Medication Assisted Induction (MAI) Regional Guidelines

2019 Edition
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MEDICATION ASSISTED INDUCTION (MAI) REGIONAL GUIDELINES

LORD FAIRFAX EMERGENCY MEDICAL SERVICES COUNCIL, INC.
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REVISION HISTORY

Description of Change	Change Effective Date
Original Document	12/01/2017
Revised and Approved By MDB	09/18/2018

PREFACE

These Medication Assisted Induction (MAI) Guidelines were approved by the Lord Fairfax Emergency Medical Services Council's (LFEMSC) Medical Direction Board, and were implemented in January 2018. They are intended to provide guidance to those Advanced Life Support (ALS) agencies in the LFEMSC region that are considering initiating a Medication Assisted Induction (MAI) airway management program under the direction of its Agency Operational Medical Director (OMD). In publishing these guidelines, the Medical Direction Board recognizes the need for alternate modes of airway management and the fact that ALS agencies must adapt some procedures to meet unique local needs and requirements.

Therefore, these are minimal guidelines. The guidelines and related documents are designed to provide a template by which agencies in the LFEMSC region will be able to meet a regional standard of care while meeting those local needs and requirements. The Agency OMD is welcome to enhance a Medication Assisted Induction (MAI) program. **Please note, however, that whatever MAI program the agency and its OMD develop must contain at a minimum all of the elements in these guidelines in order to meet the regional standard of care as established by the LFEMSC Medical Direction Board.**

MEDICATION ASSISTED INDUCTION (MAI) AUTHORIZATION TO PRACTICE

The 2018 Edition of the Medication Assisted Induction (MAI) Protocol is to be utilized within the Lord Fairfax EMS Council by authorized Advanced Life Support (ALS) personnel at the Paramedic level to provide life-saving treatment.

Authorization to Practice for Medication Assisted Induction (MAI) may be withdrawn under such conditions as, but not necessarily limited to, intoxication/substance abuse while on duty, practicing without a valid ALS certification at the Paramedic level, failure to comply with LFEMSC ALS Standards and Regional Protocols or failure to comply with requests/directions of the Agency OMD, LFEMSC Regional OMD, and/or LFEMSC Medical Direction Board.

Any Emergency Department Physician in the LFEMSC Region who feels that there is reasonable cause to immediately, but temporarily withdraw, the Authorization to Practice for Medication Assisted Induction (MAI), may do so according to this policy. In circumstances where it is necessary for an Emergency Department Physician to immediately withdraw the Authorization to Practice, he/she must immediately inform:

1. The ALS provider's immediate supervisor.
2. The ALS provider's Jurisdictional EMS Coordinator.
3. The Agency OMD.
4. The Virginia Office of Emergency Medical Services Program Representative.

_____
Agency Operational Medical Director

_____
Date

THIS IS NOT A CONTRACT
I have attended a Medication Assisted Induction (MAI) session and acknowledge receipt of this authorization.

_____ _____
Provider Signature *Print Name and Certification Number*

_____ _____
Agency Affiliation *City / County*

_____ _____
Instructor, Medication Assisted Induction Class (Signature) *Date of Class*

Scope:

These guidelines are designed to allow trained Paramedic level providers the option of managing patient airways with Medication Assisted Induction in the LFEMSC region. This document will provide clear guidelines to trained Paramedic level providers about patient care requiring MAI, proper documentation, and the essential quality assurance/quality improvement review.

NOTE: A Paramedic level provider may perform MAI when the patient's condition warrants the treatment and Air Medical Services have been requested.

These regional guidelines will apply to any patient that meets the patient profile in Section IV of these guidelines.

I. Definition:

Medication Assisted Induction, or MAI, is the use of pharmacological agents to facilitate endotracheal intubation. Sedation and paralysis, allows laryngoscopy and placement of an endotracheal tube in those patients who fulfill the patient profile requirements.

II. Purpose:

MAI is an organized approach to emergency intubation comprised of sedation, muscle paralysis along with continued sedation after successful intubation. Pharmacological paralysis facilitates endotracheal intubation and maximizes the probability of successful placement of an endotracheal tube while minimizing hemodynamic responses and complications.

