The current global severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic has magnified the risk to healthcare providers when initiating airway management, and safe tracheal intubation has become of paramount importance. Mitigation of risk to frontline providers requires airway management to be an orchestrated exercise based on training and purposeful simulation. Role allocation and closed-loop communication form the foundation of this exercise. We describe a methodical, 10-step approach from decision-making and meticulous drug and equipment choices to donning of personal protective equipment, and procedural concerns. This bundled approach will help reduce unplanned actions, which in turn may reduce the risk of aerosol transmission during airway management in resource-limited settings. [West J Emerg Med. 2020;21(5)1076-1079.]

Disclaimer: Due to the rapidly evolving nature of this outbreak, and in the interests of rapid dissemination of reliable, actionable information, this paper went through expedited peer review. Additionally, information should be considered current only at the time of publication and may evolve as the science develops.

BACKGROUND
The emergence of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), or COVID-19, pandemic has brought infections that are transmitted via droplet and aerosol under the spotlight.1 Infections such as influenza A subtype H1N1, Nipah virus infection, Ebola virus disease, and multidrug-resistant tuberculosis are equally contagious and pose a significant risk to healthcare professionals, especially those involved in airway management.2,3 Herin, we describe a step-by-step approach to endotracheal intubation of critically ill patients with suspected or confirmed COVID-19 and other airborne diseases with the goal of limiting the risk of exposure to healthcare providers.

CONCEPTS
1. Rapid sequence intubation (RSI) and invasive mechanical ventilation are preferred. Non-invasive positive pressure ventilation (NIPPV) increases the risk of aerosol generation; NIPPV has been associated with increased risk of healthcare worker infection and hence should be avoided.4,5

2. The care area is divided as follows:
   • Hot zone: A three-meter [9.85 feet] radius around the patient
   • Warm zone: The area between hot and cold zone where decontamination takes place
   • Cold zone: The outermost noncontaminated area.

3. The intubation team members are described in Table 1.

4. Encourage closed-loop communication.

STEPS OF MIST (Modified Intubating Sequence for Transmissibility) BUNDLE
1. Pre-assessment phase and pre-briefing phase – Cold Zone
   Step a. Review patient clinical data to determine appropriateness of endotracheal intubation and mechanical ventilation for the patient.
   Step b. Team leader (TL) debriefs the intubation plan to the...
team to avoid unplanned and unarticulated actions.
Step c. Infection control nurse (ICN) alerts team to any
breach of protocol or infection control practice.

2. Preparatory phase – Cold Zone
Step a. Use continuous positive airway pressure mode with
non-invasive ventilation (NIV) mask for preoxygenation.
The registered respiratory therapist (RRT) assembles the
ventilator with its circuit including preparation of the NIV
mask with a viral filter and checks for possible leaks and
disconnections. Ventilator settings: pressure support 0
centimeters of water, positive end expiratory pressure as per
the requirement, and fraction of inspired oxygen to 100%.
Deselect the apnea setting.
Step b. Review the equipment required for intubation (Figure
1A) (Table 2); the registered nurse (RN) loads pre-calculated
doses of RSI medications (Table 3).
Step c. The assembly (Figure 1B) of the endotracheal tube
(ETT) should be preset with a catheter mount containing a
viral filter, and an inflation syringe with an intubating bougie.

3. Preoxygenation Phase: Hot Zone
Step a: The RRT ensures wall-mounted suction unit is
properly connected. A Yankauer suction connected to the
wall-mounted suction unit should be available, but its usage
should be judicious. The suction tip, if used, should be
disposed of in a Ziploc bag.
Step b: TL at the head of the bed places the NIV mask
with the viral filter onto the patient and ensures proper
sealing to avoid leak. The RRT “starts” the ventilator and
preoxygenates until adequate oxygen saturation is attained.

Avoid bag-valve mask for preoxygenation. Meticulous
preoxygenation should be done for 3–5 minutes.
Step c: RN ensures patent intravenous access, assesses the
vitals periodically, and communicates them to the TL.

