

# Prehospital Medication Assisted Intubation

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This document includes the protocol for prehospital medication assisted intubation (MAI). Also included are clinical algorithms, educational recommendations and guidelines for quality assurance.

The efficacy of sedatives and neuromuscular blocking medications has been demonstrated for prehospital as well as hospital use to facilitate intubation. The success of a prehospital medication assisted intubation program depends on several factors.

- First, there needs to be a comprehensive initial educational program that includes operating room observation time. The initial education is supplemented with monthly case review and semi annual skills review.
- The quality assurance program requires commitment by the service medical director and paramedic manager. An interdisciplinary committee should review MAI cases on a regular basis. The case review is so important for the successful use of the protocol that meeting attendance is mandatory. The service medical director and paramedic manager should participate in all the meetings of the interdisciplinary committee. In their absence they should send a designee who would be able to report information back to their service. More than one unexcused absence threatens the quality performance of the service. Thus, a service should be suspended from using the protocol until they can comply with regular attendance and participation in the quality review process.
- A standard database should be used so that intubation data can be merged from multiple services.
- Individual paramedic should have performed 20 intubations per year to use the protocol as a standing order. The paramedic service should have performed over 100 intubations per year.
- Two-paramedic crews may use the protocol as a standing order.

## EDUCATION

The initial educational program consists of didactic lectures, skills labs and observation time in the Operating Room. The initial program takes approximately 20-24 hours to complete. The continuing education program includes monthly case reviews and semi-annual skills review.

- I. The classroom time will be approximately 8 hours and should include the following:

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- a. Anatomy and physiology - including systems for grading the airway.
  - b. Pharmacology - focusing on contraindications, indications, mechanism of action, onset, duration of action, dosing, special considerations for pediatric patients and drug interactions.
  - c. Advanced airway management - includes review of the algorithm and case scenarios with attention to the complicated airway section of the algorithm. The use of the LMA, transtracheal jet insufflation, needle and surgical cricothyrotomy should be covered in detail. End tidal CO<sub>2</sub> monitoring should be reviewed.
- II. The labs will need approximately 8 hours and should include the following:
- a. Review techniques for needle and surgical cricothyrotomies and LMA. Procedures can be performed on mannequins and animal necks. Use some case scenarios to incorporate the use of the procedures as rescue airways as part of the algorithm
- III. Operating Room Observation
- a. Observe the use of neuromuscular blocking agents by anesthesia. Knowledge objectives should include contraindications, dosing, drug onset and duration, estimation of pediatric weight, airway equipment sizes and lip line estimates, Each paramedic needs to have done 20 intubations (field or O.R.) per year prior to using the protocol
- IV. Completion of written and practical exam given by the Medical Director.

## QUALITY ASSURANCE

Quality assurance will be performed by each service. The Service Medical Director and Advanced Life Support (ALS) Manager will review each MAI case individually and keep a written record of their review. Sample forms are included.

The paramedics will enter the appropriate information from MAI case into the standardized database. The service MAI data may be merged with data from other services upon the request of OEMS.

At least bimonthly, MAI cases should be reviewed by an interdisciplinary committee. The committee should include, but not be limited to, paramedics, emergency physicians, pediatric emergency physicians, and anesthesiologists.

The interdisciplinary committee should review cases and make recommendations for continuing education of the paramedics. Also the committee should review service data regarding utilization, etc., on an annual basis.

### MEDICATION ASSISTED INTUBATION PROTOCOL ADULT

(Greater than 30 kg/66 lbs.)

### GENERAL INDICATIONS

Any patient who has the need for definitive airway control and/or prolonged ventilatory assistance in whom such control has not been established by more conventional means.

### CONTRAINDICATIONS

- Inability to ventilate patient with Bag-Valve Mask
- Upper airway obstruction
- Tracheal obstruction (i.e., foreign body, tumor)
- Suspected pharyngeal infection (i.e., epiglottitis, peritonsillar or retro-pharyngeal abscess)
- Patients at high risk for hyperkalemia
- Neuro-muscular disorders (i.e., multiple sclerosis, muscular dystrophy, ALS etc.)

