

GD-067-PHS-EMS: Recommendations for Paramedic Performance of Rapid Sequence Intubation (RSI) in the Prehospital EMS Environment

STATE OF ARIZONA • EMERGENCY MEDICAL SERVICES AND TRAUMA SYSTEM

Recommendations for Paramedic Performance of Rapid Sequence Intubation (RSI) in the Prehospital EMS Environment

INTRODUCTION

Rapid sequence intubation (RSI) is an advanced airway STR skill, under Medication Assisted Intubation in Table 5.1, for Paramedics that some Arizona Emergency Medical Services (EMS) Providers may consider beneficial for the care of their patients. At this time, there is debate about the precise prehospital patient population most benefited by RSI and about the optimal structure and implementation of an RSI program in the prehospital EMS environment.

The Arizona Department of Health Services (Department) views RSI as an important prehospital tool, the safe and appropriate use of which requires a tremendous amount of time, resources, and dedication. This document provides the Department's recommendations for Paramedic performance of RSI in the prehospital EMS environment. Ultimately, whether an EMS Provider's Paramedics are authorized to perform RSI and how the EMS Provider's RSI program is structured and implemented falls to the discretion of the EMS Provider's administrative medical director.

RECOMMENDATIONS FOR PARAMEDIC PERFORMANCE OF RSI

Initial Sedation Agent: Etomidate

Paralytic Agent: Succinylcholine

Continued Sedation Agent: Midazolam HCl or diazepam

Analgesic Agent: Morphine sulfate, fentanyl, or ketamine

Indications for Performance of RSI: See Exhibit A

Contraindications for Performance of RSI: See Exhibit A

Training Prerequisite for Performance of RSI:

Require successful completion of standardized competency-based training consistent with Exhibit A before a Paramedic is authorized to perform RSI.

Safety Measures in Performance of RSI:

Use the following with each patient upon whom RSI is performed:

1. A continuous in-line CO₂ monitor with capnographic waveform printing capabilities;
2. An automatic transport ventilator (ATV) device to ensure appropriate rate control and tidal volume ventilation; and
3. If endotracheal intubation is not successful, one of the following alternative airway management devices:
 - a. Esophageal tracheal double lumen airway device (ETDLAD),
 - b. Laryngeal mask airway (LMA), or
 - c. Intubating laryngeal mask airway (ILMA).

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Administrative Medical Director Discretion and Supervision:

An administrative medical director should:

1. Authorize only select Paramedics to perform RSI, based upon significant time, experience, and skill as practicing Paramedics;
2. Require successful completion of standardized competency-based training consistent with Exhibit A before a Paramedic is authorized to perform RSI;
3. Require as a prerequisite to performing RSI that a Paramedic demonstrate proficiency to the administrative medical director by performing at least 12 endotracheal intubations, with each intubation performed:
 - a. In an operating room, emergency department, or coroner's office; or
 - b. If these are not available, with a mannequin simulator;
4. Ensure that each Paramedic authorized to perform RSI maintains proficiency by successfully performing at least 12 endotracheal intubations each year, including at least one prehospital RSI; and
5. Ensure that complete data is collected, reviewed, and analyzed through a data management system, a data collection program, and a quality management program as described below.

Data Collection and Review, Quality Management:

An EMS Provider offering RSI should have:

1. A data management system to track participating Paramedics' endotracheal intubations, including at least:
 - a. The number of attempted endotracheal intubations, with a separate figure for attempted RSIs;
 - b. The number of successful endotracheal intubations, with a separate figure for successful RSIs; and
 - c. The number of unsuccessful endotracheal intubations, with a separate figure for unsuccessful RSIs;
2. A data collection program that includes:
 - a. EMT documentation of at least the information listed in Exhibit A, subsection (VII)(N), using a form such as Exhibit B;
 - b. Collecting real-time monitoring printouts of patient physiologic parameters, including heart rate, oxygen saturation, and end-tidal CO₂; and
 - c. Collecting follow-up information, including patient outcome, from hospitals receiving patients upon whom RSI was performed, using a form such as Exhibit C; and
3. A quality management program that includes:
 - a. Administrative medical director review of every attempted or completed RSI, including the EMT documentation described in subsection (2)(a) and the real-time monitoring printouts of patient physiologic parameters described in subsection (2)(b);

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- b. Administrative medical director review of all patient follow-up information obtained from receiving hospitals as described in subsection (2)(c); and
- c. A process for taking corrective action, such as requiring a Paramedic to complete remedial training or rescinding a Paramedic's authority to perform RSI, when the administrative medical director detects a problem in a Paramedic's performance of RSI.

