VTR# 0623-01

Use of Drug Assisted Airway Management by PA Ground Advanced Life Support Agencies

PHASE 2: STATEWIDE PILOT RECOMMENDATIONS

PREPARED BY: PEHSC RSI TASK FORCE

APPROVED
Pennsylvania Emergency Health Services Board of Directors
June 21, 2023

PEHSC
PENNSYLVANIA EMERGENCY HEALTH SERVICES COUNCIL
Your Voice In EMS

Contents

Executive Summary 2
Background 3
Objective 5
Scope 5
Pilot Duration 5
Approval Process 5
Agency Medical Director 5
Education and Training 7
Education and Training Objectives 9
Psychomotor Skills Practice & Evaluation 10
Recurrent Education and Training 10
Training and Education Equivalency 10
Protocol 11
Operational Requirements 11
Data Collection and Quality Improvement 11
Acknowledgements 13
Workgroup Participants 14
Appendix A: Education/Training PowerPoint Slides 15
Appendix B: DAAM Protocol 16
Appendix C: Data Collection & QI 23
Appendix D: Intubation Preparation Checklist 27
Appendix E: NAEMSP Position Paper 28

Executive Summary

The use of drug assisted advanced airway management (DAAM) has been a tool available to EMS for many years. For the purposes of this pilot, we will replace the term "RSI" with "DAAM" to be consistent with the terminology used by the National Association of EMS Physicians (NAEMSP) in their 2021 position statement.

In Pennsylvania, the use of medication-assisted advanced airway control involving the use of neuromuscular blockers has traditionally been restricted to critical care transport teams. There is general agreement that DAAM, a.k.a. rapid sequence intubation (DAAM), is a low-frequency, high-risk procedure used in high acuity patients for which lesser measures have proved ineffective.

Expanding field use of DAAM has been a point of controversy nationally, and in the Commonwealth, for many years. Ground ALS providers perceive the restriction of DAAM to air ambulances inhibits their ability to provide adequate care in certain situations, most of which involve trauma patients. Anecdotally, providers recount incidents where a helicopter was called to a scene solely for medication-assisted airway control; the aircrew quickly performed the procedure and then evacuated the patient. The efficiency with which the procedure was performed may, however, be creating a false impression with some ground-based providers by equating efficiency with simplicity. The reality is DAAM requires hours of education and training and a commitment from the agency and its medical director to ensure excellence.

Should all ALS ground agencies in Pennsylvania perform DAAM? The simple answer is no; the cost and logistical challenges associated with high-risk procedures are likely out of the reach of small, low-volume agencies. However, should this preclude agencies who have the capability to safely perform the procedure? Again, the answer is no. ALS agencies that demonstrate their commitment and ability to safely deploy DAAM should be permitted to do so.

In response to a request from the PA Department of Health, Bureau of EMS, PEHSC assembled a task force of subject matter experts to examine the issue of expanding DAAM usage in the Commonwealth. Our recommendations will be divided into two phases. The Department's letter of January 7, 2022, in response to VTR# 1221-01, the Department authorized PEHSC to design a statewide pilot program to evaluate the efficacy and practicality of DAAM by ground-based ALS units. This document outlines the four essential areas of the pilot design: 1) Medical Direction, 2) Education/Training, 3) Clinical Protocol Development, and 4) Data Gathering/Quality Improvement Activities.

Background

Rapid sequence intubation, now referred to as "DAAM," is an advanced airway control adjunct that involves the use of both a sedative agent and neuromuscular blocker. This procedure, considered to be high-risk but low frequency, is reserved for a subset of medical and trauma patients for which installation of an advanced airway is otherwise not possible. Impediments to the need for elective intubation or in the emergent setting may be, but are not limited to patient agitation, intact gag reflex or trismus.

The use of DAAM in the prehospital setting has been a subject of long-standing controversy, both nationally and in Pennsylvania's EMS system. Although there is general agreement on the need for the procedure in certain situations, there is considerable debate as to who should perform the procedure. In Pennsylvania, DAAM in the prehospital setting has historically been in the purview of the Prehospital Registered Nurse (PHRN) while providing EMS for a licensed air ambulance or ground critical care transport ambulance.

In 2000, a pilot program was conducted in the Emergency Health Services Federation region involving 11 ALS ambulance agencies. During the pilot period, ending in December 2001, 53 intubations were performed using DAAM as an airway control adjunct. Based on the relatively small number of cases, there was only one case that could be ruled a misuse of DAAM. Based on anecdotal comments on PCRs and evaluation forms, there a few cases where the provider and/or physician felt the patient's outcome would not have changed with DAAM; however, in those cases, intubation was deemed necessary to protect an airway in a comatose patient. No change in paramedic scope of practice occurred based on this pilot program.

In 2002, a study from the County of San Diego, CA Health and Human Services Agency – Emergency Medical Services entitled, *"The Use of Neuromuscular Blocking Agents and Advanced Sedation by Field EMT-Paramedics for More Effective Airway Management in Adult Trauma Patients with Glasgow Coma Score of 8 or Less"* was released. During the study, which primarily focused on patients suffering from neurotrauma, 428 patients were enrolled; 363 patients underwent successful ET intubation, 56 were intubated with a Combitube and there were 9 failed attempts.

This study was stopped prior to its planned conclusion out of an abundance of caution for patient safety when the data indicated the DAAM group had worse outcomes than those receiving other methods of airway control. The reason for this was never determined, although there was considerable unsubstantiated industry speculation. The report did note that while the study's hypothesis was not proven, prehospital use of DAAM may be beneficial in medical patients.

In 2015, Pennsylvania paramedics providing EMS on a licensed air ambulance or ground critical care transport ambulance and having completed an education program approved by the Department of Health, were granted expanded scope of practice privileges, including DAAM. The paramedic's ability to perform this procedure is situationally driven. For a patient to receive DAAM to facilitate intubation, the paramedic must be supervised by a PHRN or Prehospital Physician (PHP). Conversely, the paramedic is authorized to maintain sedation/paralysis of a previously intubated patient during transport without supervision.

In 2020, the subject of amending the scope of practice to include DAAM for paramedics providing EMS on a licensed advanced life support ambulance or squad vehicle was raised. There are paramedics, EMS agencies and EMS agency medical directors who believe that properly trained paramedics can safely administer DAAM in limited, but critical situations.

On October 29, 2020, PEHSC received correspondence from the Bureau of EMS requesting assistance in convening a task force to review DAAM and determine if the benefits outweigh the potential risks for paramedics on ALS ambulance services performing the procedure.

This proposal outlines the elements necessary to safely conduct a statewide pilot program to provide qualified ALS agencies authorization to employ medication assisted ALS airway control beyond the use of sedatives.

