Advanced Airway Management in Adults

Alan Brie, LPN, NREMT-P
National College Paramedic Program
AIR goes in and out.
BLOOD goes round and round.
Any deviation is a problem.
Airway – Airway - Airway

TIME IS CRITICAL!

- 0–1 min: cardiac irritability
- 0–4 min: brain damage not likely
- 4–6 min: brain damage possible
- 6–10 min: brain damage very likely
- More than 10 minutes: irreversible brain damage
This picture is obviously of major facial trauma from an explosion. Most would probably think to cricothyrotomy. But simply sitting the patient up and forward he was able to keep airway on his own.

The thing re-learned over the last 8 years is that simple airway positioning can do a lot without tubes and cricothyrotomy.

U.S. Army Ranger Medic, 75th RGR Regt
1990-1995 at 1/75
1995 to 2012 at RHQ
2012 to present at USSOCOM
There are other times when advanced and aggressive airway management is the only chance your patient has.

This photograph is of a mauling by an Alaskan Brown Bear. The incident occurred when the patient walked up on a sleeping bear in a berry patch.
Multiple facial fractures from a MVA
HINT: Former students who recently took both the Intermediate and Paramedic Registry written exams stated that they both were heavy on pathophysiology of the respiratory system.

SO PAY ATTENTION AND TAKE NOTES!
Establishing and maintaining a patent airway and ensuring effective oxygenation and ventilation are vital to patient care.

- The human body needs a constant supply of oxygen.

- *Failure to manage the airway is a major cause of preventable death in the prehospital setting.*

Diagram of an oxygen atom
Anatomy of the Respiratory System
• **Tonsils**
  
  - **Adenoids** and tonsils may become swollen and infected.
  
  - May cause upper airway obstruction
Anatomy of the Pediatric Airway

- Relatively greater proportion of soft tissue
- Larynx more superior and anterior
- Epiglottis rounder and floppier
- Smaller jaw
- Cricoid cartilage – narrowest part of the pediatric airway
- Loosely attached mucous membranes
Anatomy of the Lower Airway
Larynx

- Marks where the upper airway ends and lower airway begins
Larynx

- **Thyroid cartilage**
  - Formed by two plates that form the laryngeal prominence (Adam’s apple)

- **Cricoid cartilage** (cricoid ring)
  - First ring of the trachea

- **Cricothyroid membrane**: ligament between the thyroid and cricoid cartilage
  - Site for emergency surgical and nonsurgical access to the airway (cricothyrotomy)

1. Thyroid Cartilage
2. Crico-Thyroid Membrane
3. Cricoid Cartilage
Glottis

- Space between the vocal cords
• **Vallecula**
  - Pocket between base of tongue and epiglottis
  - Important landmark for ET intubation

• **Arytenoid cartilages**
  - Posterior attachment of the vocal cords
  - **Valuable guides for ET intubation**
Neck wounds from vampires, werewolves,
And zombies will require an occlusive dressing!

DARK SHADOWS IS STILL BETTER THAN TWILIGHT!
Lungs

Consists of smaller bronchi, bronchioles, and alveoli
Lungs

- **Alveoli**
  - Functional site for the exchange of oxygen and carbon dioxide
  - Increase surface area of the lungs
  - Lined with a phospholipid compound (**surfactant**)

Alveoli are the functional site for the exchange of oxygen and carbon dioxide. They increase the surface area of the lungs and are lined with a phospholipid compound called surfactant.
Human lungs have a total surface area of 750 square feet, about the same as one side of a tennis court.
Lungs - Landmarks

- These landmarks will help you assess and manage the airway.
Physiology of Breathing

**Inhalation:**
- Rib cage expands as rib muscles contract
- Diaphragm contracts (moves down)
- Air inhaled

**Exhalation:**
- Rib cage gets smaller as rib muscles relax
- Diaphragm relaxes (moves up)
- Air exhaled
Patient Assessment: Airway Evaluation

- Quality of care depends on assessment

- Adequate breathing
  - Patient is responsive, alert, able to speak
  - Rate between 12 and 20 breaths/min
  - Adequate depth
  - Regular pattern of inhalation and exhalation
  - Clear and equal breath sounds
Recognizing Inadequate Breathing

- Breathing rate of less than 12 breaths/min or more than 20 breaths/min
- Cyanosis: indicator of low blood oxygen
- Preferential positioning
  - Upright sniffing (tripod) position
  - Semi-Fowler (semi-sitting) position
- Potential causes:
  - Severe infection
  - Trauma
  - Brainstem insult
  - Noxious or oxygen-poor environment
  - Renal failure
  - Upper and/or lower airway obstruction
  - Respiratory muscle impairment
  - Central nervous system impairment
Recognizing Inadequate Breathing

• Airway management steps:
  – Open the airway.
  – Clear the airway.
  – Assess breathing.
  – Provide appropriate intervention(s).