Submission of Information to MDC and ADHS

An EMS Provider offering RSI should:

1. Voluntarily submit RSI data to the Medical Direction Commission (MDC) on a quarterly basis; and
2. Voluntarily submit to ADHS's Bureau of Emergency Medical Services a letter of intent to have an RSI program, copies of the training outline and protocols to be used, and a description of the quality management program to be used.

EXHIBIT A: Training Outline for RSI

INTRODUCTION

- Purpose:** To prepare Arizona certified Paramedics to perform rapid sequence intubation (RSI)
- RSI:** The use of a sedation agent and a paralytic agent to facilitate endotracheal intubation
- Design:** Didactic and psychomotor skills education and training in the techniques of RSI, including advanced airway management; recognition of indications, contraindications, and complications; pharmacology; protocols; and special considerations
- Prerequisites:** Currently certified Paramedic, active in the field, with permission of the employing EMS Provider's administrative medical director

Competencies:

- A. Identify and simulate advanced airway management according to the standards and procedures outlined in the course. (I)
- B. Identify the indications, contraindications, and complications for RSI. (II, III, IV)
- C. List the anticipated mechanical and pharmacological interventions that may be used before, during, and after RSI. (I, V, VI, VII, VIII)
- D. Identify and explain the steps in the algorithm for RSI. (VI, VII)
- E. Identify special patient management modalities for RSI. (VII, VIII)
- F. Demonstrate use of the continuous in-line CO₂ monitor with capnographic waveform printing capability and the ability to interpret the end-tidal CO₂ measurement values and waveforms. (VI, VII)
- G. Demonstrate cricothyrotomy. (I, VI, VII)
- H. Demonstrate use of the laryngeal mask airway (LMA), intubating laryngeal mask airway (ILMA), and/or esophageal tracheal double lumen airway device (ETDLAD). (I, VI, VII)

COURSE OUTLINE

I. Advanced Airway Management

- A. Lecture
- B. Skills demonstration:
 - 1. Demonstration of basic life support (BLS) airway management:
 - a. Bag-valve mask (BVM),
 - b. Oral pharyngeal airway (OPA), and
 - c. Sellick's maneuver;
 - 2. Demonstration of appropriate ventilation rate and volumes;
 - 3. Demonstration and application of airway-difficulty-assessment parameters, using the Mallampati classification or a similar airway classification scale;
 - 4. Demonstration of appropriate interpretation of pulse oximetry values, capnography waveforms, and ECG values;
 - 5. Demonstration of oral endotracheal intubation;
 - 6. Demonstration of confined space intubation (ambulance or helicopter setting);
 - 7. Demonstration of dual lumen airway placement; and
 - 8. Demonstration of surgical cricothyrotomy.

II. Indications for RSI

- A. Respiratory failure
- B. Loss of gag reflex or protective airway reflex
- C. Glasgow Coma Scale score of 7 or less
- D. Severe head trauma
- E. Combative patient
- F. Spinal cord injury
- G. Facial and airway burns
- H. Asthma or respiratory illness
- I. **The benefit of obtaining airway control must be weighed against the risk of complications caused by the procedure.**

III. Contraindications for RSI

- A. Absolute
 - 1. Known hypersensitivity to any drug used in RSI
 - 2. Patient in whom cricothyrotomy would be impossible
 - 3. Patient in whom intubation would be impossible
 - 4. Neck injury or swelling that compromises the airway
 - 5. Patient younger than 14 years of age
 - 6. Upper airway obstruction
 - 7. Known or suspected epiglottitis
 - 8. Known history of myasthenia gravis or another skeletal muscle myopathy