The essential elements of the pilot program are:

- ***Medical Direction***
- ***Provider Education and Training***
- ***Clinical Protocol Development***
- ***Data Collection and Quality Improvement Activities***

Objective

To establish the feasibility for approved advanced life support providers practicing on ground advanced life support units to safely perform advanced airway procedures using sedative and neuromuscular blocking medications.

Scope

This pilot project is open to all licensed ground advanced life support agencies in the Commonwealth, subject to approval by the Pennsylvania Department of Health, Bureau of Emergency Medical Services.

Pilot Duration

The pilot is proposed for a two-year period to enroll a sufficient number of cases. The timeline may be extended as needed to ensure there is enough case data to on which to make a final recommendation.

Approval Process

Agencies interested in participating in the pilot program will submit a letter of interest to the regional EMS council signed by both the agency's administrator/chief/director and agency medical director. The letter will be reviewed by the regional EMS council and a recommendation be made to the Bureau of EMS to accept, reject or return for additional information.

Agency Medical Director

The medical director serves as the chief medical officer for an EMS Agency. In this role, the physician performs a variety of tasks to ensure patient care is delivered in a timely, safe, and competent manner. Although a medical director may delegate some of the more routine tasks to physician or non-physician subordinates, it is essential the physician be engaged as an integral part of the prehospital healthcare delivery system.

In EMS agencies utilizing paralytics and/or sedative medications in advanced airway management, the physician medical director's role takes on added significance due to patient acuity and the complex treatment modalities that must be undertaken to maintain the high quality, standard of care and assure patient safety. ALS providers, whether paramedics, pre-hospital nurses, pre-hospital physician extenders, or pre-hospital physicians, represent the best of their profession, but can only provide optimal care when the agency medical director is prepared to guide and support their practice.

In the recent survey of ALS agency medical directors (n=74) conducted by PEHSC, physician engagement was a central issue. On the question of specialty board certification, 97.3% are certified in emergency medicine, with 28.3% also certified in the new EMS subspecialty. 93.2% have been in clinical practice for at least 6 years; 29.7% for 11-15 years; 25.6% for 25 or more years. 62.2% serve as an ALS agency medical director for two or more agencies.

Medical Director Expectations

1. Fulfill all requirements for ALS Agency Medical Director as set for them in both PA EMS Act and current Rules and Regulations.
2. Maintain active medical practice, licensed in the Commonwealth of Pennsylvania, with current credentialling and utilization in current practice of all medications to be included in the pilot project, including but not limited to, opioids, benzodiazepines, dissociative agents, paralytics.
3. Credential ALS providers, above the level of AEMT, to participate in the pilot program. Appropriate providers should be credentialled for inclusion in pilot program based on parameters including, but not limited to, adequate experiences in patient contacts, airway management, demonstration of appropriate care management decision ability.
4. Fulfill all training requirements of providers who will participate in pilot project including skills training and skills verification of airway management devices. Training shall include all skills which can be involved in airway management utilizing the Department of Health – Bureau of EMS approved pilot project training module.
5. Additional training educators may be utilized provided they are credentialed in the skill to be instructed [i.e., DAAM medication use, surgical cricothyrotomy, etc.] and are directly supervised during the training.
6. Continue on-going training and skills verification of providers throughout pilot project on a quarterly basis, at a minimum, for continued pilot project eligibility and participation.
7. Utilize training methods for airway management including high-fidelity simulation mannequins, cadavers, OR patients/live patients for endotracheal intubation.
8. Fulfill 100% QA&I review of all patient care records throughout pilot project with required quarterly reporting to Region and DOH-BEMS and participation, as defined by region, in MAC and QA&I committees. Non-adherence may result in removal of pilot project eligibility.

9. Address pilot project provider care deviations, complications, and sentinel events with appropriate intervention, including remediation, retraining, de-credentialing in a timely manner with required reporting to Region and DOH-BEMS.
10. Maintain roster of current, credentialed providers who may participate in the pilot project with additional inclusion of de-credentialed providers with appropriate notification of Region and DOH-BEMS as required.
11. Reciprocity of training for the pilot project for providers, who are affiliated with other agencies which are also involved in the pilot project, shall be at the discretion of the agency medical. Options may include credentialling of provider recognizing the appropriate pilot project training with a different agency's medical director, verification of part of prior training, or requiring the repeat training module.
12. Maintain close supervision and control of pilot project with the ability to suspend activity if it is judged that patient care may be in jeopardy. This could be on a partial or complete basis with appropriate notification of region and DOH-BEMS as required.

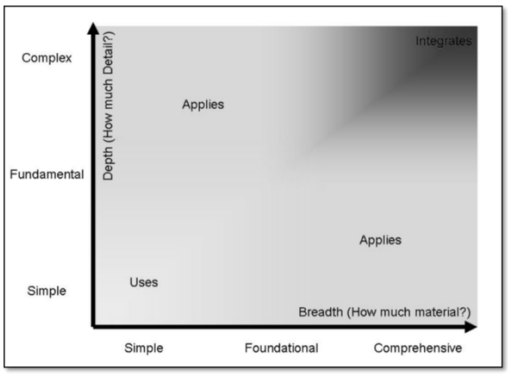
Education and Training

Comprehensive provider education and training in the techniques and medications used in the DAAM procedure is essential to ensure patient safety. Provider education will extend beyond a knowledge of medications and psychomotor skills to secure an ALS airway and will stress proper patient assessment and critical decision making.

The design of the standardized education and training program will review, reinforce and build upon the knowledge and skills obtained in the paramedic or PHRN program. To degree to which topic areas will be addressed, we will follow the conventions used in NHTSA's National EMS Education Standards to define competencies, clinical behaviors and judgments.

Education Standard Components

1. **Competency** – represents the minimum competency required for an entry-level provider at each level.
2. **Knowledge Required to Achieve Competency** – represents an elaboration of the knowledge within each competency (when appropriate) that entry-level providers would need to master in order to achieve competency.
3. **Clinical Behaviors/Judgments** – describes the clinical behaviors and judgments essential for entry-level providers at each level.



The ***depth* of knowledge** is the amount of detail a student needs to know about a particular topic. The *breadth* of knowledge refers to the number of topics or issues a student needs to learn in a particular competency. For example: the Emergency Medical Responder (EMR) needs to have a thorough understanding (depth) about how to use the bag-valve-mask device safely and effectively; however, the EMR is taught a limited number of concepts (breadth) surrounding airway management.

