Trauma Airway Management Guidelines
Draft 5/11/09

Purpose:
To provide a standardized and interdisciplinary approach to airway management of trauma patients. These guidelines were created through a collaborative effort between the Departments of Anesthesia, Emergency Medicine, and Trauma Surgery.

Approach to airway management:
Early recognition of the difficult airway and a methodical, prepared approach will assist in establishing a safe and successful intubation. The emergency airway management algorithms endorsed by the American Society of Anesthesiologists, Walls et al. and Dunham et al. are included in this guideline. They are referenced and attached as appendices (1-3).

Indications for intubation:
Airway management is a critical component of resuscitation of the trauma patient.
Clinical indications for endotracheal intubation may include:

- Airway Obstruction
- Altered mental status with severe cognitive impairment (GCS $\leq$ 8)
- Cardiac Arrest
- Hypoventilation
- Hypoxia
- Hemorrhagic shock
- Smoke inhalation or burns
- Anticipated clinical course

Guidelines:
The following guidelines are acceptable best practices for airway management in trauma patients:

1. *Roles, Experience & Training in emergency airway management:*
    1. Physicians performing intubation of trauma patients should have prior training in emergency airway management and the approach to the difficult airway.
    2. The physician should also have familiarity with the available equipment (Appendix 4), personnel, and protocols of trauma airway management in the Emergency Department.
    3. Physicians should have knowledge of indications and contra-indications of the available airway devices
    4. The decision to intubate a patient will be made by the resuscitation leader in conjunction with the EM attending, Trauma Surgery, and Anesthesia attendings.
    5. The specific primary team responsible for intubation will be determined by the prior written policy between the Departments of Emergency Medicine, Anesthesia, and Trauma Surgery
        1. As of August 2008:
           Monday 6:00 AM until Saturday 6:00 AM:
            1. Anesthesia team has the primary responsibility for the trauma airway
           Saturday 6:00 AM until Monday 6:00 AM:
            2. Emergency Medicine team has the primary responsibility for the trauma airway
    6. When the EM team is primarily managing the airway, the Anesthesia team will support the EM airway team as a consultant in case of difficulties. Ideally, a short briefing between the EM team and the anesthesia consultant is performed prior to the

arrival of the patient[1].

2. *Preparation:*
    1. The equipment available for airway management will be regularly checked and re-stocked per Emergency Department Protocol. The physician managing the airway will be responsible for verifying:
        1. Functioning and appropriately sized laryngoscopes, blades and endotracheal tubes (Adults: size 6.5-8.0; Pediatrics: size 3.5-6.0; stylet and balloon tested)
        2. Oral and nasal airways
        3. Intravenous access
        4. Cardiac monitoring
        5. Oximetry and Capnography
        6. Suction (Yankauer, endotracheal suction)
        7. Bag-Valve-Mask (BVM)
        8. Supraglottic device (LMA / Combitube)
        9. Cricothyrotomy kit
3. *Assessment:*
    1. In order to identify the anticipated difficult airway, the airway team should perform early examination (when feasible), including Mallampati score and assessment of thyromental distance (i.e. LEMON, Appendix 5).
    2. When a difficult airway is encountered or anticipated, a call for additional equipment, resources and the anesthesia team should be made.
4. *Positioning:*
    1. If there is concern of cervical spine injury, cervical spine immobilization should be maintained prior to intubation and after the airway is secured.
    2. During the procedure, the cervical spine collar (if used) should be opened and an assistant designated by the airway physician will provide in-line cervical spine stabilization
    3. Cricoid pressure should be applied when the patient is unconscious. If an inadequate view is encountered, the intubating physician may manually reposition the larynx, or direct the assistant to release cricoid pressure.
5. *Preoxygenation:*
    1. If feasible, patients will be administered 100% oxygen for at least 3 minutes, or 8 vital capacity breaths by BVM prior to intubation
6. *Medications:*
    1. A standard intubating drug (Appendix 6) kit will be requested with any 900/911-trauma activation
    2. In case of peri-intubation hemodynamic collapse vasoactive drugs (ACLS) should be available, including atropine, phenylephrine, and epinephrine.
    3. The medications given for rapid sequence induction and intubation will be under the direction of the physician overseeing airway management
    4. As medications are administered, they will be announced and recorded by the nursing scribe during the resuscitation
    5. Upon successful intubation, post-intubation sedation medications will be ordered by the airway physician
7. *Pre-treatment:*
    1. In selected patients with signs of increased intracranial pressure, aortic dissection, or reactive airway disease the following medications may be **considered** as pre-