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- B. Relative
 - 1. Spontaneous breathing with adequate ventilation
 - 2. Patient in whom cricothyrotomy would be difficult
 - 3. Patient in whom intubation would be difficult

IV. Complications of RSI

- A. Inability to secure the airway after administration of the paralytic agent
- B. Arrhythmias:
 - 1. Tachycardia
 - 2. Bradycardia
 - 3. Asystole
- C. Aspiration
- D. Bronchospasm
- E. Inability to evaluate neurological status and seizures
- F. Emesis
- G. Prolonged apnea
- H. Histamine flush
- I. Hypotension

V. Pharmacology

- A. Etomidate: Review Drug Profile for Etomidate
- B. Succinylcholine: Review Drug Profile for Succinylcholine
- C. Midazolam HCl: Review Drug Profile for Midazolam Hydrochloride
- D. Diazepam: Review Drug Profile for Diazepam
- E. Morphine sulfate: Review Drug Profile for Morphine Sulfate

VI. Preparation for Procedure

- A. Maintain and continually assess basic life support procedures.
- B. Maintain the patient's airway and, if indicated, c-spine immobilization.
- C. Have the following equipment immediately available:
 - 1. BVM with proper size mask and OPA;
 - 2. Suction device;
 - 3. Intubation equipment:
 - a. Endotracheal tubes,
 - b. Laryngoscope with blades,
 - c. Stylet, and
 - d. 10cc syringe;
 - 4. Pulse oximeter;
 - 5. Continuous in-line CO₂ monitor with capnographic waveform printing capability;
 - 6. ECG monitor;

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7. Cricothyrotomy equipment;
 8. Alternative airway equipment:
 - a. LMA,
 - b. ILMA, or
 - c. ETDLAD; and
 9. Automatic transport ventilator (ATV) device.
- D. Breathing:
1. Assist ventilations with ATV (or BVM, if ATV unavailable) if needed, at appropriate rates and volumes.
 2. Apply and assess values from pulse oximeter and in-line CO₂ monitor waveforms.
 3. Provide oxygen via ATV (or BVM, if ATV unavailable) to pre-oxygenate the patient so that the patient can be apneic for 2-3 minutes without serious hypoxia, by:
 - a. Providing 100% oxygen for at least 1-2 minutes (preferably 4-5 minutes) to establish an oxygen reserve; or
 - b. If unable to wait, giving 4 vital capacity breaths.
 4. **Ensure that patient is not hyperventilated at any time!**
- E. Perform circulation assessment.
- F. Establish IV of normal saline at 30cc/hr or greater.
- G. Apply ECG monitor (must be used before, during, and after procedure).
- H. Reassess values (pulse oximeter, in-line CO₂ monitor waveforms, and ECG rate and rhythm).
- I. Perform neurological exam before administering paralytic agent, by:
1. Determining Glasgow Coma Scale score,
 2. Assessing pupils, and
 3. Detecting extremity movement or lack thereof.
- J. To the extent possible, obtain a focused history and detailed assessment of patient to determine appropriate use of the procedure.

VII. Procedure

- A. Prepare the drugs and intubation equipment, including the suction equipment.
- B. Pre-oxygenate with 100% oxygen, with appropriate rate and depth of ventilation.
- C. Assess values (pulse oximetry, in-line CO₂ monitor waveforms, and ECG rate and rhythm) and pupil response at least every 5 minutes (monitors must be left in place continuously).
- D. Provide supportive explanations to patient, family, and bystanders, as needed.
- E. Maintain cricoid pressure throughout entire procedure, until intubation is confirmed.
- F. Administer Etomidate.
- G. Administer Succinylcholine.
- H. Intubate patient.