NOTE: Neuromuscular blocking agents will not be given without first giving a sedative agent.

A general overview of MAI involves: assessment of the patient; pre-oxygenation; preparation of equipment and medications; sedation; muscle relaxation; intubation; securing the airway; continuous reassessment; continued sedation; delivery of the patient to the closest medical facility or air ambulance; and completion of the quality assessment/quality improvement process.

III. Patient Profile:

The standard of airway control is orotracheal intubation using MAI as indicated for the following patients:

1. Airway protection is for the patients who may not be intubated using standard airway management techniques and who are in need of airway control but present with a gag reflex or trismus.

2. Failure to appropriately ventilate / oxygenate a patient with other conservative resources.

IV. Patient Contraindications:

1. Any patient under age 12 and/or weighing less than 50 kgs.
2. Any patient who has spontaneous respirations with adequate ventilation / oxygenation and a protected airway.
3. Any patient where intubation may not be successful due to airway obstruction or trauma (i.e. epiglottitis, major facial / laryngeal trauma with significant edema or distortion of facial / airway anatomy).
4. Upper airway obstruction.
5. Any patient with known hypersensitivity to MAI medications.

V. Recognized Potential MAI Complications:

1. Inability to secure the airway after paralytic administration.
2. Dysrhythmias.
3. Aspiration.
4. Tachycardia.
5. Bronchospasm.
6. Increased intracranial pressure.
7. Inability to recognize decreased neurological status.
8. Hypoxia.
9. Cardiac arrest.

VI. EMS Provider Profile:

Initial: EMS providers who meet the following criteria will be cleared to perform MAI:

1. Paramedic certification with documented 2 years of experience as a cleared provider.
2. Completion of a training program that incorporates all elements of these Regional MAI Guidelines and is endorsed by the LFEMSC Medical Direction Board.
3. A passing score on a regional written examination administered during the training program, as well as satisfactory completion of the MAI clinical lab instruction and testing.
4. A MAI authorization form endorsed by the provider's OMD, maintained by the agency's quality assurance coordinator.

5. Continued education in MAI medication administration and intubation skills every six months to maintain the authorization to perform MAI.

VII. Regional MAI Medications

Medications approved by the LFEMSC Medical Direction Board for use in Medication Assisted Induction procedures within the LFEMSC region are: Fentanyl, Ketamine, Rocuronium (or Vecuronium), and Versed.

VIII. General Guidelines:

The following are an overview of General Policy Guidelines – see attached regional protocols for performance of MAI.

1. Preparation

a. Take into consideration the indications, risks, and alternatives to MAI.

b. Obtain SAMPLE history.

c. A thorough evaluation of the anatomy of the hypopharynx is essential in airway management. This should be performed using the LEMON acronym (Look, Evaluate, Mallampati, Obstruction, Neck). Perform an anatomic assessment to determine those patients who are to be considered as MAI candidates, and those airway alternatives that may be required with failed MAI.

d. Perform a neurological assessment. Document neurological status and GCS Score, Pain Response, and extremity movement. This **must** precede the administration of sedatives and neuromuscular blocking agents.

e. Essential equipment:

1) Suction (working with Yankauer attached).
2) Oxygen (connected to a bag-valve mask [BVM]).
3) Airway (laryngoscope, endotracheal (ET) tube, stylet, BVM – failed MAI back up alternate airway adjuncts, King Airway™, and surgical cricothyrotomy equipment, etc.)
4) Pharmacology – have all required drugs that are expected to be used in an easily accessible and premixed condition. These agents **must** be readily available upon demand when attempting MAI.
5) Monitoring equipment (cardiac monitor, pulse oximetry, ETCO2 monitor, and blood pressure monitor).

2. Establish An Open Airway and Pre-Oxygenate Patient

Pre-oxygenation is required before proceeding with sedation and paralysis. If at all possible, allow the patient to pre-oxygenate on his or her own. Patients should be given 100 percent oxygen via non-rebreather facemask while assembling equipment (approximately 2 to 3 minutes), or assist the patient's own effort with a BVM and 100 percent oxygen for 1 to 2 minutes to maximize oxygen saturation.