• Evaluation includes:
  – Observe
  – Palpate
  – Auscultate
Inadequate Breathing

- Note the following:
  - Position
  - Orthopnea
  - Chest rise/fall
  - Skin
  - Flared nostrils
  - Pursed lips
  - Retractions
  - Use of accessory muscles
  - Asymmetric chest wall movement
  - Quick breaths, long exhalation
  - Labored breathing

- Signs:
  - Fewer than 12, more than 20 breaths/min plus dyspnea
  - Irregular rhythm
  - Diminished, absent, or noisy sounds
  - Abdominal breathing
  - Reduced flow
  - Unequal chest expansion
  - Increased effort
  - Shallow breathing
  - Pale, clammy skin
  - Retractions
  - Staccato speech
Inadequate Breathing

- Feel for air movement.
- Observe chest for symmetry.
- Note any paradoxical motion.
- Assess for pulsus paradoxus.
  - Systolic blood pressure drops more than 10 mm Hg during inhalation.
- Ask about history of present illness
  - Onset, trigger, duration?
  - Other symptoms?
  - Interventions, previous hospitalization?
  - Medications and overall compliance?
  - Risk factors?

If you’ve been in this program long enough the most hated one word is assessment. The truth is the ability to perform a good assessment is what will make you an excellent provider. Remember, you can not treat a patient unless you know what is going on!
Assessment of Breath Sounds

- Auscultate breath sounds with stethoscope.
  - Should be clear and equal
Difficult Breathing (or Shortness of Breath) and Hyperventilation

Normal breathing pattern: 6 L/min, 12 breaths/min, 40 mm Hg aCO2

Ineffective breathing pattern (hyperventilation): >12 L/min, >18 breaths/min, <35 mm Hg aCO2

- Chest muscles are hypoxic and tense
- Airways are constricted (due to alveolar hypopcaopia) and possibly obstructed (due to mucus and inflammation)
- Diaphragm is tense (spasm) and hypoxic during all phases of breathing

www.NormalBreathing.com
Assessment of Breath Sounds

“Normal” Breath Sounds

Tracheal. Inspiratory and expiratory sounds are both loud.

Bronchial. Inspiratory sounds are shorter than expiratory sounds, and both are loud.

Bronchovesicular. Inspiratory and expiratory sounds are about the same, and of medium intensity.

Vesicular. Inspiratory sounds last longer than expiratory sounds, and both are faint.

The thickness of the bars shows intensity (loudness) of the breath, and slope correlates with pitch (steeper slope, higher pitch).
Assessment of Breath Sounds

• Duration: length of time for inspiratory and expiratory phases
  – Normal I/E ratio: 1:2
  –Expiration is prolonged with lower airway obstruction.
  –Expiration is short with tachypneic patients.

• Pitch: higher or lower than normal (stridor or wheezing).
  Intensity of sound depends on:
  Airflow rate
  Constancy of flow throughout inspiration
  Patient position
  Site selected for auscultation
Abnormal Breath Sounds

- Wheezing: continuous, high-pitched
- Rhonchi: continuous, low-pitched
- Crackles: discontinuous
- Stridor: loud, high-pitched, heard during inspiration
- Pleural friction rub: surfaces of visceral and parietal pleura rub together

GRUNTING IN A CHILD IS AN OMINOUS SIGN!
Airway Management

- Air reaches the lungs only through the trachea.
  - In a compromised airway, clearing the airway and maintaining patency are vital.
Positioning the Patient

- Move unresponsive patients found in a prone position to a supine position.
  - Log roll and assess for breathing.
- If the patient is breathing adequately and is not injured, move to recovery position.
Manual Airway Maneuvers

- If an unresponsive patient has a pulse but is not breathing, you must open the airway.
  - Maneuver patient’s head to propel the tongue forward and open the airway.
Head Tilt-Chin Lift Maneuver

• Indications:
  – Unresponsive
  – No spinal injury
  – Unable to protect airway