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- I. Assure adequate sedation and analgesia for prolonged paralysis.
- J. Maintain spinal immobilization if patient has possible spinal injury.
- K. Confirm proper endotracheal tube placement, using:
 - 1. Continuous in-line CO₂ monitoring;
 - 2. Continuous pulse oximetry monitoring; and
 - 3. At least one of the following methods:
 - a. Bilateral breath sounds,
 - b. Negative epigastric sounds,
 - c. Use of an intubation detector bulb, or
 - d. Visualization of the tube passing through the vocal chords.
- L. If intubation is unsuccessful:
 - 1. Ventilate the patient with ATV (or BVM, if ATV unavailable) and 100% oxygen until the next attempt;
 - 2. Consider administering Midazolam or Diazepam if it has been more than 3 minutes since Etomidate administration, and administer if determined to be beneficial; and
 - 3. Attempt intubation again.
- M. If the second intubation attempt is unsuccessful:
 - 1. Ventilate the patient with ATV (or BVM, if ATV unavailable) and 100% oxygen;
 - 2. If possible, obtain airway management using an ETDLAD, LMA, or ILMA; and
 - 3. If unable to adequately ventilate patient using other airway adjuncts, perform surgical cricothyrotomy.
- N. Document at least the following, using a form such as Exhibit B:
 - 1. Incident number and date;
 - 2. Agency and unit identification;
 - 3. Identification of each Paramedic involved;
 - 4. Call type;
 - 5. Patient age, sex, and weight;
 - 6. Indications and contraindications for RSI present;
 - 7. Patient's Glasgow Coma Scale score;
 - 8. Pre-oxygenation performed (ATV, BVM, or vital capacity breaths);
 - 9. Patient vitals before and after the procedure (documented at least every 5 minutes after the procedure), including:
 - a. Pulse,
 - b. Blood pressure,
 - c. Respiratory rate, and
 - d. O₂ saturation;
 - 10. End-tidal CO₂ measurements, including waveform interpretation (continuous throughout entire patient management);

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11. Medication name, dose, route, and time for each administration of medication, including continued sedation, if any;
12. Whether the Sellick's maneuver was used;
13. Number of RSI and other intubation attempts;
14. Methods used to confirm placement of the endotracheal tube;
15. Whether alternative airway equipment was used and, if so, an explanation;
16. Whether surgical cricothyrotomy was performed;
17. An explanation of any repeated doses of medication (e.g., medication name and reason, such as lack of paralysis);
18. An explanation of the rationale for using RSI;
19. If intubation was unsuccessful, an explanation of why intubation was unsuccessful; and
20. Complications encountered.

VIII. Special Considerations

- A. The benefits of obtaining airway control must be weighed against the risk of complications caused by the procedure.
- B. Once Succinylcholine is given, the Paramedic must be vigilant because the patient is paralyzed and unable to breathe independently.
- C. Paralysis can be prolonged with repeated doses of Succinylcholine.
- D. A Paramedic must maintain c-spine immobilization if needed.
- E. A Paramedic must continuously monitor in-line CO₂ and pulse oximetry.
- F. A Paramedic must continuously monitor the rate and depth of ventilations.
- G. Because a paralyzed patient may still be awake and in severe pain, adequate sedation and analgesia must be provided before, during, and after the procedure.

IX. EMS Provider's Specific Protocols

- A. Prerequisites to performing RSI
- B. Annual requirement to maintain proficiency
- C. Data management system
- D. Data collection program
- E. Quality management program
- F. Algorithm for RSI
- G. Drug profiles