In addition to pre-oxygenating the patient as described above, place a nasal cannula on the patient and flow at 15 lpm throughout the entire Medication Assisted Induction procedure.

Note: Bag-Valve Mask assist increases potential for gastric distention with air, which increases the possibility of vomiting and aspiration.

3. **Place patient on continuous cardiac monitor, pulse oximeter, and blood pressure monitoring.**

4. **Verify that functioning IV line is securely in place. Administer 250 ml bolus of 0.9% Sodium Chloride.**

5. **Premedication if indicated.**

Fentanyl – Administer 3 minutes prior to attempting the Medication Assisted Induction procedure.
Usual Dose: 3 mcg/kg IV/IO, over 30 seconds, 3 minutes prior to laryngoscopy. Maximum efficiency is 1 to 2 minutes after dosing.
Contraindications: Known hypersensitivity and respiratory depression.

Note: May skip if patient is hypotensive (<90 mm Hg systolic).

6. **Sedation**

NOTE: Sedatives must be administered prior to administration of a neuromuscular blocking agent, to eliminate the sensation of paralysis.

Ketamine – Administer 1 minute prior to paralytic agent. 20 second IV/IO push**.** Onset of action is 30 to 40 seconds.
Usual Dose: 2 mg/kg over 20 seconds.
Contraindications: Hypersensitivity to drug.

7. **Administration of a Neuromuscular Blocking Agent**

Rocuronium – Administer 1 mg/kg. 20 second IV/IO push. Onset of action 1 minute.
Usual Dose: 1 mg/kg over 20 seconds.
Contraindications: Known hypersensitivity.

OR

Vecuronium – Administer 0.1 mg/kg. 10 second IV/IO push. Onset of action 2 minutes.
Usual Dose: 0.1 mg/kg over 10 seconds.
Contraindications: Known hypersensitivity.

NOTE: Continued sedation is necessary to control agitation. Hypertension and tachycardia may be early indicators of the patients awakening to paralysis. Patients who exhibit agitation, seizure activity, cough, increased gag reflex or other activities which may compromise adequate ventilation and/or airway control, need immediate intervention.

NOTE: NEUROMUSCULAR BLOCKING AGENTS DO NOT HAVE SEDATIVE PROPERTIES. THEY DO NOT ALTER PAIN RECEPTION, NOR DO THEY STOP SEIZURE ACTIVITY TAKING PLACE IN THE BRAIN!

8. Intubation

Intubation should be performed when the muscles are fully relaxed. **Do not attempt laryngoscopy until the mandible is flaccid.** If unable to intubate the patient after the first attempt or at any time the patient's oxygen saturation level drops below 91%, ventilate the patient with the BVM and 100 percent oxygen for 1 minute. If 2 intubation attempts fail (or sooner at the discretion of the Paramedic), ventilate the patient with a BVM, then attempt King Airway™ placement. If unable to secure the airway with the King Airway™, continue ventilation of the patient with BVM and 100 percent oxygen until satisfactory spontaneous breathing resumes, or arrival at the receiving hospital. Consider a surgical airway if intubation fails and ventilation is not possible.

9. Verification of Tube Placement

NOTE: Tube placement verification is more important than the intubation itself. Unrecognized esophageal intubation is catastrophic.

The position of the endotracheal tube in the trachea must be confirmed by 3 different methods. Acceptable documentation of tube placement may include:

a. Presence of bilateral breath sounds and absence of breath sounds over the epigastrium.
b. Presence of condensation on the inside of the ET tube.
c. End tidal carbon dioxide monitoring.
d. Visualization of the tube passing through the cords.
e. Note the depth of the endotracheal tube.

Document patient's oxygen saturation every 5 minutes and CO2 by end tidal monitoring, or other appropriate device. After each patient transfer or movement, which may potentially dislodge the tube, the provider must re-verify and document appropriate tube position.

10. Secure the Endotracheal Tube

Secure the endotracheal tube once it is placed and the appropriate location of the tube has been verified. Additionally, as permitted, secure the patient's neck with a rigid cervical collar or other means. Use extreme caution with any patient movement after securing the airway to prevent the tube from becoming dislodged during the movement.

NOTE: Re-verification of appropriate tube placement is mandatory each time after the patient is moved, and it must be appropriately documented.