### PROCEDURE

Assemble equipment:

- Intubation set (including all blades and Magill forceps)
- Endotracheal tubes (two of each size)
- Malleable stylet (pediatric and adult)
- Pulse oximeter (capable of constant reading)
- Cardiac monitor
- Bag-Valve-Mask with oxygen
- Suction with Yankaur tip
- End tidal CO<sub>2</sub> detector
- NASO gastric tube (to be placed following intubation if time allows)
- Melker Cricothyrotomy Kit
- Adjunctive airway system (BVM, OPA, NPA, LMA)

### MEDICATION ASSISTED INTUBATION

### PATIENT PREPARATION

1. Intubate patient by conventional methods unless the patient's clinical condition (i.e., agitation, combativeness or increased muscle tone) requires sedating/paralytic agents and that a first attempt by conventional methods would delay obtaining a definitive airway.
2. Grade the airway. Consider the contraindications to using medications, including succinylcholine.
  - 2.1. Contraindications for Succinylcholine
    - Patients at high risk for hyperkalemia
    - Neuromuscular disorders (e.g., multiple sclerosis, muscular dystrophy, "ALS" Lou Gehrig's Disease, Guillian-Barre, severe muscular atrophy diseases)
    - Burns over 48% BSA
    - Patient of familial history malignant hyperthermia
    - While not a contraindication, caution should be used in patients suspected of organophosphate / nerve agent exposure as it may potentiate effect and cause prolonged paralysis
3. Patient should have all applicable monitoring devices attached and working.
4. IV should be established with a large bore catheter and secured appropriately.
5. Pre-oxygenate with 100% oxygen prior to administration of medications.
6. Medications should be prepared during high flow O<sub>2</sub> period.

### MEDICATION ADMINISTRATION

1. Fentanyl and/or midazolam or etomidate may be used for sedation. Fentanyl alone and/or etomidate is preferable for hemodynamically compromised trauma or medical patients. Remember when using Etomidate for a patient age 10 or older in shock, the dose is reduced from 0.3 mg/kg to 0.2 mg/kg with maximum dosing of 20 mg. The dose of fentanyl 1-2 mcg/kg I.V.
2. Midazolam (2.0-2.5 mg I.V.) or Etomidate 0.3 mg/kg may be used alone, if there is a contraindication to using fentanyl. Also midazolam or etomidate may be used in addition to fentanyl, if sedation with fentanyl is inadequate or to relieve muscular rigidity caused by higher doses of fentanyl. Remember the increased potential for lowering blood pressure when using two medications together. For patients who are already heavily sedated with narcotics or sedatives, etomidate, midazolam and fentanyl may not be necessary prior to neuromuscular blockade.
3. Rate the difficulty of intubation before neuromuscular blockade (i.e., short neck syndrome, very anterior airway position, micrognathia, etc.). If the patient's airway would be too difficult to intubate with the use of paralytic medications, then ventilate patient by mask and transport to the hospital.

4. Administer succinylcholine 1.5 mg per kilogram IV push. Dosing is based on patient's lean body mass. Maximum dose of succinylcholine should not exceed 120 mg.
5. Apply cricoid pressure until intubation completed. C-collar may need to be removed to maintain cricoid pressure and to maintain in line stabilization.
6. Pass endotracheal tube, if patient's sedation is adequate at this time..
7. Upon evidence of paralysis (apnea, jaw relaxed and decreased resistance to bag-mask ventilation) proceed with intubation. Maintain C-spine immobilization when indicated. If patient is not intubated within twenty (20) seconds, stop and re-ventilate patient for thirty (30) seconds to one (1) minute before attempting to intubate patient again. Continuously monitor heart rate and pulse oximeter. If patient is unable to be intubated, then ventilate patient by bag-valve-mask until muscular paralysis abates. If bag-valve-mask ventilation is ineffective, go to the "Rescue Airway Algorithm" and contact Medical Control.
8. After passing the endotracheal tube, placement should be confirmed by auscultation of breath sounds bilaterally, the absence of abdominal sounds and using the end tidal CO<sub>2</sub> detector. Continuous monitoring of heart rate and pulse is imperative.
9. Document lip line. Contact Medical Control. Fentanyl and/or midazolam may be used for post sedation. The doses and hemodynamic concerns are the same as noted above for pre-intubation sedation.
10. Post intubation some patient's may become severely agitated despite sedatives. If the patient's agitation threatens the loss of the ET tube contact medical control for an order for Vecuronium 0.1 mg/kg. Vecuronium is only for patient's age 16 or older and maximum dose is 10 mg IV/IO. Vecuronium is a standing order in the therapeutic hypothermia protocol only.
11. Placing an oral gastric tube while en route to the receiving facility is optimal, but should not detract from other more important patient care duties.
12. Complete written documentation including airway assessment and degree of difficulty to be included in patient's hospital record.