To describe the intended depth of knowledge of a particular concept the terms *simple, fundamental, and complex* are used. This terminology better illustrates the progression of the depth of knowledge from one level to another. For example, the EMR's *depth* of knowledge for bleeding control is simple while the EMT's *depth* of knowledge for bleeding control is fundamental.

To describe the intended **breadth of knowledge** of a concept within a provider level, the terms *simple, foundational, and comprehensive* are used. This terminology also better illustrates the progression of the breadth of knowledge from one level to another. For example, the EMT's *breadth* of knowledge for cardiovascular disorders is foundational while the Paramedic's *breadth* of knowledge for cardiovascular disorders is comprehensive.

Education and Training Objectives

NHTSA Standard	Paramedic	DAAM
Airway Management, Respiration and Artificial Ventilation	**Integrates complex knowledge of anatomy, physiology, and pathophysiology into the assessment to develop and implement a treatment plan with the goal of assuring a patent airway, adequate mechanical ventilation, and respiration for patients of all ages.**	**Reviews and expands upon the comprehensive knowledge of airway management, focusing on airway assessment, sedation and neuromuscular blockade. Emphasizes consideration of lesser methods of airway management prior to DAAM. Compares and contrasts video and direct laryngoscopy, reviews cricothyrotomy and use of supraglottic airways.**

Airway Management	**Paramedic Material:**
	
	Complex depth, comprehensive breadth:
	
	Within the scope of practice of the paramedic:
	• Airway anatomy
	• Airway assessment
	• Techniques of assuring a patent airway including BLS adjuncts, orotracheal and nasotracheal intubation and use of supraglottic airways.
		PLUS:
		
		Review of airway assessment and airway control techniques.
		
		Complex depth, comprehensive breadth:
		• Airway assessment
		  • 3-3-2 rule
		  • Mallampati Classification
		  • L.E.M.O.N
		  • Cormack Lehane Scale
		  • Anatomic variations and/or abnormalities
		  • The 6 P's
		• Airway control options
		  • BLS/BVM
		  • Supraglottic Airways
		  • ET intubation
		  • Video laryngoscopy
		  • Direct laryngoscopy
		  • Surgical Cricothyrotomy
		• Use of DAAM Procedure Checklist
		• Equipment preparation
		• Drug facilitated airway control
		  • Sedation options
		  • Neuromuscular blockers
		  • Depolarizing
		  • Non-Depolarizing
		• Airway control in special patient populations
		  • Morbidly obese
		  • Pregnancy

The agency medical director will administer the standardized education and training course. Additional instruction may be provided by an associate medical director, other physicians, or healthcare providers with subject matter expertise. The didactic portion of the program may be delivered in-person, virtually or using distributive learning resources.

Please see Appendix A to review the PowerPoint slides developed for the didactic presentation.

Psychomotor Skills Practice & Evaluation

All ALS providers will be required to complete a psychomotor evaluation via airway manikin, high-fidelity simulation and/or operating room rotations that is reflective of the skills and critical decision making presented during the course. While we recognize that an operating room experience is considered the gold standard for advanced airway training, restrictions to and competition for operating room time has made this not possible in most areas.

Providers should be expected to demonstrate competency by performing at least 12 intubations in the above referenced settings, under various patient conditions, including situations when DAAM may not be a safe/appropriate option.

Recurrent Education and Training

Agencies participating in the pilot will be required to perform recurrent education and training for all providers at least on a quarterly basis. This education and training will be administered by the agency medical director, who is responsible for determining the depth and breadth of these sessions. Additional instruction may be provided by an associate medical director, other physicians, or other healthcare providers with subject matter expertise. The didactic portion of the recurrent education and training may be delivered in-person, virtually or using distributive learning resources. Providers will also be required to complete a skills-check by the agency medical director or associate medical director.

Training and Education Equivalency

Subject to the approval of the agency medical director, a provider who has completed DAAM education and training at another approved agency, and provides proof of the same, will not be required to repeat the education and training at another agency participating in the pilot.

Likewise, subject to the approval of the agency medical director, any provider who have completed critical care transport expanded scope of practice training or is covered by the equivalencies for that program (see

below), will not be required to repeat the education and training, provided they can provide proof of current practice with a licensed air or critical care ground ambulance agency.

DAAM Education and Training Equivalencies from the Critical Care Transport Program.

Provide evidence of current certification as a Certified Flight Paramedic (FP-C), Certified Flight Registered Nurse (CFRN), Certified Ground Critical Care Transport Paramedic (CCP-C) or Certified Transport Registered Nurse (CTRN)/PHRN; including a letter from the CCT ground or air ambulance agency medical director attesting to the provider's active status and competency to perform DAAM.

Protocol

Please see Appendix B to review the DAAM protocol.

Operational Requirements

Personnel

To initiate DAAM per protocol, two (2) ALS providers, both above the level of AEMT, must be present, one of which must be credentialed by their ALS agency to perform DAAM. This requirement does not extended to a prehospital physician, who performs DAAM under the authority of the Medical Practice Act. Following control of the airway, the provider who administered the DAAM medication must accompany the patient to a receiving facility.

Equipment

In addition to direct laryngoscopy equipment, agencies participating in the pilot program must also carry video laryngoscopy equipment and surgical airway supplies/devices.

Medication Security

The EMS agency will always maintain proper security and accountability of DAAM related medications. Except for medications for which the agency is authorized to use under the Sedation Assisted Intubation protocol, all other medications must be removed from the vehicle and secured when a credentialed DAAM provider is not on duty.

Data Collection and Quality Improvement

As DAAM is a low-frequency, high-risk procedure, a 100% review of these cases by the agency medical director, which is consistent with the threshold used by critical care transport agencies, is required. All cases must be submitted to the agency medical director within 72 hours for review. In cases involving an adverse

event, the agency medical director must be notified within 24 hours and the case be reviewed as soon as possible.

Adverse Events

- Multiple attempts at laryngoscopy (>1)
- Use of surgical or supraglottic airway following ETI attempt
- Vomiting
- Cardiac arrest
- Peri-intubation
    - Hypoxia and hypotension will be calculated as a dose (time x depth)
    - Hypoxia, defined as SPO2 <90%, will review cases separately in which patients were hypoxic prior to intubation attempt despite efforts to pre-oxygenate.
    - Hypotension, defined as SBP<90, will review cases separately in which patients were hypotensive despite efforts to resuscitate prior to induction.

In addition to the PCR, the provider is required to complete an DAAM administration data form to be submitted to the agency medical director in hard copy or electronically. The ALS agency will forward a copy of the DAAM data form to their regional EMS council on a quarterly basis. Continued participation in the program will be contingent on both the provider and agency submitting cases for review in a timely manner. Interim analyses of aggregate cases will be performed every 4 months and presented to the PEHSC MAC to ensure safety and compliance.