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EXHIBIT B. FORM FOR PARAMEDIC DOCUMENTATION OF RSI

Incident Number	Date	Agency	Unit
Medic 1	Medic 2	Medic 3	
Call Type	Patient Age	Patient Sex	Patient Weight
INDICATIONS/CONTRAINDICATIONS FOR RSI			
Respiratory Failure Y <input type="checkbox"/> N <input type="checkbox"/>		Loss of Gag/Protective Airway Reflex Y <input type="checkbox"/> N <input type="checkbox"/>	
Glasgow Coma Scale Score < 8 Y <input type="checkbox"/> N <input type="checkbox"/> GCS Score: _____		Severe Head Trauma Y <input type="checkbox"/> N <input type="checkbox"/>	
Combative Patient Y <input type="checkbox"/> N <input type="checkbox"/>		Spinal Cord Injury Y <input type="checkbox"/> N <input type="checkbox"/>	
Facial and Airway Burns Y <input type="checkbox"/> N <input type="checkbox"/>		Asthma or Respiratory Illness Y <input type="checkbox"/> N <input type="checkbox"/>	
Absolute Contraindications Present Y <input type="checkbox"/> N <input type="checkbox"/> If Yes, Explain:		Relative Contraindications Present Y <input type="checkbox"/> N <input type="checkbox"/> If Yes, Explain:	
PROCEDURAL DATA			
Pre-oxygenation With 100% O ₂ Performed: ATV <input type="checkbox"/> BVM <input type="checkbox"/> Vital Capacity Breaths <input type="checkbox"/>		Continuous End-Tidal CO ₂ Monitoring Y <input type="checkbox"/> N <input type="checkbox"/> (Attach Printout)	
Vitals Before:	Vitals 5 Min. After:	Vitals 10 Min. After:	Vitals 15 Min. After:
Etomidate Administration	Dose:	Route:	Time:
Succinylcholine Administration	Dose:	Route:	Time:
Other Medication Administration	Name & Dose:	Route:	Time:
Other Medication Administration	Name & Dose:	Route:	Time:
Sellick's Maneuver Used Y <input type="checkbox"/> N <input type="checkbox"/>	# RSI Attempts	# Intubation Attempts	
ET Tube Placement Confirmed By: Continuous In-Line CO ₂ Monitoring Y <input type="checkbox"/> N <input type="checkbox"/> Continuous Pulse Oximetry Y <input type="checkbox"/> N <input type="checkbox"/> Bilateral Breath Sounds Y <input type="checkbox"/> N <input type="checkbox"/> Negative Epigastric Sounds Y <input type="checkbox"/> N <input type="checkbox"/> Intubation Detector Bulb Y <input type="checkbox"/> N <input type="checkbox"/> Visualization of Tube Y <input type="checkbox"/> N <input type="checkbox"/>		Alternative Airway Equipment Used Y <input type="checkbox"/> N <input type="checkbox"/> If Yes, Explain:	
Explain Repeated Doses of Medication:		Surgical Cricothyrotomy Performed Y <input type="checkbox"/> N <input type="checkbox"/>	
Explain Rationale for Using RSI:			
If Intubation Unsuccessful, Explain Why:			
COMPLICATIONS			
None <input type="checkbox"/>	Tachycardia <input type="checkbox"/>	Prolonged Hypoxia <input type="checkbox"/>	
Bronchospasm <input type="checkbox"/>	Bradycardia <input type="checkbox"/>	Medication Error <input type="checkbox"/>	
Hypotension <input type="checkbox"/>	Other Dysrhythmia <input type="checkbox"/>	Other: _____	

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EXHIBIT C. RSI HOSPITAL FOLLOW-UP FORM

Date	Agency	Unit	Incident Number
Hospital Name	Time of Arrival	Patient Age	Patient Sex

Hospital Provider:

Please complete this follow-up form as soon as possible (within 12 hours) to assist with the evaluation of our EMS Agency's RSI program. Once completed, please fax to _____ and mail the original in the attached envelope. Questions or comments may be directed to the following EMS Agency contact: _____ at _____.

Please do not place in the medical record. Thank you.

Airway type used by EMS Agency: _____

If endotracheal intubation was performed by EMS Agency, how was initial tube placement confirmed at Hospital? _____

Was X-ray performed? Yes No

Was endotracheal tube placement adequate? Yes No

Arterial blood gases (initial set if performed):

pH _____ PCO₂ _____ PaO₂ _____ HCO₃ _____ Be _____

Diagnosis: _____

Outcome: DOA Died in ED To ICU Other: _____

Airway managed appropriately by EMS Agency? Yes No

Agree with the prehospital need for intubation? Yes No

If no, why not? _____

Did EMS Agency administer appropriate medication (paralysis and sedation)? Yes No

If no, explain: _____

Other comments: _____

Form completed by: _____ Date: _____

Not part of hospital record