11. Considerations:

a. Once a neuromuscular blocking agent is given, the provider assumes complete responsibility for maintaining an adequate airway and ventilations.
b. The provider must be prepared to perform a surgical airway if intubation cannot be executed and ventilation with a King Airway™ or BVM is not possible.
c. The provider can maintain sedation/paralysis with 5 mg Versed or re-dose with 2 mg/kg Ketamine. Ketamine is the recommended drug to maintain sedation post intubation.
d. The provider must monitor oxygen saturations and end-tidal carbon dioxide continuously.

Consider the use of a PEEP valve in conjunction with BVM!

NOTE: Under no circumstances should MAI be used to restrain a violent or combative patient.

12. Documentation

Documentation will be completed on the Patient Care Report and any agency MAI evaluation document.

In addition to complete documentation of patient assessment and care, specific areas to be addressed on the PCR will include but not be limited to:

a. MAI indications.
b. Description of airway condition (clear, vomitus, blood, etc.).
c. Documentation of pre-oxygenation with the oxygen saturations.
d. All medications used – doses, times and provider name administering medications.
e. Vital signs every 5 minutes post medication administration.
f. Number of intubation attempts (pre and post use of MAI).
g. Endotracheal Tube size.
h. Depth of endotracheal tube insertion and method used for securing the endotracheal tube.
i. 3 methods used for tube verification. **NOTE: presence of bilateral breath sounds and no air movement over the epigastrium are bundled as only one method of confirmation of tube position.**
j. Oxygen saturation levels during procedure.
k. Documentation of neck immobilization after intubation for tube security.
l. Documentation of ECG monitor strip before and after intubation.
m. Documentation of reverification of tube placement during transport and the methods used.
n. Status of ETT at turnover at receiving facility and after each patient movement.
o. Physician name and signature at receiving facility.

IX. Documentation, Review and Quality Assurance:

NOTE: The LFEMSC Medical Direction Board has adopted a policy that all incidents where Medication Assisted Induction (MAI) is performed on a patient will be reviewed by the Agency OMD, Jurisdiction EMS Coordinator, and the Agency's QA/QI committee.

Quality Assurance (QA) / Quality Improvement (QI) documentation is solely for QA / QI purposes and is not to be included in nor be considered a part of the medical record. QA / QI documentation is confidential and not to be shared or discussed outside of the QA / QI process.

After the provider completes the Patient Care Report, the provider will complete an agency MAI Evaluation Form. This form will include feedback from the receiving Emergency Department physician. This completed documentation will be submitted to the Jurisdictional EMS Coordinator within 24 hours of the MAI incident and then forwarded to the Agency OMD for review.

FENTANYL (Sublimaze®)

Scope | EMR | EMT | AEMT | INT | PM

Generic Name:	**Fentanyl (fen'-ta-nil)** ***DEA Class: Schedule II***
Trade Name:	Sublimaze®, Duragesic®, Fentora®
Chemical Class:	Opiate derivative
Therapeutic Class:	Narcotic analgesic
Actions:	Fentanyl is a powerful synthetic opiate with mechanism of action similar to Morphine. It is considered both faster acting and of shorter duration than Morphine. Binds with opiate receptors in the CNS, altering both perception of and emotional response to pain through unknown mechanism. Specifically used for patients with marked hypertension and suspected intracranial pressure.
Pharmacokinetics:	*IV/IO:* Onset immediate. Peak effect several minutes. Duration of action 30 to 60 minutes.
Indication:	Moderate to severe pain. Premedication to MAI procedure
Contraindications:	1. Known hypersensitivity 2. Respiratory depression
Precautions: ***Pregnancy Cat. C***	1. Use with caution with suspected traumatic brain injury. 2. Use with caution in patients with COPD. 3. Use with caution in patients with cardiac bradyarrhythmias.
Side Effects:	*CNS:* dizziness *CV:* hypotension, hypertension, bradycardia *EENT:* blurred vision *GI:* nausea, vomiting *RESP:* respiratory depression, apnea, laryngospasm *SKIN:* diaphoresis
Administration:	*Adult:* 3 mcg/kg up to 200 mcg IV/IO over 30 to 60 seconds.
Supply:	100 mcg in 2 mL
Notes:	If a subsequent dose is given prior to the peak effect of the initial dose, there is a risk of dose stacking and potential overdose.

