre-oxygenation or for apnoeic oxygenation due to the risk to the intubation team.

Oxygen delivery & ventilation equipment – post intubation

- Oxygenation and mechanical ventilation can be delivered using operating theatre (OT) anaesthetic machines or mechanical ventilators (in ICU or ED). While there are advantages and disadvantages of both, the choice will likely depend more on their availability and the location of patient care rather than their individual characteristics.

Airway Equipment

To keep the main airway trolley outside the patient room, we recommend a pre-prepared 'COVID-19 intubation tray' (see table 5 for suggested contents) or a dedicated 'COVID-19 airway trolley'.

Table 5: Suggested contents of pre-prepared COVID-19 Intubation Tray

- Macintosh Videolaryngoscope (with blade sized to patient)
- Hyperangulated videolaryngoscope (if available, with blade sized to patient)
- Macintosh direct laryngoscope (with blade sized to patient)
- Bougie/Stylet*
- 10ml syringe
- Tube tie
- Sachet lubricant
- Endotracheal tubes (appropriate size range for patient)
- Second generation supraglottic airway (sized to patient)
- Oropharyngeal airway and nasopharyngeal airway (sized to patient)
- Scalpel and bougie CICO rescue kit
- Large bore nasogastric tube (appropriate size for patient)
- Continuous waveform end-tidal CO_2 (ETCO2) cuvette or tubing
- Viral filter
- In-line suction catheter

*At least one pre-curved introducer (bougie/stylet) must be available for use with hyper-angulated VL blade.

Supraglottic Airways

- Where a supraglottic airway is indicated, use of a second-generation device is recommended as its higher seal pressure during positive pressure ventilation decreases the risk of aerosolisation of virus containing fluid particles.

Videolaryngoscopy

It is recognised that videolaryngoscopes are a limited resource in many settings. Where they can be accessed:

- They should be immediately available in the room during tracheal intubation.
- A videolaryngoscope should be dedicated for use in the COVID-19 patient group where this is feasible.

- Disposable videolaryngoscope blades are preferred.
- Both Macintosh and hyperangulated blades should ideally be available.
- Hyperangulated blades should only be used by airway operators who are proficient in their use.

Suction

- Once the patient is intubated, closed suction systems should be used to minimise aerosolisation.

Miscellaneous

- A cuff manometer should be available to measure tracheal tube cuff pressure in order to minimise leaks and the risk of aerosolisation.

Equipment outside the room

- Cardiac arrest trolley
- Airway trolley
- Bronchoscope

Team

When assembling a team for intubation, you should:

- Limit numbers: only those directly involved in the process of airway management should be in the room.
- Use the best available staff.
- Consider excluding staff who are vulnerable to infection from the airway team. This includes staff who are older (> 60yrs), immunosuppressed, pregnant or have serious co-morbidities.
- Allocate clearly defined roles:

We recommend the following team (see figure 1):

1. **Airway Operator.** Most experienced/skilled airway clinician to perform upper airway interventions. This may require calling for assistance of another clinician (e.g. a senior anaesthetist) within your hospital. If an anaesthetist is called, they should perform tracheal intubation and all airway management decisions should be deferred to them.