Please see Appendix C to review the list of required data elements to be reported as outlined above.

Acknowledgements

PEHSH would like to acknowledge and thank the following individuals for their time and dedication to this project:

Christopher Boyer, Ed.D ,EMT-P, Pennsylvania College of Technology

Dr. Joshua Brown, UPMC, PA Trauma Systems Foundation

Dr. Greg Frailey, Regional Medical Director-LTS EMS Council (Task Force Chair)

Dr. Frank Guyette, STAT MedEvac/UPMC

Nathan Harig, EMT-P, Cumberland Goodwill EMS

Kim Holman, PHRN, Good Fellowship Ambulance Corp.

David Jones, Manager, Penn State University EMS, President-PEHSC

Dr. Douglas Kupas, Commonwealth EMS Medical Director, PA Department of Health

Keith Micucci, PHRN, CRNP, Lehigh Health System MedEvac

Dr. Matthew Poremba, AHN Lifeflight

Dr. Brian Risavi, Regional Medical Director-EMMCO West EMS Council

Dr. Duane Siberski, Associate Regional Medical Director-Eastern PA EMS Council

Dr. Walt Stoy, Center for Emergency Medicine of Western PA

Dr. Jonathan Trager, St. Lukes University Health Network

Dr. Alvin Wang, Regional Medical Director-Montgomery Co. EMS Council

Mervin Wertz, Tower Health System

Gary Watters, EMT-P, AMED Ambulance Service

Dr. Bryan Wilson, St. Lukes University Health Network

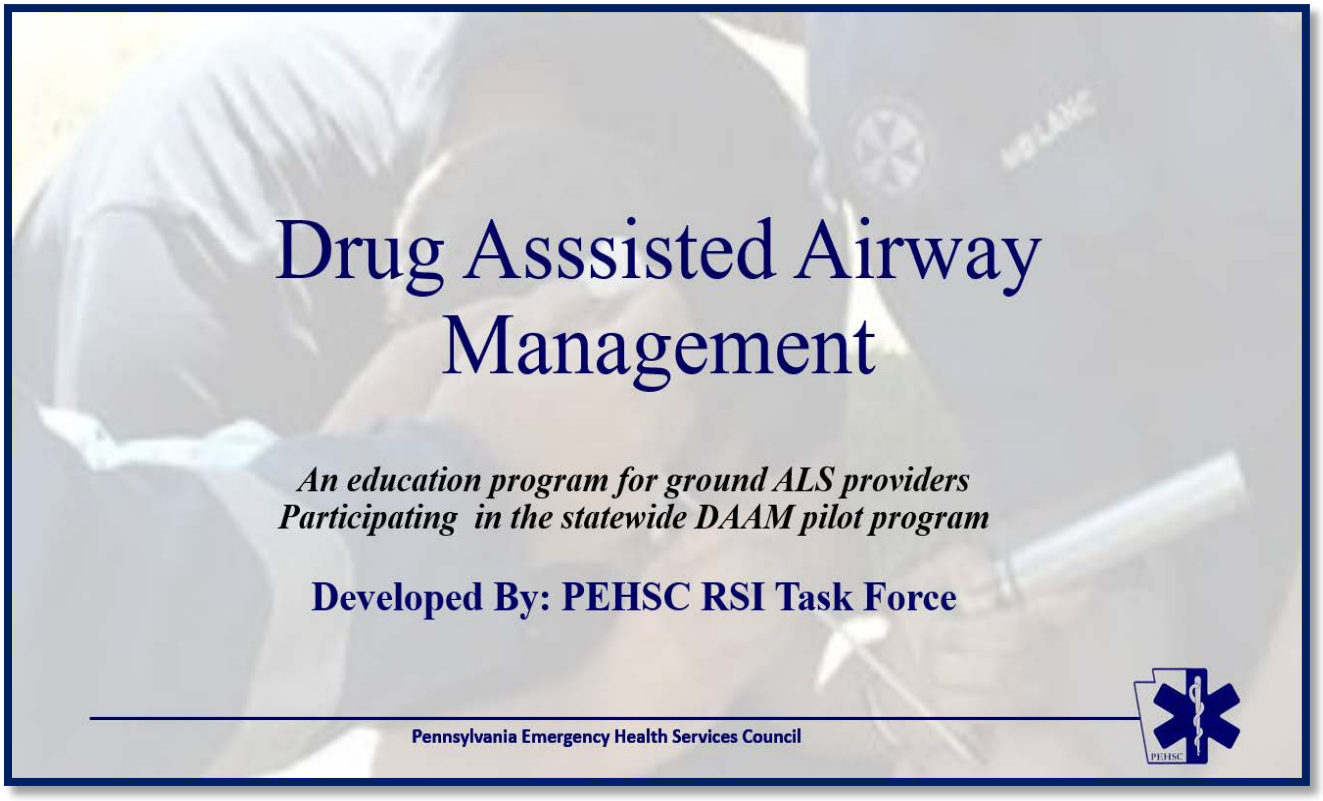
Dr. Gerald Wydro, Regional Medical Director-Bucks County EMS Council

Staff Support: Butch Potter, Paramedic, Sr. EMS Systems Specialist – PEHSC

Workgroup Participants

Workgroup	Facilitator	Participants
Education and Training	Dr. Walt Stoy	Kimberly Holman, RN Keith Micucci Mervin Wertz Christopher Boyer, Ed.D. Dr. Jonathan Trager Dr. Bryan Wilson Dr. Greg Frailey Dr. Douglas Kupas University of Pittsburgh Students: Jadon Nardo Marianna Gatti Sarah Handley
Medical Direction	Dr. Duane Siberski	Dr. Matthew Poremba Dr. Brian Risavi Gary Watters Dr. Alvin Wang Dr. Greg Frailey Dr. Douglas Kupas
Protocol Development	Dr. Alvin Wang	Dr. Matthew Poremba David Jones Gary Watters Dr. Gerald Wydro Dr. Greg Frailey Dr. Douglas Kupas
Quality Improvement and Data Collection	Dr. Frank Guyette	Nathan Harig Keith Micucci, RN, CRNP Christopher Boyer, Ed.D. Dr. Joshua Brown Dr. Alvin Wang Dr. Greg Frailey Dr. Douglas Kupas

Appendix A: Education/Training PowerPoint Slides



(See attached slide deck)

Appendix B: DAAM Protocol

PEHSC DAAM Pilot Protocol
DRAFT

Task Force Chair: **Dr. Greg Frailey**

PEHSC Staff Support: **Mr. Butch Potter**

Subcommittee Chair: **Dr. Alvin Wang**

Subcommittee Workgroup: **Dr. Matthew Poremba, Mr. David Jones, Mr. Gary Watters, Dr. Gerald Wydro, Dr. Greg Frailey, Dr. Douglas Kupas**

In addition, the protocol subcommittee would like to extend special appreciation to Dr. Ronald Klebacher, Mr. David Huebner II, the Virtua Health MICU team, and many others in the EMS community for sharing their agency's DAAM protocols with the subcommittee to assist in formulating this work.