KETAMINE (Ketalar®)

Scope | EMR | EMT | AEMT | INT | PM

Generic Name:	**Ketamine (ket'-a-meen)**
Trade Name:	Ketalar®
Chemical Class:	Analgesic
Therapeutic Class:	General anesthetic
Actions:	Ketamine attaches to NMDA receptors which disassociates the portion of the brain that controls consciousness from the portion of the brain that controls vital bodily functions. The result is, when given in sufficient doses, anesthesia that provides pain control and amnesia while not causing hypotension or prolonged apnea.
Pharmacokinetics:	*IV/IO:* Onset 30-40 seconds. $t_{½}$ = 5 minutes.
Indications:	Pain augmentation as an adjunct to an opiate analgesic. Patients with a psycho-social condition exhibiting extreme anxiety and/or combative / violent behavior. Sedation.
Contraindications:	1. Hypersensitivity to the drug. 2. Marked hypertension with potential for increased intracranial pressure. 3. Patients less than 12 years of age and/or under 50 kg.
Precautions: ***Pregnancy Cat. B***	In patients with cardiac diseases / syndromes, Ketamine might worsen such conditions; NOT indicated as sedation prior to cardioversion or transcutaneous pacing.
Side Effects:	*CNS:* confusion, delirium, vivid dreams *CV:* hypertension, tachycardia *GI:* nausea, vomiting, hypersalivation *RESP:* respiratory depression
Administration	*Adult:* *IV:* Give 2 mg/kg IV over 1-2 minutes. May repeat as needed every 10 to 15 minutes.
Supply:	Vial contains 500 mg in 10 mL.
Notes:	1. Ketamine (in lower doses) is much more effective in relieving pain when given following a dose of an opiate analgesic. It is effective in relieving pain when combined with another opioid. 2. The first line analgesic is Fentanyl. Morphine may be substituted when a Fentanyl contraindication exists or when Fentanyl is not available.

MIDAZOLAM (Versed®)

Scope	EMR	EMT	AEMT	INT	PM

Generic Name: **Midazolam (mid-az'zoe-lam)** ***DEA Class: Schedule IV***

Trade Name: Versed®

Chemical Class: Benzodiazepine

Therapeutic Class: Sedative/hypnotic

Actions: Midazolam causes central nervous systems depression via facilitation of inhibitory GABA[1] at benzodiazepine receptor sites (BZ_1 – associated with sleep; BZ_2 – associated with memory, motor, sensory, and cognitive function). Midazolam is a short-acting benzodiazepine that is three to four times more potent than Diazepam. Midazolam has important amnestic properties.

Pharmacokinetics: *IM:* Onset 15 minutes. Peak 30 to 60 minutes.
IV/IO: Onset 3 to 5 minutes. $t_{½}$ = 1.2 to 12.3 hours.

Indications:
1. Sedation for cardioversion and transcutaneous pacing.
2. Sedation for endotracheal intubation only after the ET tube is inserted.
3. Seizures not caused by hypoglycemia, *secondary to Diazepam*.[2]
4. Severe agitation, tachycardia, or hallucinations caused by alcohol withdrawal, *secondary to Diazepam*.[2].
5. Behavioral or alcohol related agitation as an adjunct to Haloperidol.
6. Sedation for shivering secondary to induced hypothermia.

Contraindications:
1. Hypersensitivity to the drug.
2. Hypotension (SBP less than 90 mm Hg).
3. Acute angle closure glaucoma.

Precautions:
Pregnancy Cat. D
Administer cautiously when alcohol intoxication is suspected. Emergency resuscitative equipment must be available prior to the administration of Midazolam. Vital signs must be continuously monitored during and after drug administration. Midazolam has more potential than the other benzodiazepines to cause respiratory depression and respiratory arrest.

Side Effects: *CNS:* drowsiness, amnesia, altered mental status
CV: hypotension, tachycardia, PVCs
RESP: bronchospasm, coughing, laryngospasm, respiratory depression, and arrest

Interactions: The effects of Midazolam can be accentuated by CNS depressants such as narcotics and alcohol.