4. Peri Induction phase: Hot Zone
Step a: RN administers the pre-calculated dose of the
induction agent followed by the paralytic agent to the patient.
Step b: Appropriate patient positioning should be performed
to maximise safe apnoea time.

Table 1. Role Allocation and Personnel Details of intubation team.

| S. No | Personnel            | Stationed in        | Responsibility                          |
|-------|----------------------|---------------------|-----------------------------------------|
| 1     | Team leader          | Hot Zone (3-meter   | Performs tracheal intubation            |
|       |                      | radius)             |                                         |
| 2     | Registered respiratory therapist | Hot Zone | Oversees airway and ventilator equipment |
| 3     | Registered nurse     | Hot Zone            | Ensures IV access and administers IV medications |
| 4     | Infection control nurse | Warm Zone | Oversees procedure and protocols        |

IV, intravenous; TL, Team Leader; RRT, Registered Respiratory Therapist; RN, Registered Nurse; ICN, Infection Control Nurse.

Figure 1. A. List of equipment required in intubation trolley. PVC pipe sealed at one end (white arrow) filled with 1% sodium hypochlorite solution is used for discarding the soiled bougie and yellow bag (arrow head) for discarding the soiled wastes. B. Intubation unit.
Table 2. List of equipment required in intubation trolley.

| Equipment                                      | Numbers |
|------------------------------------------------|---------|
| Intubation unit (Figure 1B)                   | 1       |
| Macintosh laryngoscope with size 3 and 4 blades in a sterile tray | 1 each |
| iGel                                           | 2       |
| Stethoscope                                    | 1       |
| Cuffed ETT, size 7                             | 1       |
| ETT fixator                                    | 1       |
| IV fluid with infusion set                     | 1       |
| Ziploc bags                                    | 5       |

**ETT**, endotracheal tube; **IV**, intravenous.

Table 3. List of drugs used in Intubation.

| Drugs                | Dose                  |
|----------------------|-----------------------|
| Inducing agent       |                       |
| Inj. etomidate or    | 0.3mg/kg IV           |
| Inj. ketamine        | 1-2mg/kg IV           |
| Paralytic agent      |                       |
| Inj. rocuronium      | 1-1.2mg/kg IV         |

**Inj., injection; mg, milligram; kg, kilogram; IV, intravenous.**

5. **Peri-intubation Phase: Hot Zone**

Step a: The RRT sets the ventilator on standby mode after adequate paralysis and oxygen saturation is achieved.

Step b: TL subsequently removes the NIV mask, which is disconnected from the ventilator by the RRT and placed in a Ziploc bag.

Step c: TL performs laryngoscopy. During this time, the RRT is required to change the settings of the ventilator to “assist control mode ventilation.” Once the vocal cords are visualized, the RRT hands over the intubating unit to the TL who should then pass the bougie between the cords under direct visualization. Video laryngoscope is a preferred choice for intubation of such patients, if available.

Step d: The RRT assists in guiding the ET over the bougie and should subsequently inflate the cuff with the pre-filled air syringe.

Step e: The RN confirms the position of the tube with five-point auscultation, following which the stethoscope should be disposed of in the Ziploc bag. End-tidal carbon dioxide confirmation is advised, if available.

6. **Post-intubation Phase: Hot Zone**

Step a: Continue ventilation and monitor hemodynamics. Initiate early sedation and analgesia.

Step b: Ensure all soiled equipment has been disposed of appropriately into the yellow bag for decontamination (Figure 1A).

Step c: The order of doffing and decontamination is TL, followed by the RN, and then the RRT who should be separately overviewed and monitored by the ICN.

**CONCLUSION**

This sequence should guide healthcare professionals to minimize aerosol and droplet transmission during intubation and expedite better patient care. This approach does not involve significant resource intensification and can be done in resource-limited settings.

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