• Contraindications:
  – Responsive
  – Possible spinal injury

• Advantages
  – No equipment
  – Noninvasive

• Disadvantages
  – Hazardous to spinal injury
  – No protection from aspiration
Jaw-Thrust Maneuver

- **Indications**
  - Unresponsive
  - Possible spine injury
  - Unable to protect airway

- **Contraindications**
  - Resistance to opening the mouth

- **Advantages**
  - Used with spine injury or cervical collar
  - No special equipment required

- **Disadvantages**
  - Cannot maintain if patient becomes responsive or combative
  - Difficult to maintain for an extended time
  - Difficult to use with bag-mask ventilation
  - Thumb must remain in place
  - Requires second rescuer
  - No protection against aspiration
Tongue-Jaw Lift Maneuver

• Used more commonly to open airway for:
  – Suctioning
  or
  – Inserting an oropharyngeal airway

• Cannot be used to ventilate a patient
  – Does not allow for an adequate mask seal
Facial Trauma

- Severe swelling and bleeding in the airway may be present.
  - Control with direct pressure.
  - Suction as needed.

- Inadequate breathing and severe oropharyngeal bleeding may be present.
  - Suction airway for 15 seconds (less in infants and children), then ventilate for 2 minutes.
  - Alternate until secretions have been cleared.

- Suspect cervical spine injury.
  - Endotracheal intubation of a trauma patient is most effectively performed by two paramedics.

- If you are unable to effectively ventilate or intubate, perform a cricothyrotomy.
WARNING!

The following series of photographs are very graphic. At the same time as a paramedic, this is a case that you could very well encounter locally, especially New Year’s Eve, and July 4th.

The patient was playing around with M80 Fireworks
Advanced Airway Management

• One of the most common mistakes with respiratory or cardiac arrest is to use advanced techniques too early.
  – Attempt to establish and maintain a patent airway with basic techniques first.

• Primary reasons to use advanced airway techniques:
  – Failure to maintain a patent airway
  – Failure to adequately oxygenate and ventilate

• Involves insertion of advanced airway devices
Predicting the Difficult Airway

• Anatomic findings:
  − Congenital abnormalities
  − Recent surgery
  − Trauma
  − Infection
  − Neoplastic diseases

• LEMON
  − Look externally
  − Evaluate 3-3-2
  − Mallampati
  − Obstruction
  − Neck mobility
LEMON Mnemonic

• Look externally.
  - The following can make intubation difficult:
    • Short, thick necks
    • Morbid obesity
    • Dental conditions

Do not overlook piercings in the airway!
LEMON

- Evaluate 3-3-2.
  - 3 — mouth width of more than 3 fingers is best
  - 3 — mandible length of 3 fingers is best
  - 2 — distance from hyoid bone to thyroid notch of 2 fingers wide is best
- Mallampati
  - Note oropharyngeal structures visible in an upright, seated patient.
LEMON

• Obstruction
  − Note anything that might interfere with visualization or ET tube placement.
    • Foreign body
    • Obesity
    • Hematoma
    • Masses

• Neck mobility
  − Sniffing position is ideal
  − Neck mobility problems most common with:
    • Trauma patients
    • Elderly patients
Endotracheal Intubation

- ET tube passes through glottic opening and is sealed with a cuff inflated against the tracheal wall
  - **Orotracheal** intubation: through the mouth
  - **Nasotracheal** intubation: through the nose
WHAT A TEAM EFFORT!

WHAP!

RIGHT ON!

DID WE TACKLE THAT AIRWAY AS PARTNERS OR WHAT?

RIGHT ON!

THE HOSPITAL JUST CALLED. THEY WANT TO KNOW WHICH ONE OF YOU IS RESPONSIBLE FOR INTUBATING THE PATIENT'S ESOPHAGUS?

HIM!

HIM!
Endotracheal Intubation

• **Advantages**
  - Secure airway
  - Protection against aspiration
  - Alternative to IV or IO route

• **Disadvantages**
  - Special equipment
  - Physiologic functions bypassed

• **Complications**
  - Bleeding
  - Hypoxia
  - Laryngeal swelling
  - Laryngospasm
  - Vocal cord damage
  - Mucosal necrosis
  - Barotrauma
Endotracheal Tubes

- Basic structure includes:
  - Proximal end
  - Tube
  - Cuff and pilot balloon
  - Distal tip
Endotracheal Tubes

• Sizes range
  – 2.5 to 9.0 mm in inside diameter
  – 12 to 32 cm in length
Endotracheal Tubes

- Pediatric patients
  - 2.5 to 4.5 mm tubes used
  - Funnel-shaped cricoid ring forms an anatomic seal with ET tube
    - No need for distal cuff in most cases.
Endotracheal Tubes

- Anatomic clues can help determine tube size
  - Internal diameter of the nostril approximates diameter of glottic opening
  - Diameter of the little finger or size of thumbnail approximates airway size.