Administration:
Adult: Give 2.5 to 5 mg slow IV/IO titrated to effect, based on protocol. May repeat dose every 5 minutes if needed.
Midazolam may also be administered 5 mg IM if unable to readily establish IV access.

Pediatric: Give 0.1 mg/kg slow IV/IO, titrated to effect. May repeat every 5 minutes as needed **[Medical Control]**.
Midazolam may also be administered 0.1 mg/kg IM if unable to readily establish IV access **[Medical Control]**.

Supply: Vial containing 5 mg in 5 mL.

Notes:
1. GABA – Gammaaminobutyric Acid, the chief inhibitory neurotransmitter in the CNS. GABA hyperpolarizes the membrane of the CNS neurons decreasing their response to stimuli.
2. **[Medical Control]** must authorize administration of Midazolam for sedation secondary to Diazepam.

ROCURONIUM BROMIDE (Zemuron®)

Scope | EMR | EMT | AEMT | INT | PM

Generic Name:	**Rocuronium Bromide**
Trade Name:	Zemuron®
Chemical Class:	Non-depolarizing neuromuscular blocking agent
Therapeutic Class:	Paralytic
Actions:	Rocuronium acts by binding competitively to cholinergic receptors at the motor end plate to antagonize the action of acetylcholine, an effect that is reversible in the presence of acetylcholinesterase inhibitors, such as neostigmine and edrophonium. Blocks cholinergic receptors on motor endplate, does not result in muscle depolarization, no fasciculations observed. Subsequent nerve impulse transmission is blocked.
Pharmacokinetics:	*IV/IO:* Onset 30-60 seconds. Peak Effects: 1-3 minutes. Duration: 30-60 minutes. $t_{½}$ = 14-18 minutes.
Indications:	Sedation for Medication Assisted Intubation (MAI).
Contraindications:	Hypersensitivity to the drug.
Precautions: ***Pregnancy Cat. C***	Rocuronium should be administered in carefully adjusted dosages by or under the supervision of experienced clinicians who are familiar with its actions and the possible complications of its use. Rocuronium is associated with a slight elevation of heart rate and blood pressure.
Side Effects:	*CNS:* hiccups *CV:* transient hypotension, tachycardia *RESP:* respiratory insufficiency, apnea
Administration	*Adult:* *IV/IO:* Give 1 mg/kg IV/IO over 20 seconds.
Supply:	Vial contains 50 mg in 5 mL.
Notes:	

VECURONIUM BROMIDE (Norcuron®)

Scope | EMR | EMT | AEMT | INT | PM

Generic Name:	**Vecuronium Bromide**
Trade Name:	Norcuron®
Chemical Class:	Non-depolarizing neuromuscular blocking agent
Therapeutic Class:	Paralytic
Actions:	Vecuronium competes with acetylcholine for cholinergic receptor sites on the postjunctional membrane. This competition results in paralysis of muscle fibers served by the occupied neuromuscular junction. It does not cause an initial depolarization wave, as does some of the other neuromuscular blocking agents. Blocks cholinergic receptors on motor endplate, does not result in muscle depolarization, no fasciculations observed. Subsequent nerve impulse transmission is blocked.
Pharmacokinetics:	*IV/IO:* Onset <1 minute. Peak Effects: 3-5 minutes (generally 2-3 minutes). Duration: 25-40 minutes. $t_{½}$ = 30-80 minutes.
Indications:	Sedation for Medication Assisted Intubation (MAI).
Contraindications:	Hypersensitivity to the drug.
Precautions: ***Pregnancy Cat. C***	Vecuronium should not be administered unless personnel skilled in endotracheal intubation are present and ready to perform the procedure. Oxygen therapy equipment should be readily available, as should all emergency resuscitative medications and equipment.
Side Effects:	*CV:* hypertension, arrhythmias, bradycardia, sinus arrest *RESP:* wheezing, respiratory depression, apnea, aspiration
Administration	*Adult:* *IV/IO:* Give 0.1 mg/kg IV/IO rapid push. **Reconstitute with 10 mL Normal Saline**
Supply:	Vial contains 10 mg in 10 mL.
Notes:	