Statement of Intent

Rapid Sequence Intubation (DAAM) is a procedure designed to place an advanced airway after administration of a rapidly acting sedative and neuromuscular blocking agent. This is an advanced-level paramedic skill and the agency medical director must be fully engaged in all aspects of protocol utilization including practitioner credentialing (and re-credentialing), comprehensive but rapid QA/QI, and patient outcome tracking. DAAM is intended to be an adjunctive measure as part of the overall advanced airway management process which is an overall part of the patient resuscitation. DAAM itself is not to be confused with patient resuscitation – rather it is designed to optimize the overall patient resuscitation.

Definitions

Difficult Airway Anatomy (DAA)– physical patient features which may increase the likelihood of difficult airway management. Dimensions of airway difficulty include difficulty in BVM ventilation, endotracheal intubation, supraglottic airway device placement, and surgical cricothyrotomy. Additionally, trauma, foreign body, structural abnormalities, fluids such as blood or vomitus and impaired neck mobility due to age, trauma, and / or need for spinal motion restriction are potential factors.

Difficult Airway Physiology (DAP) – physiological factors that must be addressed prior to administration of medications to facilitate intubation. Considerations include known or predicted hypotension, hypoxia, and metabolic acidosis.

Shock Index (SI)– The shock index is calculated by dividing the heart rate by the systolic blood pressure. A normal shock index is 0.5 – 0.7 in healthy adults. Elevated Shock Index (ESI) is defined as a shock index greater than 0.8.

Hemodynamic Instability – Patients considered to be hemodynamically unstable are patients with SBP

<= 90, Shock Index >= 0.8, or HR > 130 bpm.

DAAM Practitioner – An DAAM practitioner is an EMS clinician at or above the paramedic level who is credentialed by their agency medical director to initiate and perform DAAM. Prior to credentialing as an

DAAM practitioner, the agency medical director must personally ensure that the selected practitioner is competent to perform at this advanced scope of practice via psychomotor and cognitive evaluation processes. To perform DAAM, 2 EMS clinicians at or above the paramedic level must be present at the patient's bedside and both must be in agreement that the patient's resuscitation will be optimized by performing DAAM. At least one of the EMS clinicians must be credentialed as an DAAM practitioner.

DAAM Assistant – An DAAM assistant is an EMS clinician at or above the paramedic level who has received additional training in DAAM and advanced airway management but has not yet been credentialed at the DAAM Practitioner level by the EMS agency medical director.

Airway visualization attempt – any time a laryngoscope crosses the plane of the patient's lips whether for the purposes of suctioning, airway assessment, or endotracheal tube placement.

Quality Assurance / Quality Improvement

100% QA / QI is required for all patients who receive DAAM. The agency medical director, in conjunction with the regional EMS authority and the Commonwealth Bureau of EMS shall participate in QA / QI activities. Sentinel events must be reported immediately upon discovery to the agency medical director and regional EMS office with review occurring within 24 hours. These events are defined as (but not limited to):

- Cardiac arrest after initiation of DAAM
- Possible unrecognized esophageal or non-tracheal endotracheal tube placement
- Use of surgical cricothyrotomy to secure airway
- Notification of **significant** adverse patient outcome by receiving facility which is thought to be related to the use of DAAM

Possible adverse events will require notification to the agency medical director and regional EMS office review within 72 hours after discovery. These adverse events include but are not limited to:

- More than 2 intubation attempts by a single practitioner after medication administration
- More than 3 airway attempts at advanced airway placement regardless of the number of EMS clinicians attempting advanced airway placement.
- Placement of a supraglottic airway after more than 2 failed attempts at endotracheal intubation
- Significant (potentially lethal) dysrhythmia during or after DAAM
- Desaturation to <= 90% during or after DAAM attempt(s)
- Vomiting during DAAM
- Hypoxia (SpO2 <= 90%) or hypotension (SBP <= 90) after DAAM with consideration given to those who were hypoxic or hypotensive prior to DAAM.

In all cases, the agency medical director must review all cases within 72 hours.

Minimum Documentation Elements

- Assessment (and presence of) for predictors of difficult airway anatomy or physiology
- Decision-making regarding medication selection and dosing

- Decision-making regarding inclusion and exclusion criteria for DAAM
- Shock index prior to DAAM
- Vital signs Q5 minutes after medication administration (minimum HR, BP, SaO2, EtCO2)
- Waveform capnography, initial EtCO2 and hospital arrival EtCO2
- Confirmation of successful airway placement to include continuous and immediate waveform capnography, bilateral breath sounds, absent epigastric gastric sounds, pulse oximetry, and chest rise/fall
- Method(s) and adjuncts used for all airway visualization and management attempts including but not limited to videoscopy or direct laryngoscopy, size of airway, depth of tube insertion, gum-elastic bougie or similar device, stylet use, supraglottic airway device, and commercial airway securing device,
- Documentation of confirmation of airway patency and continued correct placement after every move of the patient from one surface to another, including transfer to hospital care.

Required equipment at the patient's bedside

- High quality video laryngoscope and backup handle / blade
- Surgical cricothyroidotomy equipment
- Gum Elastic Bougie
- PEEP valve
- OPA and NPA
- Large bore rigidt suction
- Supraglottic airway device(s)
- NC, NRB, and BVM
- DAAM checklist (See appendix A)

Inclusion criteria

Patients who are thought to benefit from DAAM as part of the optimization of their resuscitation after comprehensive patient assessment due to failure to maintain airway patency, failure to adequately oxygenate or ventilate by any other means, or anticipated *rapidly decompensating* clinical course prior to hospital arrival (such as airway burns or expanding neck hematoma). Consideration should be given to anticipated clinical course of the patient during transport as well as transport time to ED or higher- level of care to the patient's bedside.