- Always have three sizes ready!
ARE YOU ALWAYS THIS BLISSFUL IN YOUR IGNORANCE, BILL?
Laryngoscopes and Blades

• A laryngoscope is required to perform orotracheal intubation by direct laryngoscopy.

• Consists of a handle and interchangeable blades
Laryngoscopes and Blades

- Straight (Miller and Wisconsin) blades
  - Tip extends beneath epiglottis and lifts it up
    - Useful with infants and small children
    - More likely to damage teeth in adults
Miller or Straight blade

The tip of the straight blade is designed to lift the epiglottis.
Laryngoscopes and Blades

- Curved (Macintosh) blades
  - Curve conforms to tongue and pharynx
  - Tip is placed in the vallecula
    - Indirectly lifts epiglottis to expose vocal cords
Macintosh or Curved blade

The tip of the curved blade should be placed in the vallecula.
Laryngoscopes and Blades

• Blade sizes range from 0 to 4
  – 0, 1, and 2 appropriate for infants and children
  – 3 and 4 considered adult sizes
  – Pediatric patients: based on age or height
  – Adults: based on experience, size of patient

• Stylet: semi-rigid wire inserted into ET tube
  – Molds and maintains shape of tube
  – Should be lubricated for removal
  – End should be bent to form a gentle curve
  – End should rest at least 1/2” from end of ET tube
Laryngoscopes and Blades

• **Magill forceps**
  - Remove airway obstructions under direct visualization.
  - Guide tip of ET tube through glottic opening if the proper angle cannot be achieved by manipulating the tube.
Orotracheal Intubation by Direct Laryngoscopy

- ET tube inserted through mouth and into trachea while visualizing the glottic opening with a laryngoscope

- **Indications**
  - Airway control needed due to coma, respiratory arrest, and/or cardiac arrest
  - Ventilatory support before impending respiratory failure
  - Prolonged ventilatory support
  - Absence of gag reflex
  - Traumatic brain injury
  - Unresponsiveness
  - Impending airway compromise
  - Medication administration
Orotracheal Intubation by Direct Laryngoscopy

• Contraindications
  – Intact gag reflex
  – Inability to open mouth because of trauma, dislocation of the jaw, or a pathologic condition
  – Inability to see the glottic opening
  – Copious secretions, vomitus, or blood in airway

• Intubation can expose you to bodily fluids.
  – Take proper precautions.
    • Gloves
    • Mask that covers your entire face
Pre-Oxygenation

- Critical before intubating
  - 2–3 minutes for apneic or hypoventilating patient
  - Prevents hypoxia from occurring
  - Monitor SpO$_2$ and achieve as close to 100% saturation as possible.
Positioning the Patient

- Airway has three axes: mouth, pharynx, and larynx
  - At acute angles in neutral position
  - Place patient in “sniffing” position to facilitate visualization of the airway.
Blade Insertion

• Position yourself at the patient’s head.
• Grasp laryngoscope.
• If mouth is not open:
  – Place thumb below bottom lip and push open.
  – “Scissor” thumb and index finger between molars
  – Open with tongue-jaw lift
Blade Insertion

- Insert blade into right side of mouth
- Sweep tongue to the left while moving blade into midline
- Slowly advance the blade.
- Exert gentle traction at a 45° angle as you lift the patient’s jaw.
  - Keep your back and arm straight as you pull upward.
Visualization of the Glottic Opening

- Continue lifting the laryngoscope as you look down the blade.
- Work the tip of the blade into position.
  - The glottic opening should come into view.
  - The vocal cords lie within.