[1] At San Francisco General Hospital, the Associate Dean of the Medical School, the hospital Chief of Staff and the hospital Chief Medical Officer have assigned the attending anesthesiologist authority to intervene in difficult airway cases.

treatment:
    1. Lidocaine 1.5 mg/kg IV
    2. Fentanyl 1-3 mcg/kg IV (caution: hypovolemia may cause hypotension)

8. Induction:

1. The following medications are recommended for induction
    1. Etomidate 0.2-0.3 mg/kg IV

9. Paralysis:

1. The following medications are recommended for paralysis
    1. Succinylcholine 1.0 - 1.5 mg/kg IV (*contraindications: appendix 7)
    2. Alternative: Rocuronium 1.0 - 1.2 mg/kg

10. Confirmation

1. After placement of an endotracheal tube, confirmation of proper placement should be confirmed by:
    1. Capnography and
    2. Auscultation of breath sounds and absence of gastric sounds
2. Additional methods of endotracheal tube verification include:
    1. Chest Radiography
    2. Fiberoptic visualization of endotracheal placement

11. Post Intubation Management

1. After the placement of a cuffed endotracheal tube has been verified, the following medications are recommended for post-intubation sedation.
    1. Midazolam 0.01-0.05 mg/kg IV OR
    2. Alternative: Propofol 25-100 mcg/kg/min IV drip
2. For pain control, the following medication is recommended:
    1. Fentanyl 1-3 mcg/kg IV
3. If paralysis is required, the following medication is recommended:
    1. Rocuronium: 0.5 mg/kg IV

Appendices & References:

1. Practice guidelines for the management of the difficult airway. An updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. *Anesthesiology* 2003; 98:1269-1277

2. Walls RM and Murphy MF: Manual of Emergency Airway Management, 3rd edition, Lippincott, Williams and Wilkins, 2008

3. Dunham et al, Guidelines for emergency tracheal intubation immediately after traumatic injury, J Trauma 2003; 55:162-79

4. Airway Management Equipment List (in progress)

5. ASSESS the Airway: LEMON mnemonic
    1. L Look externally
       E Evaluate 3-3-2
       M Mallampati Score
       O Obstruction/Obesity
       N Neck mobility

6. Intubating Drug Kit Contents:
    1. Succinylcholine Prefilled syringe

2. Etomidate
3. Rocuronium

7. Succinylcholine contraindications include:
    1. Burns or crush injury >48 hours post initial injury
    2. Known or suspected myopathy
    3. Hyperkalemia
    4. Malignant Hyperthermia

Appendix 1:

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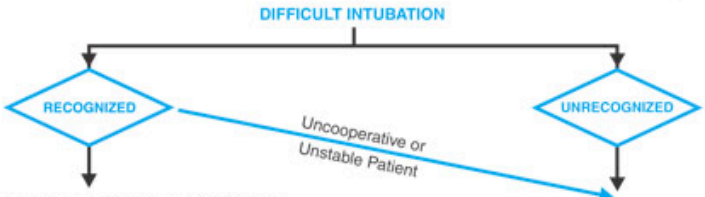
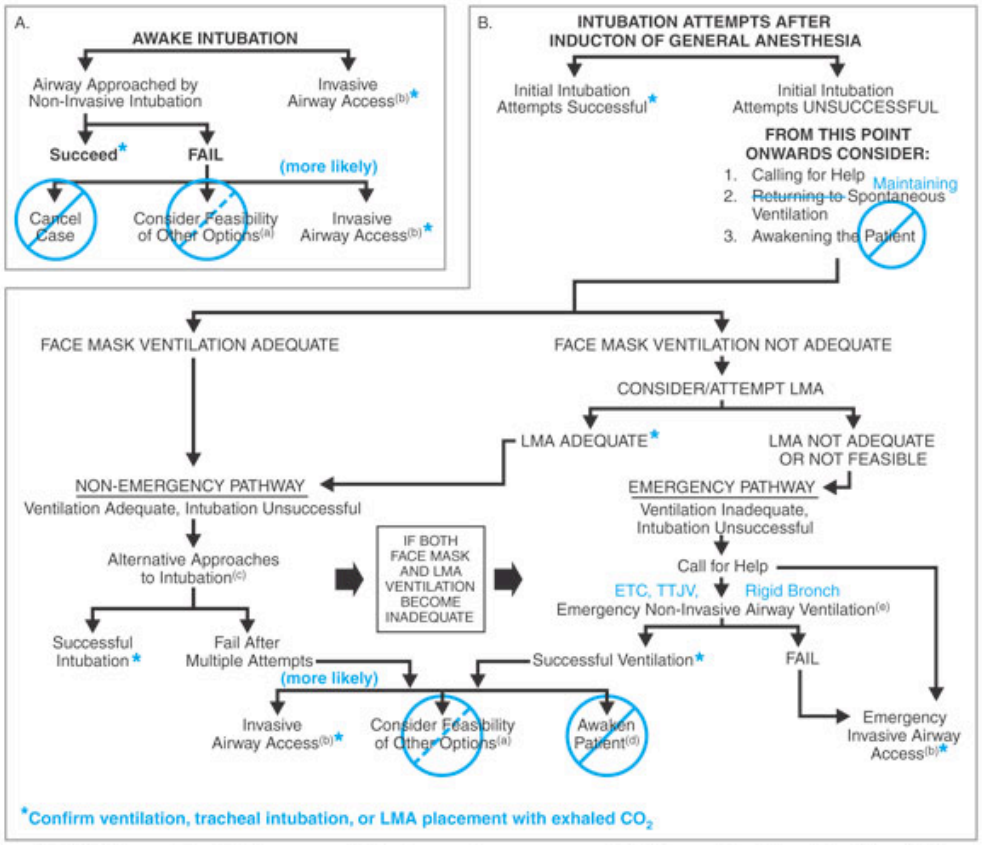
2003 DIFFICULT AIRWAY ALGORITHM (MODIFIED FOR TRAUMA)

1. Assess the likelihood and clinical impact of basic management problems.
   - A. Difficult Ventilation
   - B. Difficult Intubation
   - C. Difficulty with Patient Cooperation or Consent
   - D. Difficult Tracheostomy
2. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway management.
3. Consider the relative merits and feasibility of basic management choices:

A.	Awake Intubation	vs.	Intubation Attempts After Induction of General Anesthesia
B.	Non-Invasive Technique for Initial Approach to Intubation	vs.	Invasive Technique for Initial Approach to Intubation
C.	Preservation of Spontaneous Ventilation	vs.	Ablation of Spontaneous Ventilation



4. Develop primary and alternative strategies:



a. Other options include (but are not limited to): surgery utilizing face mask or LMA anesthesia, local anesthesia infiltration or regional nerve blockade. Pursuit of these options usually implies that mask ventilation will not be problematic. Therefore, these options may be of limited value if this step in the algorithm has been reached via the Emergency Pathway. Judgment required. Rarely appropriate for trauma patients.

b. Invasive airway access includes surgical or percutaneous tracheostomy or cricothyrotomy.

