



Current Research in Medication Assisted Intubation at Air Care, Part II – Kevin Franklin EMT-P, RN

Welcome back to our second article in the series on Medication Assisted Intubation (MAI). In our previous article we discussed the need for oxygenation and nitrogen washout to allow for the prolonged period of apnea that occurs in MAI. We also discussed the need for Atropine to block the strong parasympathetic response, that is exhibited in pediatric patients under the age of 10 when a stimulus is provoked in the posterior pharynx, hypopharynx and laryngeal structures.

In this issue we continue with the premedications used in MAI by discussing the use of fentanyl and lidocaine. Though both are widely used in MAI in current practice, their reason for use and efficacy

is not always known to medical providers. Here we will address the current research findings and how they apply to the different patient populations in MAI.

One of the more controversial drugs utilized in MAI is lidocaine. At West Michigan Air Care we have implemented lidocaine in the MAI matrix (shown above) in all patients who have acutely suffered a Traumatic Brain Injury (TBI), have increased Intracranial Pressure (ICP), Acute Aortic Dissection (AAD), Abdominal Aortic Aneurysm (AAA), and Reactive Airway Disease (RAD). With lidocaine this broad spectrum of patients can/may experience decreased adverse effects previously noted with MAI.

For those patients whom have suffered a TBI or have increased ICP, lidocaine has shown equivocal results with decreasing ICP spikes that occur during MAI and/or intratracheal suctioning^(4,5,7,9). Current theory is that by decreasing cough stimulation, increasing the depth of anesthesia, decreasing cerebral metabolic oxygen demand, decreasing cerebral blood flow and by increasing cerebral vascular resistance, that this promotes a neuroprotective atmosphere for patients undergoing MAI. In addition there are equivocal results present in the literature that lidocaine has the ability to attenuate increases in heart rate (HR) and systolic blood pressure

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MEDICATION ASSISTED INTUBATION (MAI) MATRIX

MEDICATION		Normal to Hypertensive TBI / □ ICP AAA / AAD	Normotensive	Hypotension Hypoperfusion Shock	Reactive Airway	Predicted difficult airway	Arrest Near arrest Crash Airway
PRETREATMENT	Oxygen	15 l/min NRB with adequate SpO ₂ , RR, and Vt BVM w/ OPA PRN w/ SpO ₂ < 90% or RR < 8 Adult or < 15 Child					BVM w/ OPA 15L/min
	Atropine	0.02 mg / kg IVP or IM for age < 8 PRN for □ HR due to vagal response and or with repeat SCh administration					
	Lidocaine	1.5 mg/ kg IVP	None	1.5 mg/ kg IVP PRN - TBI	1.5 mg/ kg IVP	1.5 mg/ kg IVP PRN - TBI	None
	Fentanyl	3 mcg / kg IVP Over 30 - 60 sec	1 mcg / kg Over 30 - 60 sec	None	1 mcg / kg PRN Over 30 - 60 sec	1 mcg / kg PRN Over 30 - 60 sec	None
SEDATIVE HYPNOTIC	Etomidate	0.3 mg / kg IVP	0.3 mg / kg IVP	0.2 mg / kg IVP	0.3 mg / kg IVP or	0.3 mg / kg IVP	None
	Midazolam	0.025 - 0.1 mg / kg IVP	0.025 - 0.1 mg / kg IVP	None	None	None	None
	Ketamine if available	None	None	None	or 1.5 mg / kg IVP	or 1.5 mg / kg IVP	None
NMB	Sch ¹	1-2 mg / kg IVP	1-2 mg / kg IVP	1-2 mg / kg IVP	1-2 mg / kg IVP	None	1 attempt ETI 1 st 2 mg / kg PRN IVP or IM
	Rocuronium	or 0.6-1.2 mg / kg	or 0.6-1.2 mg / kg	or 0.6-1.2 mg / kg	or 0.6-1.2 mg / kg	None	None

1. Sch - absolute contraindications in persons with hx of malignant hyperthermia, skeletal muscle myopathies known hypersensitivity to Succ, and K > 7.0

(SBP) that correlate with changes in ICP during stimulation^(4,5,7).

Adverse outcomes associated with increased ICP include further extension of brain injury, brain stem herniation, increased or recurrent hemorrhage in cerebral blood vessels (from all causes of cerebral bleeds) and a decrease in the cerebral perfusion pressure (CPP).