Exclusion criteria

- Patients below age 15.
- Anticipate inability to successfully visualize airway for endotracheal intubation.
- Anticipated inability to ventilate with BVM after paralysis
- Patients with inadequate airway access (confined space, entrapment, entaglement)
- Patients who do not achieve a SBP >= 90 mm Hg prior to administration of DAAM medication.
- Patients with states of extreme, decompensated metabolic acidosis such as severe DKA, salicylate overdose, and severe lactic acidosis
- Contraindication to administration of succinylcholine

- Degenerative neuromuscular disease such as DMD or ALS
- History of malignant hyperthermia
- Suspected hyperkalemia (dialysis, DKA, significant burns > 24 hours old, crush injury)

DAAM Procedure

- Assess for patient stability via the following definitional table

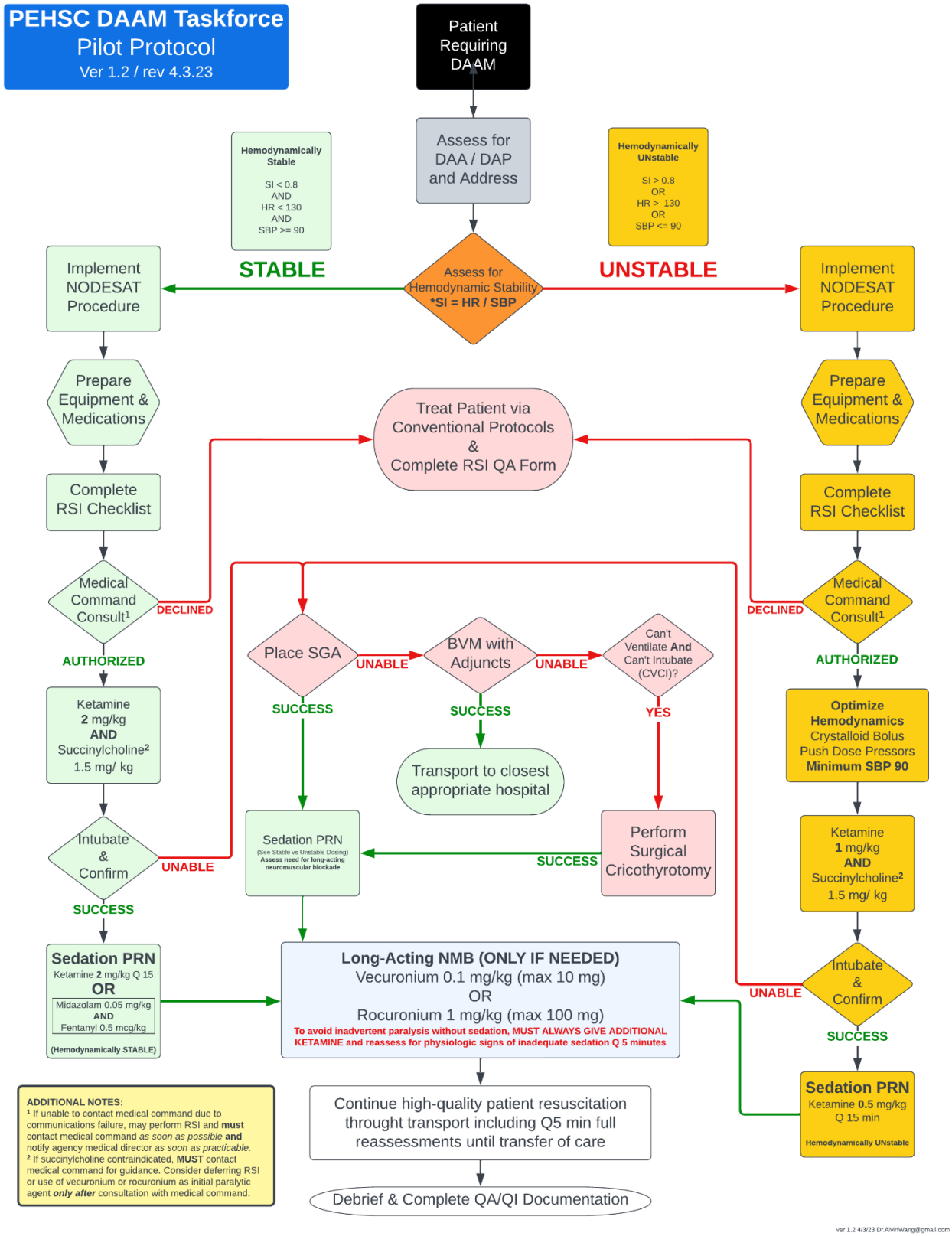
Category	Definition	Decompensation Risk
Hemodynamically Stable	Shock Index < 0.8 **AND** Systolic BP >= 90 mm Hg **AND** Heart Rate < 130 bpm	Lower
Hemodynamically Unstable	Shock Index >= 0.8 **OR** Systolic BP < 90 mm Hg **OR** Heart Rate > 130 **OR** Suspected Severe Acidosis	Higher
Inadequate Oxygenation	SpO2 < 93%	Higher

- Assess for physical and physiologic dimensions of airway management difficulty (DAA / DAP)
- Implement NO-DESAT oxygenation strategy (15 lpm via NC which will remain on during intubation attempt) in conjunction with conventional pre-oxygenation strategies (BVM with high-flow O2, NRB, and/or CPAP). Consider seated or heads-up positioning to aid in alveolar recruitment and oxygenation.
- Ensure at least 1 well-secured large bore (18-ga or greater) IV is in place with preference being given to having 2 peripheral IVs available. If decision is made to perform DAAM with only 1 peripheral IV in place, all IO placement equipment must be immediately available at the patient's bedside for placement
- Ensure at least 500mL bag of IV crystalloid solution is hanging and connected to peripheral IV.
- Prepare DAAM equipment and medications using the DAAM Checklist (Appendix A)

- DAAM practitioner shall call for medical command authorization (required), if possible prior to DAAM, otherwise immediately thereafter. Minimum report to include:
    a. Patient age and clinical condition(s) being treated by DAAM
    b. ETA to hospital or arrival of higher-level of care if transport were to be initiated now
    c. Patient weight in kg.
    d. Patient current physiologic parameters including: BP, HR, SI, SpO2, and RR
    e. Assessment findings for DAA and DAP
    f. DAAM medications (medications and dose in mg)
    g. Post-intubation sedation plan (medications and dose in mg)
- Prepare DAAM medications, push-dose pressor, and post-intubation sedation.
- Administer DAAM medications per protocol based on patient's stability
- Intubate and confirm placement. If unable to intubate, place supraglottic airway. If unable to place SGA, use BVM with adjuncts such as NPA and OPA to manage airway. If unable to intubate, ventilate, or oxygenate by any other means, perform surgical cricothyrotomy.
- Assess patient response to intubation and continue hemodynamic optimization and high-quality patient resuscitation.
- Administer post-intubation sedation if needed.
- If needed, administer long-acting post-intubation neuromuscular blockade. At no time shall a long-acting paralytic be administered without sedation. At no time shall a patient who has received a long-acting paralytic be allowed to become awake and alert while under the influence of a paralyzing agent.
- Monitor and treat vital signs every 5 minutes including RASS (once intubated). Maintain EtCO2 35-45 mm Hg (unless superseded by medical command orders). Titrate PEEP to a maximum of 10cm H2O to maintain adequate oxygenation (unless superseded by medical command orders).