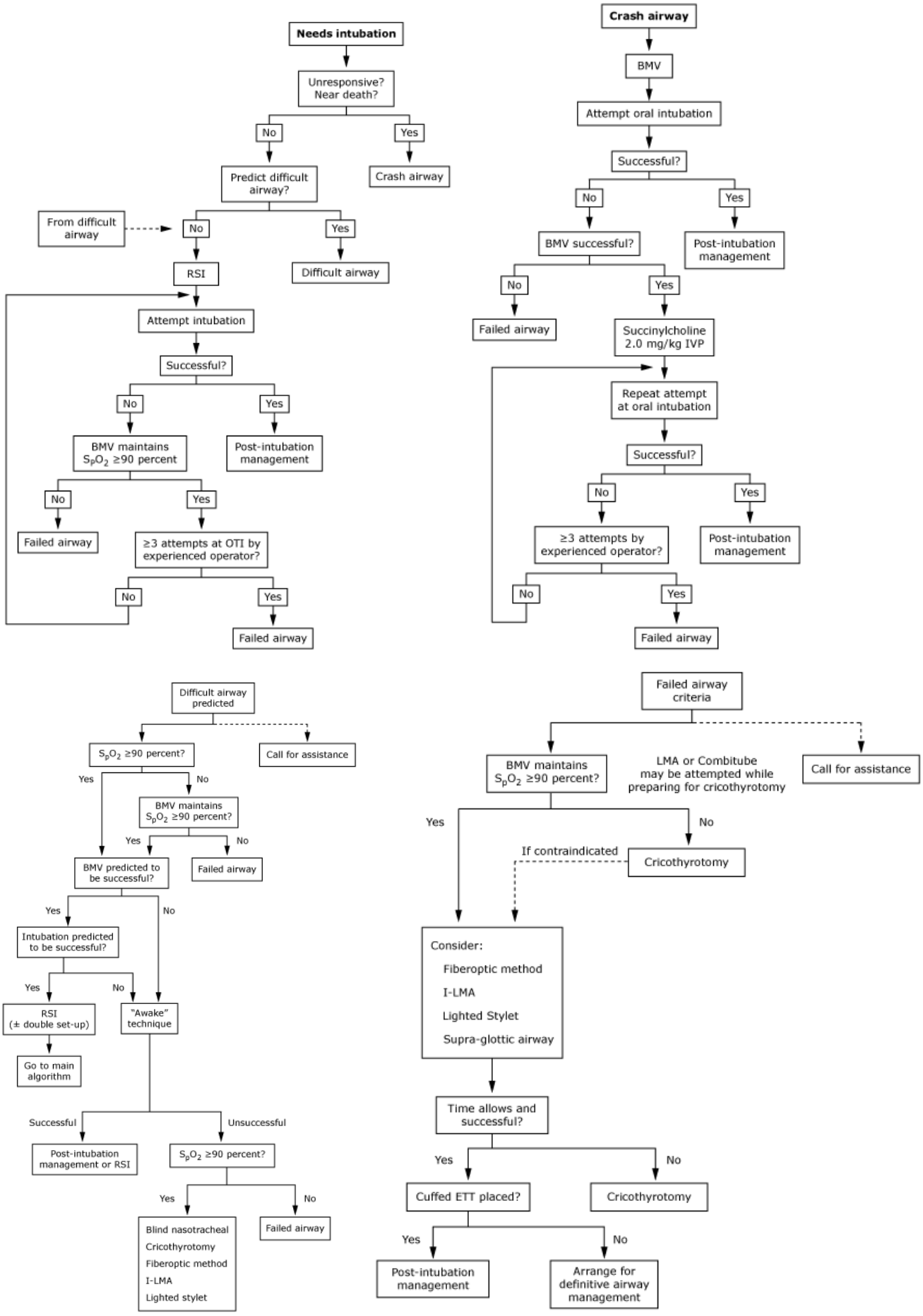
c. Alternative non-invasive approaches to difficult intubation include (but are not limited to): use of different laryngoscope blades, LMA as an intubation conduit (with or without fiberoptic guidance), fiberoptic intubation (FOB), intubation stylet or tube changer (airway exchange catheter, (AEC) light wand, retrograde intubation, and blind oral or nasal intubation.

d. Consider re-preparation of the patient for awake intubation or canceling surgery. Rarely applicable in the trauma patient.