In the field your airway usually will not look this clean!
Visualization of the Glottic Opening

- Gum elastic bougie
  - Flexible device
  - Approximately 1 cm in diameter, 60 cm long
  - Used in epiglottis-only views to facilitate intubation
- Gum elastic bougie
  - Insert through the glottic opening under direct laryngoscopy.
  - Once placed, it becomes a guide for the ET tube.
Tube Insertion

• Pick up preselected ET tube.
  – Hold it near connector as you would a pencil.
• Insert tube from the right corner of mouth through the vocal cords.
  – Continue until the proximal end of the cuff is 1 to 2 cm past the vocal cords.
• Do not pass the tube down the barrel of the laryngoscope blade.
  – Will obscure your view of the glottic opening

NEVER TAKE MORE THAN 30 SECONDS PER ATTEMPT AT EACH INTUBATION!

Hint: Hold your breath while intubating - when you need to take a breath, so does the patient!
Ventilation

- After you have seen the ET tube cuff pass roughly 1/2” beyond the vocal cords
  - Gently remove the blade.
  - Secure tube with right hand
  - Remove stylet from tube
- Inflate the distal cuff with 5 to 10 mL of air, then detach the syringe from the inflation port.
- Have your assistant attach the bag-mask device to the ET tube; continue ventilation.
  - Ensure that the patient’s chest rises with each ventilation.
- Listen to both lungs and to the stomach.
  - You should hear equal breath sounds and a quiet epigastrium.
- Ventilation should be dictated by age.
  - Adult with a pulse: 10 to 12 breaths/min
  - Infant/child with a pulse: 12 to 20 breaths/min
  - Patient in cardiac arrest: 8 to 10 breaths/min
Confirmation of Tube Placement

- Visualize the ET tube passing between the vocal cords.
- Auscultate.
  - Unequal or absent breath sounds suggest:
    - Esophageal placement
    - Right mainstem bronchus placement
    - Pneumothorax
    - Bronchial obstruction
  - Bilaterally absent breath sounds or gurgling over the epigastrium: esophagus was intubated
    - Immediately remove ET tube.
    - Be prepared to suction the airway.
  - Breath sounds only on right: tube has been advanced too far.
    - Reposition the tube.
Confirmation of Tube Placement

• Continuous waveform capnography plus clinical assessment
  – Most reliable method of confirming placement
  – Attach capnography T-piece when bag-mask device is attached to the ET tube.

• After confirming proper placement, mark ET tube where it emerges from the mouth
  – Shows others whether tube has slipped in or out
Securing the Tube

• Never take your hand off the ET tube before securing with an appropriate device.
  – Support the tube manually while you ventilate to avoid a sudden jolt from the bag-mask device.

• Steps:
  – Note the centimeter marking on the ET tube.
  – Remove the bag-mask device.
  – Position the tube in the center of the mouth.
  – Place the securing device over the tube.
  – Reattach the bag-mask device, auscultate, and note the capnography reading and waveform.
Confirm placement of ET Tube

- ETCO$_2$ detector
- Capnography

Purple “poopy” = no CO2 detected (no perfusion)
Yellow “yay” = CO2 detected (good perfusion)
Reconfirm ETT placement

Recheck placement “often” and every time the patient is moved.

Accidental extubation can occur if BVM device pulls on the tube.
Nasotracheal intubation is indicated for a patient who:

- Cannot be placed in supine position
- Is lethargic but not unconscious
- Has peculiarities of the oropharynx that make visualizing the cords difficult (*e.g.*, *swelling*, *copious secretions*)
- Has a clenched jaw
Nasotracheal Intubation

**Advantages**

+ Variable patient position
  
  *(semi-sitting, upright)*

+ Patient need not be unconscious

+ Practical w/ seizures & trismus

**Disadvantages**

– Requires a breathing patient

– Lower success rate

– Soft tissue injuries

– Infection

– Limited lumen size
Technique for Nasotracheal Intubation

- Insert tube into nostril, bevel facing toward the nasal septum
  - Aim tip straight back toward ear
  - Position just above the glottic opening
- Manipulate head to control tube tip position and to maximize air movement.
- Instruct patient to take a deep breath, and gently advance tube.
  - Placement will be evidenced by an increase in air movement through the tube.
Technique for Nasotracheal Intubation

- Soft-tissue bulge on either side of the airway
  - Tube is probably in the piriform fossa
    - Hold head still, slightly withdraw the tube
    - Once maximum airflow is detected, advance tube
  - No soft-tissue bulge
    - Tube has entered the esophagus.
      - Withdraw until you detect airflow; extend head
- Once tube is in place, inflate the distal cuff
  - Attach bag-mask device and ventilate.
  - Clean up any secretions or excess lubricant.
  - Secure the tube with tape.
  - Document depth of insertion at the nostril.
Failed Intubation