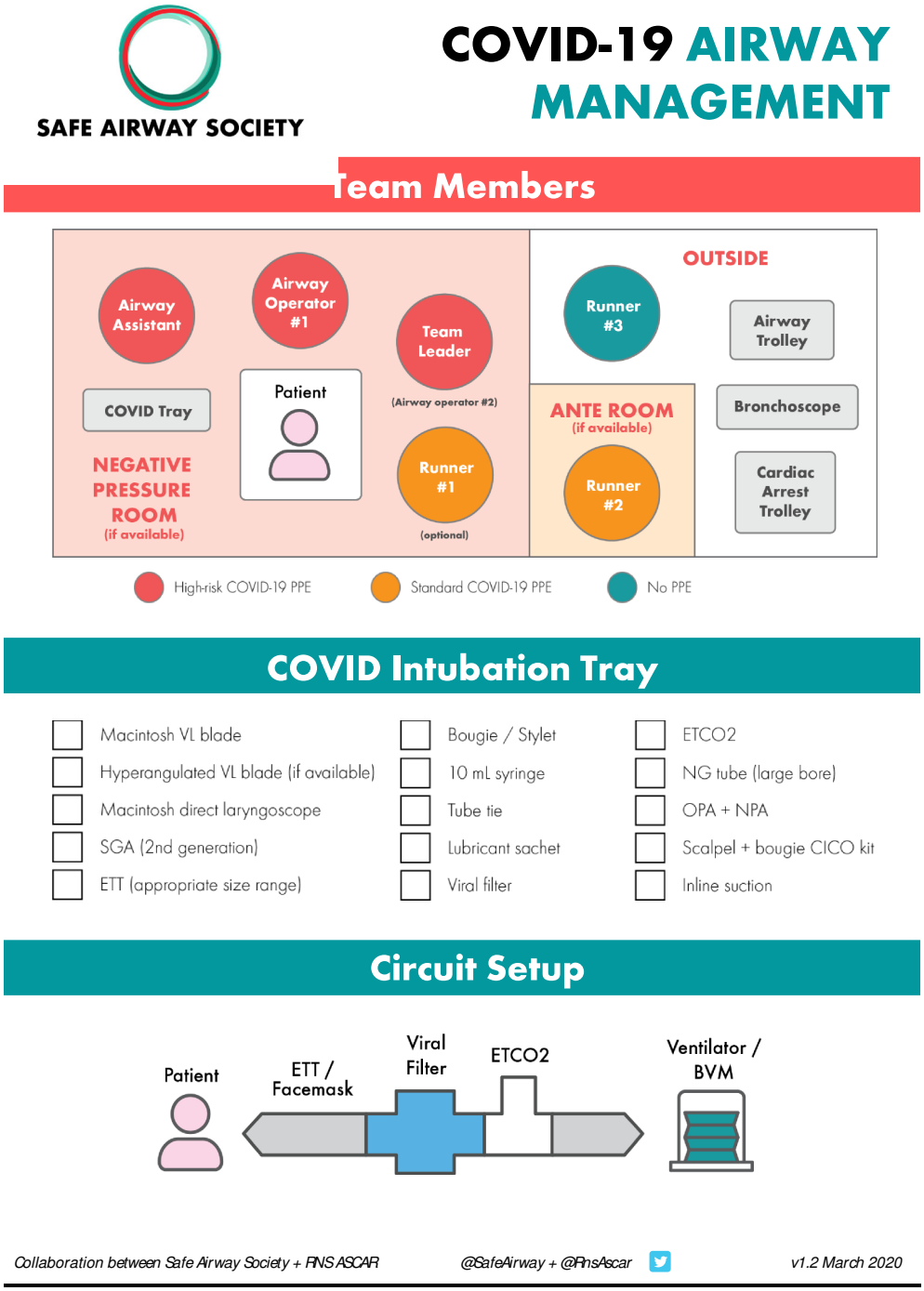
2. **Airway Assistant.** This should be an experienced clinician, to pass airway equipment to the Airway Operator, and help with bougie use and bag-valve-mask (BVM) ventilation.
3. **Team Leader.** A second senior airway clinician to coordinate team, manage drugs, observe monitoring and provide airway help if emergency front-of-neck airway (eFONA) is required.
4. **In-Room Runner**. This team member is optional, depending on need. The number of team members in the room should always be minimised.
5. **Door Runner** (in ante room or just outside patient room) to pass in any further equipment that may be needed in an emergency. This team member can also act as the PPE 'Spotter' (see below)
6. **Outside Room Runner.** To pass equipment into ante room (dirty side), or directly to Door Runner if no ante room.

'Intubation teams' may be employed by certain hospitals. This would be at the discretion of individual institutions and dependent on the number of cases and staff resources. This may improve familiarity, compliance and efficiency of processes around airway management in the COVID-19 patient group, including proper application/removal of PPE use amongst the staff. Evidence for the benefit of this strategy is not yet available.

Planning

- Meticulous airway assessment to be performed early by senior airway clinician and clearly documented.
- An individualised airway management strategy should be formed, based on patient assessment and the skill-mix of the team. This should include plans for intubation and airway rescue via face mask, supraglottic airway and eFONA, with defined triggers for moving between each.
- The ventilation plan should be discussed prior to intubation. This may involve protective lung ventilation, use of high PEEP, prone ventilation, and other strategies for refractory hypoxaemia including consideration of extracorporeal membrane oxygenation.

Figure 1: COVID-19 intubation team members



Communication

Clear communication is vital while managing the COVID-19 patient group due to the risk of staff contamination. At the same time, PPE may impede clear communication.

- Pre-briefing should occur, to share a mental model with the whole team prior to intubation. This should include (but is not limited to) verbalising role allocation, checking equipment, discussing any anticipated challenges, the airway

management strategy, post intubation plans and PPE donning and doffing processes.

- Clear, simple, concise language should be used.
- Voices need to be raised to be heard through PPE.
- It may be hard for the Outside Room Runner to hear requests from inside the room. If there is no audio communication system in place, a whiteboard and marker pen should be provided for each patient room.
- Standardised language should be consistently employed; that is precisely defined, mutually understood and used to communicate key moments of situation awareness (critical language).(21)
- Closed-loop communication should be encouraged.
- Speaking up should be encouraged.

Cognitive Aids

The incidence of errors during airway management is known to increase under stress, even when experienced clinicians are involved. Task fixation, loss of situation awareness and impaired judgement may arise.(22) The use of resources to support implementation of the airway strategy is particularly important in the COVID-19 patient group, where the challenges involved may consume significant cognitive bandwidth, even before airway management becomes difficult.