DAAM medications

Push Dose Pressor		
Epinephrine (1mg in 100mL) (Prepare by mixing 1mL of Epinephrine 1 mg in 10mL with 9mL of NSS)	Shock Index > 0.8 SBP < 90 mmHg (DO NOT use in presence of STEMI). Fluid resuscitation must be utilized prior to push-dose pressor use	10-20 mcg IV Q 3-5 minutes Titrate to SBP >=90mmg Hg or highest achievable
Induction Agent		
Ketamine	Sedation / Induction	Hemodynamically Stable: 2mg/kg IV Hemodynamically UNstable: 1 mg/kg IV
Initial Neuromuscular Blockade		
Succinylcholine	Neuromuscular Blockade	1.5 mg/kg IV
Long-Acting Neuromuscular Blockade		
Vecuronium OR Rocuronium	Post-intubation paralytic (if needed and must be administered with post-intubation sedation.	Vecuronium 0.1 mg/kg IV (max 10mg) OR Rocuronium 1 mg/kg IV (max 100mg)
Post-Intubation Sedation		
Fentanyl	Analgesia. May be given concomitantly with Ketamine for hemodynamically stable patients only.	**Stable dosing only:** 0.5 mcg / kg IV/IO (Max single dose 100mcg). May repeat at 0.25 mcg/kg IV (1/2 initial dose) dose Q5 min (max dose 300mcg)
Midazolam	Sedation (use with caution – Midazolam administration in temporal proximity to Ketamine administration has been associated with hypotension)	**Stable dosing only:** 0.05 mg / kg IV / IO Q 10 min (max single dose 5mg)
Ketamine	***MUST BE USED IF LONG-ACTING PARALYTIC IS GIVEN*** Post-intubation Sedation option for both hemodynamically stable or unstable patients	**Hemodynamically stable** 2mg/kg IV q 15 minutes **Hemodynamically UNstable** 0.5 - 1 mg/kg SLOW IV q 15 minutes


PEHSC DAAM Taskforce
Pilot Protocol
Ver 1.2 / rev 4.3.23
Patient Requiring DAAM
Assess for DAA / DAP and Address
Hemodynamically Stable
SI < 0.8
AND
HR < 130
AND
SBP >= 90
Hemodynamically UNstable
SI > 0.8
OR
HR > 130
OR
SBP <= 90
STABLE
UNSTABLE
Assess for Hemodynamic Stability
*SI = HR / SBP
Implement NODESAT Procedure
Implement NODESAT Procedure
Prepare Equipment & Medications
Prepare Equipment & Medications
Treat Patient via Conventional Protocols & Complete RSI QA Form
Complete RSI Checklist
Complete RSI Checklist
Medical Command Consult[1]
DECLINED
AUTHORIZED
Medical Command Consult[1]
DECLINED
AUTHORIZED
Place SGA
UNABLE
BVM with Adjuncts
UNABLE
Can't Ventilate And Can't Intubate (CVCI)?
SUCCESS
SUCCESS
YES
Transport to closest appropriate hospital
Ketamine 2 mg/kg AND Succinylcholine[2] 1.5 mg/ kg
Optimize Hemodynamics Crystalloid Bolus Push Dose Pressors Minimum SBP 90
Intubate & Confirm
UNABLE
SUCCESS
Sedation PRN
(See Stable vs Unstable Dosing)
Assess need for long-acting neuromuscular blockade
SUCCESS
Perform Surgical Cricothyrotomy
Ketamine 1 mg/kg AND Succinylcholine[2] 1.5 mg/ kg
Sedation PRN
Ketamine 2 mg/kg Q 15
OR
Midazolam 0.05 mg/kg
AND
Fentanyl 0.5 mcg/kg
(Hemodynamically STABLE)
Long-Acting NMB (ONLY IF NEEDED)
Vecuronium 0.1 mg/kg (max 10 mg)
OR
Rocuronium 1 mg/kg (max 100 mg)
To avoid inadvertent paralysis without sedation, MUST ALWAYS GIVE ADDITIONAL KETAMINE and reassess for physiologic signs of inadequate sedation Q 5 minutes
Intubate & Confirm
UNABLE
SUCCESS
Sedation PRN
Ketamine 0.5 mg/kg Q 15 min
Hemodynamically UNstable
ADDITIONAL NOTES:
[1] If unable to contact medical command due to communications failure, may perform RSI and must contact medical command as soon as possible and notify agency medical director as soon as practicable.
[2] If succinylcholine contraindicated, MUST contact medical command for guidance. Consider deferring RSI or use of vecuronium or rocuronium as initial paralytic agent only after consultation with medical command.
Continue high-quality patient resuscitation throught transport including Q5 min full reassessments until transfer of care
Debrief & Complete QA/QI Documentation
ver 1.2 4/3/23 Dr.AlvinWang@gmail.com

Appendix C: Data Collection & QI

Data Collection Method

Source data for this project will be obtained from 3 primary sources:

1. PCR data
2. Completion of the DAAM case report
3. Hospital outcome data

The preferred method of reporting the data will be by electronic means, with hardcopy reporting as a failsafe. The task force is communicating with the Bureau of EMS to ascertain their ability to set up a data collection portal. Should this not be possible, then other avenues of data collection will be explored.

Upon completion of each case involving DAAM, the provider will report the required data elements in addition to the PCR. The case involving DAAM requires 100% QA review by the agency medical director or designee. Adverse events will be reported to the agency medical director within 72 hours as described below.

The online data will be available to the agency medical director, regional EMS councils and the Bureau of EMS. The regional council and/or Bureau of EMS should perform a quarterly review of the data and forward a summary to the PEHSC Medical Advisory Committee for review and discussion.