#### MONITORING / DOCUMENTATION

Documentation for all medically assisted intubations should include blood pressure, heart rate, respiratory rate, oxygen saturation, and end tidal CO<sub>2</sub>. If there are any situations where this cannot be captured by your monitoring system(s), please document that in the ePCR.

PEDIATRIC  
(less than 30 kg/66 lbs.)

GENERAL INDICATIONS

The indications for prehospital endotracheal intubation of the pediatric patient are unchanged whether or not paralytic medications are available. Within the population of children for whom intubation is indicated, the prehospital use of paralytic agents as an adjunct to endotracheal intubation should be restricted to those children whose trachea cannot be intubated after administration of the sedative induction agents prescribed in this protocol.

CONTRAINDICATIONS

- Inability to ventilate patient with Bag-Vale Mask
- Upper airway obstruction
- Tracheal obstruction (i.e., foreign body, tumor)
- Suspected pharyngeal infection (i.e., epiglottitis, peritonsillar or retro-pharyngeal abscess)
- Patients at high risk for hyperkalemia
- Neuro-muscular disorders (i.e. muscular dystrophy, multiple sclerosis, etc.)

PROCEDURE

Assemble equipment:

- Intubation set (including all blades and Magill forceps)
- Endotracheal tubes (two of each size)
- Malleable stylet (pediatric and adult)
- Pulse oximeter (capable of constant reading)
- Cardiac monitor
- Bag-Valve-Mask with oxygen
- Suction with Yankaur tip
- End tidal CO<sub>2</sub> detector
- NASO gastric tube (to be placed following intubation if time allows)
- Melker Cricothyrotomy Kit
- Adjunctive airway system (BVM, OPA, NPA, LMA)

MEDICATION ASSISTED INTUBATION

PATIENT PREPARATION

1. Intubate patient by conventional methods unless the patient's clinical condition (i.e., agitation, combativeness or increased muscle tone) requires sedating/ paralytic agents and that a first attempt by conventional methods would delay obtaining a definitive airway.
2. Grade the airway. Consider the contraindications to using medications, including succinylcholine.
3. Patient should have all applicable monitoring devices attached and working.
4. IV should be established with a large-bore catheter and secured appropriately.
5. Pre-Oxygenate with 100% oxygen prior to administration of medications.
6. Medications should be prepared during high flow O<sub>2</sub> period.

#### MEDICATION ADMINISTRATION

1. Fentanyl and/or midazolam may be used for sedation. Fentanyl alone is preferable for hemodynamically compromised trauma or medical patients. Administer fentanyl 1-2 mcg/kg I.V. Midazolam may be used alone, if there is a contraindication to using fentanyl. Also midazolam may be used in addition to fentanyl, if sedation with fentanyl is inadequate or to relieve muscular rigidity caused by higher doses of fentanyl. Midazolam dose is 0.05-0.1 mg/kg IV push (up to 2.5 mg total per dose). Remember the increased potential for lowering blood pressure when using both medications together. For patients who are already heavily sedated with narcotics or sedatives, midazolam and fentanyl should not be necessary prior to neuromuscular blockade. Etomidate can be used for children over 10 years of age, dosing is 0.2 mg/kg in shock and 0.3 mg/kg in patients not in shock. Maximum dosing is 20 mg IV/IO. Etomidate is not appropriate for post intubation sedation. Etomidate can be use with either midazolam or fentanyl, but typically will not need to be combined with other medications for sedation.
2. If clinical condition still warrants the use of paralytics rate the difficulty of intubation before neuromuscular blockade (i.e., short neck syndrome, very anterior airway position, micrognathia, etc.). If the patient's airway would be too difficult to intubate with the use of paralytic medications, then ventilate patient by mask and transport to the hospital.
3. Premedicate with Atropine 0.01 mg/kg to prevent bradycardia. Minimum dose of Atropine is 0.1 mg to prevent paradoxical bradycardia. Maximum dose of Atropine is 0.5 mg. Administer succinylcholine 1.5-2.0 mg per kilogram IV push. Dosing of succinylcholine is based on patient's lean body mass.