- Use of a 'kit dump' mat may facilitate preparation of equipment. Ideally this should be specifically modified for the COVID-19 patient group.
- Routine use of an intubation checklist, preferably specifically modified for the COVID-19 patient group, is recommended. (see Appendix)
- Familiarity, availability and use of a simple cognitive aid for airway rescue, that is designed to be referred to in real-time during an evolving airway crisis, is recommended.

Personal Protective Equipment (PPE)

- 'Buddy system': all staff should ideally have donning and doffing of PPE individually guided by a specially trained and designated staff member acting as a 'Spotter' before entering room. This may help protect task-focused staff

from PPE breaches and may help mitigate the stress experienced by the intubating team.

- PPE for **Airway Operator, Airway Assistant** and **Team Leader** (who may need to perform eFONA) should be guided by local health regulatory authorities.(23) At a minimum, it should include:
    - Impervious gown, theatre hat, N95 mask, face shield and eye protection, consider double gloves. Clinicians requiring corrective eyewear should be cognisant of institutional policies for removing and cleaning it without self-contamination.
    - Outer gloves (if used) should be removed carefully after airway management is completed.
    - This level of PPE should also be worn for endotracheal tube repositioning/replacement, bronchoscopy and percutaneous dilatational tracheostomy.
- PPE for **In-Room Runner** and **Door Runner**:
    - Gown, gloves, N95 facemask, eye protection.
- No PPE should be worn by **Outside Room Runner**
- Infection control and staff safety to remain top priority. Hand hygiene processes need to be vigilantly followed.
- Follow hospital and/or WHO guidelines for both donning AND doffing of PPE.(24)
- Recognise that doffing is a high-risk step for virus transmission to healthcare workers.
- Any exposed areas of skin (e.g. neck) should be cleaned with hospital-grade antiviral wipes after doffing.

Process for Airway Management

Familiar, reliable techniques should be used to maximise first pass success, secure the airway rapidly and minimize risks to staff.

Pre-oxygenation

- Limited experience with the COVID-19 patient group has shown that rapid and profound desaturation can occur on induction of anaesthesia. Pre-oxygenation is therefore of particular importance.

- In the period before the team enters the room to perform intubation, the patient's oxygen delivery should be maximised by placing patient in 45° head up position, and they should remain in this position for pre-oxygenation
- Prior to the team entering, a critically unwell COVID-19 patient may be receiving high flow oxygen via nasal cannulae, simple oxygen mask or a non-rebreather mask with a reservoir bag. These devices should not be used for pre-oxygenation when the team is in position, due to the risks of aerosolisation.
- If the patient is receiving high flow oxygen, it should be turned off prior to removal of the face mask or nasal cannulae to minimise aerosolisation.
- Pre-oxygenation should then be commenced immediately, using the best available facemask device, with a viral filter firmly applied directly to the mask and ETCO2 in the system. Added connections on the patient side of the viral filter increase the opportunity for disconnection.
- Positive End Expiratory Pressure (PEEP) should be applied via a PEEP valve attached to a Mapleson C circuit or self-inflating BVM, the adjustable pressure limiting (APL) valve on an anaesthetic machine or via NIV.
- A vice (V-E) grip is recommended to maximize the facemask seal and minimise gas leak after induction. (see Figure 2).
- It is suggested that a process is instituted to encourage the COVID-19 patient group to remove all facial hair on admission where feasible, so as to optimise face mask seal if airway management is required.
- Continuous waveform capnography should be used if available. A triangular rather than square ETCO2 trace or a low numerical ETCO2 value during preoxygenation may indicate a leak around the face mask and should prompt interventions to improve the seal.
- Fully pre-oxygenate the patient. **A minimum of five minutes of pre-oxygenation is recommended** if ETO_2 is not available.
- After neuromuscular blockade, patients with severe disease are likely to require manual ventilation to prevent profound oxygen desaturation. To minimise the risk of aerosolisation of airway secretions, this should be performed as a two-person technique, with the Airway Assistant gently squeezing the bag and adjusting the level of PEEP as required.

- If NIV is used for pre-oxygenation, any perceived advantage over the technique outlined above should be balanced against increased complexity and risk of aerosolisation. A viral filter should be inserted between the face mask and the circuit, and the ventilator placed on standby prior to removing the mask.
- The use of high flow nasal oxygen for apnoeic oxygenation during intubation is not recommended given the risk to staff.

Figure 2: Vice (V-E) Grip

Induction

- Use rapid sequence intubation (RSI) as the default technique unless concerns with airway difficulty make this inappropriate.
- Initial neuromuscular blockade can be achieved with rocuronium (>1.5mg/kg IBW) OR suxamethonium (1.5mg/kg TBW). Generous dosing promotes rapid onset of deep neuromuscular blockade and minimises the risk of the patient coughing during airway instrumentation.
- Palpating for the cricoid cartilage may inadvertently encourage clinicians to lean in closer to the patient's airway and given its highly stimulating nature may precipitate coughing. In view of the limited evidence for its effectiveness, the risk-benefit of application of cricoid pressure should be carefully considered.