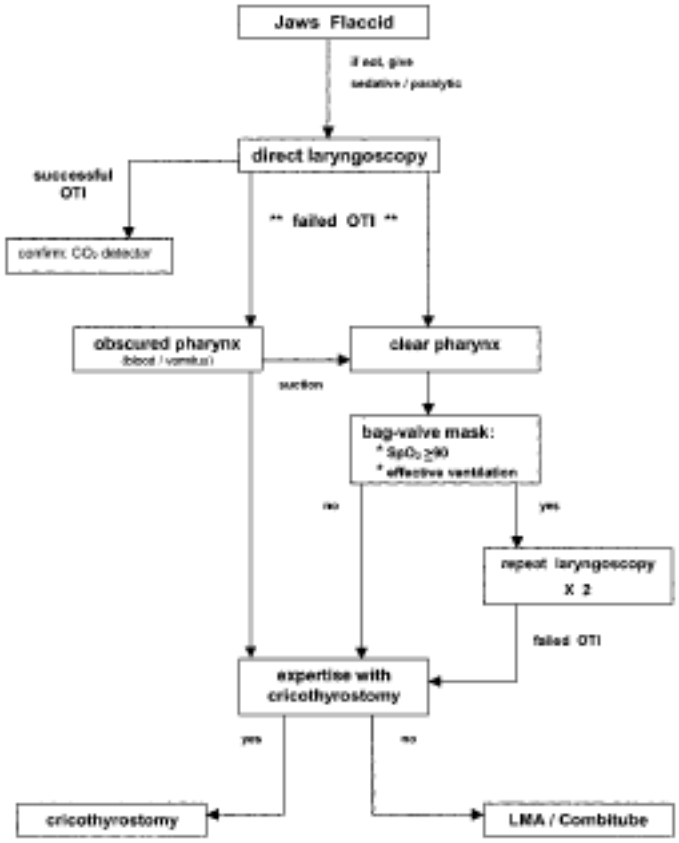
e. Options for emergency non-invasive airway ventilation include (but are not limited to): rigid bronchoscope (Rigid Bronch), esophageal-tracheal combitube ventilation (ETC), or transtracheal jet ventilation (TTJV).

f. Extubation strategies include: evaluation of the airway with FOB and extubation over an airway exchange catheter (AEC).

Appendix 2:


Needs intubation
Unresponsive? Near death?
No
Yes
Crash airway
Predict difficult airway?
From difficult airway
No
Yes
Difficult airway
RSI
Attempt intubation
Successful?
No
Yes
Post-intubation management
BMV maintains S_pO_2 ≥90 percent
No
Yes
Failed airway
≥3 attempts at OTI by experienced operator?
No
Yes
Failed airway
Crash airway
BMV
Attempt oral intubation
Successful?
No
Yes
Post-intubation management
BMV successful?
No
Yes
Failed airway
Succinylcholine 2.0 mg/kg IVP
Repeat attempt at oral intubation
Successful?
No
Yes
Post-intubation management
≥3 attempts by experienced operator?
No
Yes
Failed airway
Difficult airway predicted
S_pO_2 ≥90 percent?
Yes
No
Call for assistance
BMV maintains S_pO_2 ≥90 percent?
Yes
No
Failed airway
BMV predicted to be successful?
Yes
No
Intubation predicted to be successful?
Yes
No
RSI (± double set-up)
Go to main algorithm
"Awake" technique
Successful
Unsuccessful
Post-intubation management or RSI
S_pO_2 ≥90 percent?
Yes
No
Blind nasotracheal
Cricothyrotomy
Fiberoptic method
I-LMA
Lighted stylet
Failed airway
Failed airway criteria
BMV maintains S_pO_2 ≥90 percent?
LMA or Combitube may be attempted while preparing for cricothyrotomy
Call for assistance
Yes
No
If contraindicated
Cricothyrotomy
Consider:
Fiberoptic method
I-LMA
Lighted Stylet
Supra-glottic airway
Time allows and successful?
Yes
No
Cuffed ETT placed?
Cricothyrotomy
Yes
No
Post-intubation management
Arrange for definitive airway management

Appendix 3:



Laryngotracheal injury (severe neck injury): partial airway obstruction → OTI; severe airway obstruction → surgical airway (cricothyrostomy / tracheostomy)

Fig. 1. *Procedural options for trauma patients needing emergency tracheal intubation.*