Use of lidocaine in this patient population offers the opportunity to decrease the number and severity of ICP spikes during MAI and other stimulating procedures. With the low side effects from single dose lidocaine use, the potential benefits outweigh the adverse effects of lidocaine.

Lidocaine has also been used in patients suffering from AAA and AAD as an adjunctive medication to decrease the cough response to MAI and other stimulating procedures. It is theorized that by decreasing this response, the potential for aortic rupture from increased intrathoracic pressure is decreased. Currently literature is inconclusive and sparse in these patient populations and the potential advantages are limited. Due to evidence currently being evaluated, lidocaine use in this patient population may be discontinued from Air Care's MAI matrix.

The final use for lidocaine in MAI is in patients with RAD that require MAI. In this population current studies are equivocal as to its ability to improve MAI for patients with RAD. It is theorized that lidocaine has little to no effect on actual bronchial dilation but rather exerts its effect by limiting cough reflex^(4,6,9). In this patient population limiting reflexive bronchospasm post stimulation has the potential to protect the patient with RAD from further ventilation compromise with minimal side effects from single dose therapy.

Two important points need to be addressed when using lidocaine for MAI. First, lidocaine must be administered at least 3 – 5 minutes prior to initiation of laryngoscopy in order to provide beneficial effects^(4,6,7). The second important point is the dose of lidocaine administered during MAI is greater than what is commonly given for arrhythmia management. The current literature recommends 1.5mg/kg lidocaine IVP in order to obtain plasma concentrations necessary to produce the desired effects in these patient populations^(4,5,6).

The last premedication used in MAI at Air Care is fentanyl. Fentanyl, a strong, short acting opiate with stable hemodynamic properties is used for all patients, except those that are hypotensive or arrest/near arrest.

Fentanyl has two uses in MAI. The first is as an analgesic to decrease the painful stimulation present during laryngoscopy and endotracheal tube placement. Though in MAI we alter a patient's cognition and ability to respond, we have a responsibility to decrease or eliminate pain. Fentanyl offers excellent hemodynamic stability in large part to its lack of histamine release that is present in other opioids. In addition its onset of action is less than 1 minute and its duration of action at 7 minutes allows completion of MAI before deterioration of pharmacological effects⁽¹⁵⁾.

Fentanyl is also used as an adjunct in MAI to decrease the hemodynamic response to airway manipulation (HR, SBP). In several studies fentanyl has been shown to limit the rise in HR and SBP that occur during laryngoscopy and endotracheal intubation^(4,10,11,12,13). Failure to attenuate the normal physiological responses has the potential to be deleterious to patients suffering from increased ICP, TBI, AAD as well as AAA. In addition it has been shown that fentanyl helps control the changes in intraocular pressure that occur during MAI⁽¹⁴⁾.

The most common significant side effect seen with use of fentanyl in MAI is dose dependent apnea. Stockholm et al., demonstrated an increase in apnea from 53% to 87% after the addition of Fentanyl 100 or 250mcg IV respectively to their

MAI sequence. A further increase in apnea, from 53% to 100% of cases, occurred in patients receiving a single 500mcg bolus of Fentanyl during MAI. Due to this common side effect, the optimum dose recommended in the literature varies depending on several factors facing the practitioner.

Currently at Air Care the 1mcg/kg dose of fentanyl for normotensive patients is used in order to minimize apnea related complications while attenuating hemodynamic response and providing analgesia. Exceptions to this include patients whom are hypertensive with increased ICP, TBI, AAA and AAD. In this subgroup of patients we chose to increase the dosage to 3mcg/kg in order to maximize the hemodynamic attenuation thus limiting adverse effects of increases in HR and SBP. Currently, an ongoing literature review of medical scientific journals and commonly used Emergency Medicine texts may propagate an increase of fentanyl to 3mcg/kg for most patients. For hypotensive and other patients whom attenuation of sympathetic response may be detrimental, Air Care has opted to hold fentanyl use in order to maintain what hemodynamic stability the patient has accomplished.

Lidocaine and fentanyl then conclude the premedications necessary for successful MAI in a broad spectrum of patients. In the next addition of AirWaves we will discuss the multiple sedative/hypnotic agents available for use in MAI and their roles in different patient populations.