- The time between administration of neuromuscular blocking agent (NMBA) and laryngoscopy should be closely monitored to minimise apnoea time while ensuring adequate time is given for the NMBA to take effect to avoid precipitating coughing. The extended duration of action of rocuronium potentially provides an advantage over suxamethonium in the COVID-19 patient group, by preventing coughing should attempts at airway management be prolonged.
- Disconnection of the viral filter from the ventilation device once the face mask has been removed from the patient's face to perform laryngoscopy is discouraged. This has been proposed as a mechanism to avoid aerosolisation of virus containing secretions on the patient side of the filter. However, teams under stress may fail to reconnect the viral filter following intubation, potentially allowing virally contaminated expired gas to be expelled into the room with ventilation.

Intubation

- In clinicians proficient with its use, routine use of a videolaryngoscope is recommended for the first attempt at intubation.
- In addition to VL potentially contributing to first-pass success, visualising the larynx using the indirect (video screen) view, with the operator standing upright and elbow straight, maximises the distance between the Airway Operator's face and the patient. This should reduce the risk of viral transmission.
- The choice between a Macintosh-geometry and a hyperangulated videolaryngoscope blade should be made according to the skill set and clinical judgement of the airway operator.
- Care should be taken to place tube to correct depth first time, to minimise the need for subsequent cuff deflations.
- Once the tube is placed, the cuff should be inflated before positive pressure ventilation is attempted.
- The viral filter should be applied directly to the end of the tracheal tube. Increasing the number of connections between the filter and the tracheal tube increases opportunities for disconnection.

- Cuff pressure should be monitored with a cuff manometer to ensure an adequate seal.

Airway Rescue

If airway management is challenging, standard airway rescue interventions should be applied where they do not conflict with the specific recommendations for managing the COVID-19 patient group. Note that use of a bronchoscope for asleep video assisted fibreoptic intubation (VAFI) or for exchange of a supraglottic airway for a tracheal tube, is not an aerosol generating event when performed in a **profoundly paralysed apnoeic patient without use of positive pressure ventilation or insufflation/suction via the bronchoscope port**. Such techniques should only be implemented by clinicians familiar with their use in accordance with their usual practice for airway rescue.

Face mask ventilation: If rescue face mask ventilation is required, the following precautions should be taken:

- A Vice (V-E) grip is recommended (the Airway Assistant is therefore required to squeeze the bag).
- Ventilation pressure should be minimised through ramping and/or early use of an oropharyngeal airway with low gas flows.

eFONA: In a CICO situation, use of a scalpel-bougie eFONA technique is advocated to minimise the risk of high-pressure oxygen insufflation via a small-bore cannula. Contrary to usual practice, further attempts to deliver oxygen from above should not occur during performance of eFONA, to avoid aerosolisation of virus containing fluids when the trachea is punctured.

Post intubation

- A nasogastric tube should be placed at the time of intubation to avoid further close contact with the airway
- Unless single use, the laryngoscope blade should be bagged and sealed for sterilisation immediately after intubation according to ASNZ4187 standards.

- PPE should be removed as per local and WHO guidelines, using a 'Spotter' and noting that there is more risk of contamination during doffing than donning. PPE should be disposed of as per local policy.
- Chest X-ray should usually be performed to confirm tube position but should be delayed until after central line insertion to minimise staff entries into the room.
- A debrief should occur after every episode or airway management in this patient group to discuss lessons learned.

Extubation practices

Generic guidelines exist for extubation.(25) These should be followed where they don't conflict with the special considerations for extubation of the COVID-19 patient group outlined below. Patients should ideally be non-infective prior to extubation but this is likely to be unfeasible as resources are drained. Where this is achievable, however, standard extubation procedures apply. In situations where a patient is still at risk of viral transmission, the following recommendations should be observed:

1. Patients should ideally be ready for extubation onto facemask.
2. Two staff members should perform extubation.
3. The same level of PPE should be worn for extubation as is worn by the Airway Operator, Airway Assistant and Team Leader during intubation.
4. The patient should not be encouraged to cough.
5. Strategies to minimise coughing during extubation include use of intravenous opioids, lidocaine or dexmedetomidine. Placement of plastic sheets over the patient's face during extubation, in case coughing occurs, has been proposed but caution is advised with this approach as the risk of clinician self-contamination may be increased due to collection of viral containing secretions on the plastic.
6. A simple oxygen mask should be placed on the patient immediately post extubation to minimise aerosolisation from coughing.
7. Oral suctioning may be performed, with care taken not to precipitate coughing.

Education

1. Early, department-based, interprofessional education is vital for ALL staff involved in the airway management of patients with COVID-19.

2. Regular and repeated education is strongly recommended.
3. Simulation-based education is strongly recommended.
4. Staff education on donning and doffing of PPE, accompanied by multimedia visual aids and supervised practise is strongly recommended.