Indications for DAAM

- The need for airway management is based upon the provider's judgment after a rapid global assessment of the patient. Indications for airway management include:
    - Apnea or agonal respirations
    - Airway reflexes compromised
    - Ventilatory effort compromised
    - Injury or medical condition compromising airway patency
    - Potential for future rapid compromise of airway, e.g. airway burns or expanding neck hematoma
        - Consider anticipated clinical course of patient during transport
        - Consider transport time to ED or arrival of higher-level of care

Contraindications

- Anticipated inability to ventilate with BVM after paralysis
- Patients with inadequate airway access Confined space / entrapment / entanglement
- Contraindications to administration of Succinylcholine
    - Degenerative neuromuscular disease such as DMD or ALS
    - History of MH
    - Suspected hyperkalemia

Patient Assessment Parameters

- Trauma or abnormal anatomy
- Modified Mallampati
- Limited mouth opening
- Limited neck mobility
- Pre-existing shock (hypotension/SI)
- Pre-existing hypoxia

Operational Parameters

- Adjuncts used
  - Video laryngoscopy
  - Bougie (Eschman Introducer)
- POGO or CL grade
- Description of difficulties
- Documentation of maintenance of the airway with each movement

Prehospital Data Element Collection

- Medical command contacted (if required)
- Time to hospital
- Patient age and estimated weight
  - A data transfer from the electronic monitoring device(s) to evaluate:
  - Hypotension (B/P Q5 minutes)
  - Hypoxia (Continuous SPO2)
  - Hyper/Hypocarbia (Continuous EtCO2 post intubation)
- Intubation attempts (blade past the teeth)
- Medications used and dosage
- Video, if available, should be reviewed by the agency medical director

Quality Metrics

Metric	Definition
Waveform capnography on patients with an advanced airway	Continuous waveform EtCO2 placed at the time of intubation and collected until transfer of care
First attempt tracheal tube (TT) success	Blade past the teeth as defining the attempt with DL or Tube past the blade in VL
Use of Supraglottic Airway	Placement of an SGA after administration of the induction drugs (either as a primary or rescue device
DASH 1A- Definitive airway "sans" hypoxia/hypotension on first attempt	Must document any occurrence of Sp02<90 or SBP<90
Medication errors	Must document the 5 rights (Patient, Drug, Dose, Route, Time)
Rapid Sequence Intubation protocol compliance	Must document protocol compliance and provide rationale and Medical Director review for all deviations
Unplanned dislodgements of therapeutic devices	Any dislodged ETT / SGA
Hypoxia Exposure	Total time patient had a SpO2 <90%
Hypotension Exposure	Total time patient had a SBP <90mmHg

Adverse Events

Event	Seriousness	Expected	Related	Severity

Multiple Attempts at Laryngoscopy (>1)				
Use of Supraglottic Airway				
Airway Trauma (blood in airway, injury)				
Cardiac Arrest				
Peri Intubation (excluding arrests) - Hypoxia (define <90%, exclude patients who were hypoxic prior to attempt				
- Hypotension (define as SBP<90, exclude patients who were hypotensive prior to arrival				
	0. Not Serious 1. Required Hospitalization 2. Required intervention to prevent disability 3. Led to permanent disability 4. Life threatening 5. Death	0. No 1. Yes	0. Not Related 1. Unlikely 2. Possibly 3. Probably 4. Definitely	0. Mild 1. Moderate 2. Severe

72-Hour Notifications

- More than 2 attempts by a single practitioner
- More than 3 attempts total
- Peri-intubation cardiac arrest
- Unrecognized esophageal intubation
- Cardiorespiratory decompensation Hypoxia < 93%
- Bradycardia < 50
- Significant dysrhythmia associated with procedure
- Inability to intubate or manage airway with SGA

The Medical Director must be notified of these events within 72 hours so that the cases can be reviewed for safety. The medical director is then responsible for determining the course of corrective action or re-education.

Patient Outcome

Hospital Outcomes

- Mortality 24 hours
- Airway Trauma
- Aspiration
- Other Adverse Events

The medical director is responsible for gathering outcome data from the receiving hospital

Appendix D: Intubation Preparation Checklist

Patient Preparation	**Complete**
1. Pulse Ox and ECG Monitor Attached	
2. Functional IV/IO Access with Fluids Attached	
3. Appropriate DAAM Medications a. Ketamine 2 mg/kg b. Succinylcholine 1 mg/kg	
4. Pre-Oxygenation – sitting patient up if possible and utilizing NRB mask or BVM	
Procedural Equipment	**Complete**
1. BMV on O2 source #1	
2. Nasal Cannula on O2 source #2	
3. Waveform ETCO2 in-line sensor connected and functional	
4. Suction on and functional	
5. Video Laryngoscopy functional and recording (if so equipped)	
6. Appropriate size endotracheal tube selected with intact pilot balloon	
7. 10 ml syringe	
8. Stylet (or bougie) for endotracheal tube <4.0 mm	
9. Stethoscope	
10. Commercial endotracheal tube restraint device	
11. Post intubation sedation medications a. Versed 0.02 mg/kg b. Fentanyl 1.0 mcg/kg	
Back-Up Plan	**Complete**
1. Direct laryngoscopy handle and blades	
2. Additional endotracheal tubes and stylets (or bougies)	
3. Supraglottic airway device available	

Appendix E: NAEMSP Position Paper

Prehospital Drug Assisted Airway Management: An NAEMSP Position Statement and Resource Document (2021)

https://doi.org/10.1080/10903127.2021.1990447

ABSTRACT

Airway management is a critical intervention for patients with airway compromise, respiratory failure, and cardiac arrest. Many EMS agencies use drug-assisted airway management (DAAM) - the administration of sedatives alone or in combination with neuromuscular blockers - to facilitate advanced airway placement in patients with airway compromise or impending respiratory failure who also have altered mental status, agitation, or intact protective airway reflexes. While DAAM provides several benefits including improving laryngoscopy and making insertion of endotracheal tubes and supraglottic airways easier, DAAM also carries important risks.

NAEMSP Recommends:

- DAAM is an appropriate tool for EMS clinicians in systems with clear guidelines, sufficient training, and close EMS physician oversight. DAAM should not be used in settings without adequate resources.
- EMS physicians should develop clinical guidelines informed by evidence and oversee the training and credentialing for safe and effective DAAM.
- DAAM programs should include best practices of airway management including patient selection, assessment and positioning, preoxygenation strategies including apneic oxygenation, monitoring and management of physiologic abnormalities, selection of medications, post-intubation analgesia and sedation, equipment selection, airway confirmation and monitoring, and rescue airway techniques.
- Post-DAAM airway placement must be confirmed and continually monitored with waveform capnography.
- EMS clinicians must have the necessary equipment and training to manage patients with failed DAAM, including bag mask ventilation, supraglottic airway devices and surgical airway approaches.
- Continuous quality improvement for DAAM must include assessment of individual and aggregate performance metrics. Where available for review, continuous physiologic recordings (vital signs, pulse oximetry, and capnography), audio and video recordings, and assessment of patient outcomes should be part of DAAM continuous quality improvement.