• Definition:
  - Failure to maintain oxygen saturation during or after one or more failed intubation attempts
  - Total of three failed intubation attempts

• Many rescue airway techniques
  - Simple BLS airway maneuvers with oral airway and/or nasal airway and bag-mask device
  - Rescue airway device

We are not spending a lot of time here because you should be familiar with BLS airway adjuncts by now. If you fail at intubation, Place a Combitube or King Airway to provide ventilations.
Multilumen Airways

- Inserted blindly
- Proven to secure airway and allow for better ventilation.
- Two primary devices in EMS:
  - King Airway
  - Combitube
Multilumen Airways - Combitube

• Combitube
  – Long tube
  – Can be used for ventilation whether it is inserted into the esophagus or trachea
Multilumen Airways - Combitube

- Combitube consists of:
  - Single tube with two lumens
  - Two balloons
  - Two ventilation attachments
Multilumen Airways - Combitube

• Indications
  - Unresponsive, apneic patients with no gag reflex in whom intubation is not possible
    • Cannot be used in children younger than 16 years
    • Only use for patients between 5’ and 7’ tall.

• Contraindications
  - Esophageal trauma
  - Known pathologic condition of the esophagus
  - Ingestion of a caustic substance
  - History of alcoholism
Complications of the Combitube

- Unrecognized displacement into esophagus
- Laryngospasm, vomiting, hypoventilation
- Pharyngeal or esophageal trauma
- Ventilation may be difficult if the pharyngeal balloon pushes the epiglottis over the glottic opening.
Multilumen Airway - King LT Airway

- Latex-free, single-use, single-lumen
  - Positive-pressure ventilation for apneic patients
  - Maintains airway in spontaneously breathing patients who need advanced management
Multilumen Airway - King LT Airway

- Curved tube with ventilation ports between two inflatable cuffs
  - Can be inserted more easily than the Combitube
Multilumen Airway - King LT Airway

• Indications
  – Alternative to bag-mask ventilation when a rescue airway device is required
  – Same considerations as Combitube

Contraindications
  – Patients with an intact gag reflex
  – Patients with known esophageal disease
  – Patients who have ingested a caustic substance
Complications of the King LT Airway

- Laryngospasm
- Vomiting
- Hypoventilation
- Trauma from improper insertion technique
- Pharyngeal balloon may push the epiglottis over the glottic opening
  - May make ventilation difficult
Cobra Perilaryngeal Airway (CobraPLA)

Of worthy mention

• Shape lets device:
  − Slide easily along the hard palate
  − Hold airway’s soft tissue away from the laryngeal inlet

• Available in eight sizes

• Indications
  − Usage similar to other supraglottic airway devices
  − Can be used in pediatric patients
  − Does not protect against aspiration

• Contraindications
  − Risk for aspiration
  − Risk for massive trauma to oral cavity
Cricothyrotomy

Indications

- Upper airway obstruction which cannot be dislodged by back blows or direct laryngoscopy and Magill forceps.
- Inability to insert an ETT past edema
- Destructive facial injury precluding the use of ALS upper airway adjuncts.
Anatomical Landmarks for Cricothyrotomy
Needle Cricothyrotomy

- **Procedure**
  - BSI
  - Ventilate
  - Check equipment
    - 12-14 gauge Cannula
    - syringe

- High-pressure jet ventilator attached to catheter hub
  - Translaryngeal catheter ventilation
  - Hyperextend head and neck
    - Locate Cricothyroid membrane
Needle Cricothyrotomy

• Advantages
  − Easier than open cricothyrotomy
  − Lower risk of damaging structures
  − Allows for intubation
  − No manipulation of cervical spine

• Disadvantages
  − Does not provide protection from aspiration
  − Technique requires a specialized, high-pressure jet ventilator
Needle Cricothyrotomy

- **Complications**
  - Improper placement can cause severe bleeding.
  - Excessive air leakage can cause subcutaneous emphysema and compression of the trachea.
  - Over inflation of lungs: barotrauma
  - Under inflation of lungs: hypoventilation
Technique for Performing Needle Cricothyrotomy

- Draw up approximately 3 mL of sterile water or saline into a 10-mL syringe.
  - Attach to IV catheter.
- Place head in neutral position
- Locate the Cricothyroid membrane
- Cleanse area if time permits
Technique for Performing Needle Cricothyrotomy

• Stabilize the larynx; insert the needle at a 45° angle toward the feet.
  − You should feel a pop as the needle penetrates the membrane.