Special Contexts

Immediate ICU care after intubation

- For ongoing mechanical ventilation, humidification of inspired gases can be achieved using a heat-moisture-exchanger (HME) filter or a humidified circuit. If the latter is chosen, the viral filter used for tracheal intubation needs to be removed (due to the risk of waterlogging) during a planned disconnection. At the same time, an in-line suction catheter system can be inserted. In a planned disconnection, the ventilator should be placed on standby and the tube clamped prior to disconnection. Care should be taken when applying and removing a tube clamp, as this can lead to tube damage or dislodgement. Care should also be taken to ensure ventilation is recommenced after re-connection.
- In a dry circuit, a combined HME and viral filter can be left in place, but this means that nebulisers cannot be administered without breaking the circuit (to place a nebuliser between the patient and the HME).
- If the viral filter has been removed, the ventilator should be placed on standby for all circuit disconnections (to minimise the risks of aerosolisation). Great care should be taken that ventilation is recommenced after the circuit is reconnected.

Urgent surgery in the COVID-19 patient group

These patients will have COVID-19 as an incidental comorbidity, unrelated to their need for airway management, and may have only mild/asymptomatic COVID-19 disease.

- If surgery is non-urgent and can be delayed until the patient is non-infective, it should be deferred.
- If patients have suspected rather than confirmed COVID-19 cases and surgery is not time-critical, then testing to confirm or exclude COVID-19 will prevent wasting PPE. The ability of available testing to reliably exclude COVID-19 is crucial if implementing this step. The time frame beyond which urgency of

surgery precludes such testing depends on the speed with which results can be provided at a given institution.

- For surgery that cannot be deferred in the COVID-19 patient group:
    - Use a dedicated 'COVID-19 theatre'.
    - Regional anaesthesia avoids airway management, decreasing the potential for aerosolisation and risk of transmission. Avoid sedation (to decrease the need for supplementary oxygen and to minimise the risk of precipitating unplanned airway management), maintain a safe minimum distance from the patient's airway and implement standard droplet/contact precautions for both anaesthetist and patient. If a patient is unlikely to tolerate regional without significant sedation the risks of precipitating unplanned airway management must be balanced against those of proceeding immediately to general anaesthesia. Creating expert 'regional anaesthesia teams' to assess the potential for surgery to be conducted using regional techniques and to maximise their success is encouraged.

- If general anaesthesia is required, airway management in the COVID-19 patient group presenting for urgent surgery should follow the same principles outlined above with particular attention to the following issues.
    - Positive pressure room ventilation should be disabled and converted to negative (ideally) or neutral pressure.
    - Where positive pressure room ventilation cannot be disabled, any neutral pressure ante rooms should be regarded as dirty afterwards.
    - The number of air exchanges per hour should be maximised.
    - Early consultation with the engineering department about the best way to optimise theatre ventilation is advised.
    - All staff should enter via an ante room using this as an 'airlock', without opening the inner and outer doors at the same time. Once the patient is inside, the doors to the theatre should be obstructed or locked and appropriately signed to prevent them inadvertently being opened.
    - As there is little evidence to inform best practice, choice of anaesthetic technique and a particular airway type (face mask, supraglottic airway,

tracheal tube) should primarily be based on the same principles as for non-COVID patients, with attention to the following considerations:

- Where general anaesthesia is required, use of neuromuscular blocking agents (according to the principles outlined above) ensures apnoea and prevention of coughing during airway interventions, thereby minimizing the risk of aerosol generation while the airway management team is in close proximity to the patient's airway.
- Intubation maximises the seal around the airway, limiting aerosol generation with positive pressure ventilation. In a patient not at risk of aspiration, deep extubation may be considered. For other strategies to minimise coughing see 'Extubation practices' above.
- Avoid positive pressure ventilation with a face mask or supraglottic airway due to the risk of aerosol generation with a suboptimal seal.

- As discussed above, staff not immediately involved with airway management should not enter the operating theatre until after the airway has been secured. This includes surgical staff.
- Once the airway is secured, sufficient time should be allowed for any aerosols generated to disperse, before other staff enter the operating theatre. The time required for this will depend on the air exchange rate in the operating theatre. This may not be possible where initiation of surgery is time-critical.
- All staff in theatre during and after airway management (even after the elapsed time) should wear aerosol-protective PPE.
- Recover the patient in the operating theatre to avoid exposure to other patients and staff.

Unplanned Airway Management (this includes Prehospital Airway Management)

These scenarios present great risk to staff, especially during cardiac arrest. Devising management protocols that minimise time to commencement of external cardiac compressions while ensuring that staff are appropriately protected from viral exposure is extremely challenging. Some guidelines have already been suggested in the UK.(26) We recommend the following principles:

- Cardiac compressions should not commence until responsible staff are in aerosol-protective PPE. Processes must be put in place to ensure appropriate PPE is rapidly allocated to staff at inpatient cardiac arrest calls (and prehospital sites).
- The number of people in the room should be kept to a minimum at all times and no one should be allowed in the room without aerosol-protective PPE.
- Steps must be taken to protect first responders from exposure to aerosols and droplets during external cardiac compressions.
- Compression only cardiopulmonary resuscitation is advocated until the airway has been secured with a viral filter in place.
- Early tracheal intubation by a skilled airway operator.
- Prior to intubation, first responders should only use the airway techniques they are experienced in performing.
- Supraglottic airway placement is likely a better option than face mask ventilation (due to less aerosolisation) if immediate intubation is not possible.
- Face mask application and positive pressure ventilation should be avoided wherever possible, especially during cardiac compressions.
- At any time, we recommend clinicians avoid close contact with the patient's mouth (e.g. do not listen for breathing.)