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Clinical Competency: Now or Never

Do you know what it's like, all the pressure is on you and your thinking, it's now or never? This story is not about our patient, nor is it about the accident he encountered. It's about the skill it takes to help him. Darby Brauning, RN started his career with Air Care last November and had never seen an intuition from "behind the handle." Yet on this scene call in April he is now in charge of this trauma patient's airway. How then does one go from being neophyte to competent in a period of less than six months? It has taken many years of research, trial and error to decide the course of action for training new flight nurses at Air Care. Our education plan could be applied to any person and the skill you hope to become proficient in.

First step Darby recalls, he read and studied many chapters and articles relating to managing the airway. He began to understand the anatomy, the physiology of what he was causing in the airway, the indications for airway management and the complications of this procedure.

A thorough understanding of the medications he would use. Reviewing Walls' *Manual of Emergency Airway Management* was an everyday ritual.

Next, the psychomotor skills needed to be mastered and memorized. Practicing the technique outlined in Walls, the repeated coaching of his preceptors, and the one-on-one instruction of Dr. Ekblad, Air Care Medical Director was added to the daily training. The mannequin, *Air Man* was a regular companion for Darby and scenario-based training was added to his instruction. Its value has been proven in such courses as ACLS and PALS. Darby remembers dozens of scenarios from his preceptors utilizing many of his airway "options."

His final test was his Standard Evaluation by an objective crewmember. A hands-on, mannequin-based skills testing scenario, complete with medication administration and cervical spine immobilization was completed. After passing this unbiased evaluation of his proficiency, Darby was geared up and confident.

In April, Air Care was dispatched to a trauma scene call, with a patient who was barely responsive after heavy blood loss. While preparing his equipment and the patient's position, many thoughts go through his mind that has been reinforced in recent months. The pressure was on; it was "now or never." The voice of his preceptors tells him what to do and when to do it. The cords were very anterior, and Sellick's maneuver was carefully used to bring them into view. The medications used, neuromuscular blockers, were instrumental in making the patient fully relaxed, maximizing the visual field.

After placing the endotracheal tube on Darby's first attempt, and confirming its accurate placement, it was secured and the patient's care was continued until his recovery was complete. Little thought is then given to this procedure after it has proven successful. In providing good medical care, more thought and careful evaluation should be given to when we are triumphant and why.

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New Air Care Associates

Please join us in welcoming two new additions to the Air Care crew.



Miles Cunat

Air Care is pleased to introduce the newest member of our pilot staff, Miles Cunat. Miles is a native of the Kalamazoo area and is returning home with his family. He learned to fly in sunny south Florida where he continued on as a Certified Flight Instructor in addition to performing general charter flying. Miles then spent several years with a corporate flight operation in the Dominican Republic where he transported company employees and business

associates in addition to supervising the aviation operation. Returning to Michigan, Mr. Cunat spent a number of years in the Detroit area where he performed charter work including organ procurement flights, auto industry related flying and VIP transportation. This led to three years of Emergency Medical Service flying in Peoria, Illinois and Ann Arbor, Michigan. Miles brings significant experience in single pilot IFR operations supporting hospital transport programs, making him a valuable addition to the Air Care team. Welcome back to Kalamazoo, Miles.



Dawn Johnston

Originally from northeast Missouri, Dawn received her Bachelor of Science degree in communications and journalism from Truman State University.

After working for a small-market ABC affiliate in commercial production and marketing, her husband's career kept Dawn and her family moving from state to state for a few years. During this time she began to pursue a career in nursing, ultimately graduating from Kellogg Community College in Battle Creek.

Since obtaining her nursing license, Dawn has worked for Bronson Hospital in the Trauma and Emergency

department, Cardiology unit and most recently, Trauma Care. She has also worked for Borgess Staffing on the cardiology floors.

Shortly after receiving her nursing license, Dawn became interested in part-time firefighting and joined Leroy Township Fire Department near Battle Creek. She graduated from Calhoun County's Fire Academy within a year, and then returned to Kellogg Community College for paramedic studies. After obtaining her paramedic license, her family moved from Battle Creek to Kalamazoo and Dawn joined Texas Township Fire Department. She then added the National Ski Patrol to her pursuits.

Dawn feels honored to be a part of Air Care and is grateful to her family, colleagues and educators for their guidance and encouragement in her life.

"I'm lucky to have a family that's O.K. with helicopters and firefighting. It's my family and some incredible friends that keep me inspired."

In her free time, Dawn loves spending time with her husband, Neal, and 11-year-old son, Harrison. She also enjoys reading, traveling and almost all outdoor pursuits.

Our team, working with your team, making a critical difference.



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