• After a pop is felt, insert needle 1 cm farther; aspirate with the syringe.
Technique for Performing Needle Cricothyrotomy

• Advance catheter over needle until catheter hub is flush with skin
  – Withdraw the needle; dispose of properly.

• Attach one end of the oxygen tubing to the catheter; other end to the jet ventilator
Technique for Performing Needle Cricothyrotomy

- Begin ventilations by opening the release valve on the jet ventilator
  - Turn release valve off with chest rise.
- Secure catheter and continue ventilations
Nasopharyngeal teratoma causing airway obstruction in the neonate.

Teratomas are the most common congenital tumors, but Teratomas of the Nasopharynx are rare in neonates. The present report concerns a premature 30-week-old infant girl with an extensive nasopharyngeal teratoma protruding from the oral cavity. The tumor completely obstructed the airway and necessitated immediate intubation. The tumor was successfully resected directly via the transoral route without needing external incisions. Histological examination of the specimen revealed it to be a mature teratoma. Intubated by EMS in the field.
Self-Inflicted GSW to the Face
Every now and again we get detailed to either someone who has attempted suicide or to one that has already occurred. It puts a pit in my stomach thinking about what I'm about to walk into. Every now and again you get one of those guys who puts a shotgun under his chin and flinches as he pulls the trigger. This forward jerking motion prevents the shotgun from blowing their brains out of the back of their head and instead results in a survivor with severe facial trauma and airway compromise. It looks something like this.
This patient sustained a shotgun injury directly on his face. He survived after multiple surgical reconstructive interventions. The first step in the ED was to secure his airway.
Burn escharotomies and severe airway edema.

Peter A. DeSocio, D.O., CPT, Medical Corps, U.S. Army
Christopher V. Maani, M.D., CPT, Medical Corps., U.S. Army
Intubation becomes increasingly difficult as swelling develops. Secure the airway early!
Facial Skin-Mucosal Biodynamic Blast Injury
SSH can cause severe airway obstruction and present as a life-threatening condition. Any disease state that requires oral anticoagulants (warfarin, acenocoumarol, etc.) can cause spontaneous bleeding since anticoagulants can antagonize the effect of vitamin K. The complications stem from retropharyngeal, sublingual and parapharyngeal bleeding, which is usually identified by direct visualization of the oral cavity.

Spontaneous sublingual hematoma (SSH) is an uncommon, but emergency state in oral cavity.
Clothesline Injury
Shotgun Injury
Crush injuries present their own unique problems. In this case, it is a clear DOA. They can cut off blood supply, create compartment syndrome, etc. It looks like she was the unlucky victim of an earthquake.
FAIR WARNING!

These next series of photographs are some of the most graphic images I’ve come across. They are posted by a paramedic on a medical forum for discussion and are not intended to be seen by a general audience.

They are the results of texting and driving!
• Trauma of the Week #17: Don't Text and Drive

This particular set was sent to me by an EMT I know from Ohio. According to him, this driver was texting while driving and had a rather devastating MVA. So let's have a look, shall we?
I've picked up more than a few body parts smeared on a road in my day and I have to say that I don't much care for it. So if you abstain from driving under the influence because that would be irresponsible, won't you abstain from texting while driving?
12 Year Old Kid Survives a Bamboo Spear Impaled in His Neck!
A builder is lucky to be alive after being impaled through neck with a metal bar after a fall at a construction site in China. Liu Qicai, 45, was working on scaffolding when he fell backwards and landed onto the protruding bar, which thrust 15cm into his neck.
Woman impaled by tree branch during weekend drive

Facial and spinal impalement injury: An airway challenge / Slide 1

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3271562/
Facial and spinal impalement injury: An airway challenge / Slide 2
Penetrating neck injury through the left cervical fossa. Trachea accessed through a right thoracotomy.
Stab Wound to the Neck / Slide 1
A patient who sustained a knife wound to the neck. This shows ligation of the anterior jugular veins.

Stab Wound to the Neck / Slide 2
Stab Wound to the Neck / Slide 3
Stab Wound to the Neck / Slide 4
Stab Wound to the Neck / Slide 5
“Lost another one to those damn Paramedics!”