Acknowledgements

Professor Tim Cook for allowing us to consult the "Royal College of Anaesthetists COVID-19 Airway Management Principles" in development during the preparation of this statement.

Dr. Louise Ellard for allowing us to consult the Austin Health's "COVID-19 intubation guidelines" during the preparation of this statement.

Dr. Dan Zeloof, Dr. Dan Moi, Dr. Jessie Maulder and Dr. Dush Iyer for their work on the graphics.

Appendix 1 – Intubation checklist for COVID-19

Appendix 2 - Summary cognitive aid

List of endorsements

List

- Australian and New Zealand Intensive Care Society (ANZICS)
- College of Intensive Care Medicine of Australia and New Zealand (CICM)
- Australian Society of Anaesthetists (ASA)
- Australasian College of Emergency Medicine (ACEM)
- New Zealand Society of Anaesthetists (NZSA)
- Australian College of Perianaesthesia Nurses (ACPAN)
- New Zealand Anaesthetic Technicians' Society (NZATS)
- Western Australia Airway Group (WAAG)
- Australasian College of Paramedicine (ACP)
- Australian Anaesthesia Allied Health Practitioners (AAAHP)
- Australian College of Critical Care Nurses (ACCCN)

References

1. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395(10223):497-506.

2. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. 2020;395(10223):507-13.

3. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72314 Cases From the Chinese Center for Disease Control and Prevention. JAMA. 2020.

4. Centre for Disase Control. Environmental Cleaning and Disinfection Recommendations: Interim Recommendations for US Households with Suspected/Confirmed Coronavirus Disease 2019. Accessed March 13, 2020 at https://www.cdc.gov/coronavirus/2019-ncov/community/home/cleaning-disinfection.html.

5. Wolff MH, Sattar SA, Adegbunrin O, Tetro J. Environmental survival and microbicide inactivation of coronaviruses. Coronaviruses with Special Emphasis on First Insights Concerning SARS. pp 201-212 Germany. Birkhäuser Basel, 2005. https://doi.org/10.1007/b137625

6. Casanova LM, Jeon S, Rutala WA, Weber DJ and Sobsey MD. Effects of Air Temperature and Relative Humidity on Coronavirus Survival on Surfaces. Appl Environ Microbiol. 2010; 76(9): 2712–2717.

7. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. New England Journal of Medicine. March 17 2020; DOI: 10.1056/NEJMc2004973

8. Ignatius Tak-Sun Yu, Hong Qiu, Lap Ah Tse, Tze Wai Wong, Severe Acute Respiratory Syndrome Beyond Amoy Gardens: Completing the Incomplete Legacy, *Clinical Infectious Diseases*, Volume 58, Issue 5, 1 March 2014, Pages 683–686, https://doi.org/10.1093/cid/cit797

9. Parodi SM, Liu VX. From Containment to Mitigation of COVID-19 in the US. *JAMA.* Published online March 13, 2020. doi:10.1001/jama.2020.3882

10. Public Health England. High consequence infectious diseases (HCID). Accessed March 10, 2020 at https://www.gov.uk/guidance/high-consequence-infectious-diseases-hcid.

11. Australian and New Zealand Intensive Care Society (ANZICS) COVID-19 Guidelines. Accessed March 27,2020 at https://www.anzics.com.au/wp-content/uploads/2020/03/ANZICS-COVID-19-Guidelines-Version-1.pdf

Version 1 is superseded by Version 2. Version 1 is retained in our records

12. Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. Canadian journal of anaesthesia = Journal canadien d'anesthesie. 2020.

13. Hui DS, Chow BK, Lo T, Tsang OTY, Ko FW, Ng SS, et al. Exhaled air dispersion during high-flow nasal cannula therapy versus CPAP via different masks. Eur Respir J. 2019;53(4).

14. Kotoda M, Hishiyama S, Mitsui K, Tanikawa T, Morikawa S, Takamino A, et al. Assessment of the potential for pathogen dispersal during high-flow nasal therapy. J Hosp Infect. 2019.

15. Zuo MZ, Huang YG, Ma WH, Xue ZG, Zhang JQ, Gong YH, et al. Expert Recommendations for Tracheal Intubation in Critically ill Patients with Noval Coronavirus Disease 2019. Chin Med Sci J. 2020.

16. Peng PWH, Ho PL, Hota SS. Outbreak of a new coronavirus: what anaesthetists should know. British journal of anaesthesia. 2020.