4. Apply cricoid pressure until intubation completed. C-collar may need to be removed to maintain cricoid pressure and to maintain in line stabilization.
5. Upon evidence of paralysis (apnea, jaw relaxed and decreased resistance to bag-mask ventilation) proceed with intubation. Maintain C-spine immobilization when indicated. If patient is not intubated within twenty (20) seconds, stop and re-ventilate patient for thirty (30) seconds to one (1) minute before attempting to intubate patient again. Continuously monitor heart rate and pulse oximeter. If patient is unable to be intubated, then ventilate patient by bag-valve-mask until muscular paralysis abates. If bag-valve-mask ventilation is ineffective, go to the “Rescue Airway Algorithm” and contact Medical Control.
6. After passing the endotracheal tube, placement should be confirmed by auscultation of breath sounds bilaterally, the absence of abdominal sounds and using the end tidal CO<sub>2</sub> detector. ETCO<sub>2</sub> caps vary in their accuracy depending on humidification. Continuous monitoring of heart rate and pulse is imperative.
7. Document lip line. Lip line should be about 12 plus ½ age for a child greater than 5 kg and 10 plus the age for a child less than 5 kg. Contact Medical Control. Fentanyl and/or midazolam may be used for post sedation. The doses and hemodynamic concerns are the same as noted above for pre-intubation sedation.
8. Placing an oral gastric tube while en route to the receiving facility is optimal, but should not detract from other more important patient care duties.
9. Complete written documentation including airway assessment and degree of difficulty to be included in the patient care report. Documentation should also include blood pressure, heart rate, respiratory rate, oxygen saturation and end-tidal CO<sub>2</sub> levels. If there are any situations where this cannot be captured by monitoring system, please document that in ePCR.

## RESCUE AIRWAY PROTOCOL

- I. Attempt basic airway maneuvers prior to advanced procedures:
  - A. Head tilt/chin lift or jaw thrust
  - B. BVM with OPA/NPA
  - C. Endotracheal intubation
  - D. LMA



- II. In the event of unsuccessful intubation, following the administration of a neuromuscular blockade, continue to ventilate with BVM until the blockade has abated.
- III. If spontaneous respiration does not occur and bag-mask ventilation is impossible or inadequate, administer Naloxone intravenously and insert LMA. If unable to use LMA, perform surgical cricothyrotomy for adult or needle cricothyrotomy for childless than 30 kg or 9 years old.
  - A. LMA
  - B. Needle Cricothyrotomy (see Cricothyrotomy Protocol)
  - C. Surgical Cricothyrotomy (see Cricothyrotomy Protocol)

## **CRICOTHYROTOMY**

Cricothyrotomy is an invasive procedure performed only when a patient is in imminent danger of death due to airway compromise which cannot be alleviated by other means.

Needle Cricothyrotomy is the preferred procedure in children under the age of 8 years old. It may also be performed in adults prior to the surgical method or as a means of allowing air into the airway until a more suitable airway can be obtained.

### CONTRAINDICATIONS

No absolute contraindication relative to the given situation.

### EQUIPMENT

Melker Emergency Cricothyrotomy Catheter Set *or Quick Trach kit*

Contained in the kit: #14 gauge needle, scalpel, introducer, dilator, guide wire, 6mm endo-tube.

This device may be use for both Needle and Surgical procedures.

### PROCEDURE

Hyperextend the neck if there is no evidence of trauma. Identify landmarks and prep the neck. Palpate the thyroid and cricoid cartilage, then palpate the cricoid membrane. Identify this membrane by placing the left index finger on the membrane while stabilizing the trachea with the thumb and middle finger of the left hand. Prep area with right hand while you maintain the landmark with the left hand.

1. Clean area in the usual fashion.

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2. Insert the #14G needle in to the crico-membrane; aspirate air. You can attempt ventilation at this time by using the 21/15mm adapter from a #3.0mm endotracheal tube. There will not be chest rise with ventilation just breath sound auscultated over lung fields.
3. To continue with a surgical cricothyrotomy insert the soft end of the guide wire through the catheter.
4. Once in place remove the catheter and thread the Introducer/dilator/tube down the wire so it is touching the throat.
5. Using the scalpel, make a small vertical incision through the skin.
6. Insert the introducer, then the tube. Remove the introducer and guide wire.
7. Ventilate and auscultate breath sounds bilaterally.
8. Secure the tube.

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