17. Higgs A, McGrath BA, Goddard C, Rangasami J, Suntharalingam G, Gale R, et al. Guidelines for the management of tracheal intubation in critically ill adults. British journal of anaesthesia. 2018;120(2):323-52.

18. Chrimes N. The Vortex: a universal 'high-acuity implementation tool' for emergency airway management. British journal of anaesthesia. 2016;117 Suppl 1:i20-i7.

19. Australian and New Zealand College of Anaesthetists (ANZCA). Guidelines for the Management of Evolving Airway Obstruction: Transition to the Can't Intubate Can't Oxygenate Airway Emergency. 2017. Accessed 12/02/2020 at http://www.anzca.edu.au/getattachment/resources/professional-documents/ps61_guideline_airway_cognitive_aid_2016.pdf.

20. Edelman DA, Perkins EJ, Brewster DJ. Difficult airway management algorithms: a directed review. Anaesthesia. 2019;74(9):1175-85.

21. Chrimes N, Cook TM. Critical airways, critical language. British journal of anaesthesia. 2017;118(5):649-54.

22. Cook TM, Woodall N, Frerk C, Fourth National Audit P. Major complications of airway management in the UK: results of the Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. Part 1: anaesthesia. British journal of anaesthesia. 2011;106(5):617-31.

23. ANZCA statement on personal protection equipment during the COVID-19 pandemic (30 March 2020). Accessed March 30, 2020 at http://www.anzca.edu.au/documents/pcu_anzca-covid-ppe-statement_20200330.pdf

24. World Health Organistion. Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected. Interim guidance: 25 January 2020.

25. Difficult Airway Society Extubation Guidelines G, Popat M, Mitchell V, Dravid R, Patel A, Swampillai C, et al. Difficult Airway Society Guidelines for the management of tracheal extubation. Anaesthesia. 2012;67(3):318-40.

26. Resuscitation Council UK. Statement on COVID-19 in relation to CPR and resuscitation in healthcare settings. Accessed 13/03/20 at https://www.resus.org.uk/media/statements/resuscitation-council-uk-statements-on-covid-19-coronavirus-cpr-and-resuscitation/covid-healthcare/


2 HANDS
VICE GRIP
© Copyright Nicholas Chrimes 2016. Licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License

COVID-19 Emergency Intubation Checklist

SAFE AIRWAY SOCIETY

CHECK BEFORE ENTERING ROOM

Team

- ❑ Anaesthesia contacted if difficulty anticipated
- ❑ Team introduced:
  - Airway Operator
  - Airway Assistant
  - Team Leader/Drugs
  - In-room Runner: optional
  - Door Runner
  - Outside room Runner
- ❑ Problems anticipated?

Patient

- ❑ ECG, BP, Sats
- ❑ Pre-oxygenation
  - FIO2 100%
  - Sitting position 45˚
- ❑ IV access x 2
  - 1L fluid on pump set
- ❑ Haemodynamics optimised
  - Fluid bolus
  - Pressor

Drugs

- ❑ RSI drugs drawn up, doses chosen
- ❑ Rescue drugs
  - Metaraminol
- ❑ Post intubation sedation plan
- ❑ Drug C/I or allergies?

Equipment

- ❑ 2 Laryngoscopes (tested)
- ❑ Tube chosen; cuff tested
- ❑ Bougie/stylet
- ❑ 10ml syringe
- ❑ Tube tie
- ❑ Lubricant
- ❑ Supraglottic airway sized to pt
- ❑ Scalpel + bougie CICO kit
- ❑ Airway trolley/bronchoscope outside room
- ❑ ETCO2
- ❑ Viral filter

FINAL CHECK IN ROOM

- ❑ Patient position optimal
- ❑ Fluid runs easily
- ❑ Suction working
- ❑ Facemask with viral filter connected
- ❑ ETCO2 trace
- ❑ O2 running at 15L.min^{-1}
- ❑ Oropharyngeal/nasal airways

❑Airway plans:

- Plan A: Videolaryngoscopy with bougie/stylet
- Plan B: Supraglottic airway
- Plan C: Vice grip, 2-person +/- Guedel/NPA
- Plan D: Scalpel/bougie/tube

The Medical Journal of Australia - Preprint only - Version 2, updated 1 April 2020

SAFE AIRWAY SOCIETY

COVID-19 AIRWAY MANAGEMENT

1. Intensive training
2. Early intervention
3. Meticulous planning
4. Vigilant infection control
5. Efficient airway management
6. Clear communication

USE A 'BUDDY CHECK' FOR CORRECT PPE FITTING

Planning

Intervene early - aim to avoid emergency intubation.
Negative Pressure room or Normal pressure with strict door policy.
Senior clinician involvement. Is Anaesthetist needed?
Early airway assessment documented by senior clinician.

Prepare

Assemble 5-6 person Airway Team (see reverse).
Use COVID-19 Intubation Tray (see reverse).
Ensure Viral Filter and ETCO2 in ventilation circuit.
Share Airway Strategy. Use a dedicated COVID intubation checklist.

PPE

Hand Hygiene (HH).
Donning: HH > Gown > Mask > Eye-protection > Hat > HH > Gloves.
Spotter to perform "Buddy Check" to ensure correct PPE fit.
Airway operator to consider double gloves.

Pre-Ox

45 degree head up position.
Pre-oxygenate with Face Mask using 2 hands for full 5 minutes.
Ensure a square ETCO2 waveform, to be confident of no leaks.
Avoid Apnoeic Oxygenation techniques due to aerosolization risk.

Perform

Use VL; use the screen (indirect view) to maximise operator distance from airway.
Modified RSI technique (1.5mg/kg IBW Roc OR 1.5mg/kg TBW Sux).
No ventilation prior to intubation unless for rescue oxygenation.
Wait 60 seconds for paralysis to take effect - avoid triggering cough.

Post-ETT

Inflate cuff BEFORE initiating ventilation and monitor cuff pressures to minimise leak.
Remove outer gloves (if on), dispose of airway equipment in sealed bag.
Doffing: Gloves > Gown > HH > Hat > Eye Protection > Mask > HH. Use a Spotter.
Debrief and share lessons.

Awake Intubation

Risk of aerosolization. Involve Senior Anaesthetist if this airway technique is indicated.

Connection / Disconnection

Apply the viral filter directly to the ETT. Only disconnect the circuit on the ventilator side of the viral filter.

CICO Rescue

Scalpel-bougie technique to avoid aerosolization.

Collaboration between Safe Airway Society + RNS ASCAR *@SafeAirway + @RnsAscar* *v1.2 March 2020*

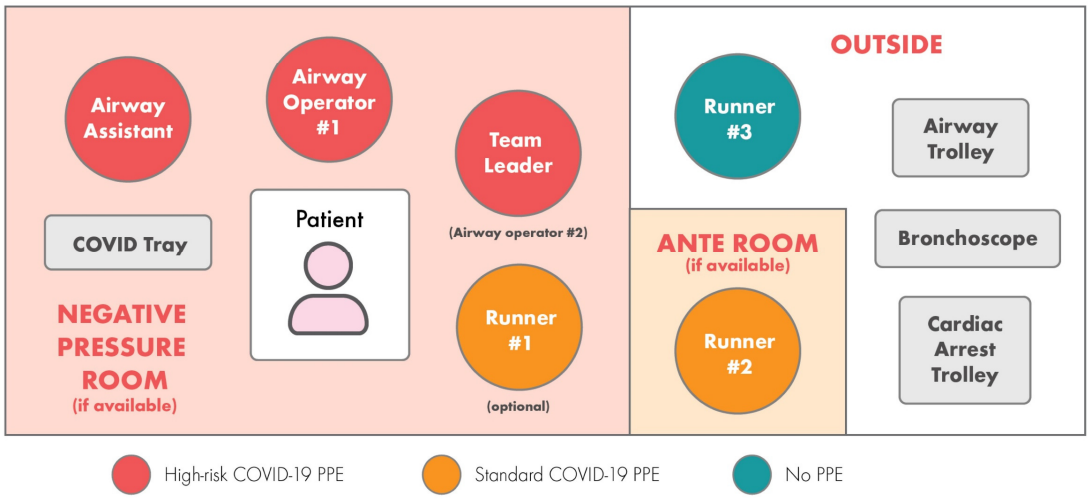
Version 1 is superseded by Version 2. Version 1 is retained in our records

The Medical Journal of Australia - Preprint only - Version 2, updated 1 April 2020

SAFE AIRWAY SOCIETY

COVID-19 AIRWAY MANAGEMENT

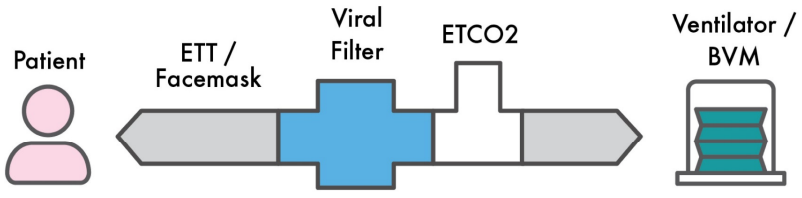
Team Members



COVID Intubation Tray

- ☐ Macintosh VL blade
- ☐ Hyperangulated VL blade (if available)
- ☐ Macintosh direct laryngoscope
- ☐ SGA (2nd generation)
- ☐ ETT (appropriate size range)
- ☐ Bougie / Stylet
- ☐ 10 mL syringe
- ☐ Tube tie
- ☐ Lubricant sachet
- ☐ Viral filter
- ☐ ETCO2
- ☐ NG tube (large bore)
- ☐ OPA + NPA
- ☐ Scalpel + bougie CICO kit
- ☐ Inline suction

Circuit Setup



Collaboration between Safe Airway Society + RNS ASCAR *@SafeAirway + @RnsAscar* *v1.2 March 2020*

Version 1 is superseded by Version 2. Version 1 is retained in our records