Advanced Airway Management
Topics To Be Discussed:

- Indications for intubation
- Review the procedure for intubation
- Identifying patients that may be difficult to intubate
- Discuss different techniques used for intubation
- Rapid sequence induction
Endotracheal intubation is clearly the preferred method of advanced airway management in prehospital emergency care.
Indications for Intubation

- Inadequate oxygenation that is not corrected by other means
- Inadequate ventilation
- Need to control pulmonary secretions
- Need to provide airway protection in the obtunded patient or in the patient with a depressed gag reflex
- Route for drug administration
Advantages of Endotracheal Intubation

- Isolates the trachea and permits complete control of airway.
- Prevents gastric distention and aspiration.
- Eliminates need to maintain a mask seal.
- Offers direct route for suctioning.
- Permits administration of some medications.
- Better volume and increased oxygen concentration.
- Can be left in place for long periods of time.
Disadvantages of Endotracheal Intubation

- Requires considerable training and experience.
- Requires specialized equipment.
- Requires direct visualization of vocal cords.
- Bypasses upper airway’s functions of warming, filtering, and humidifying the inhaled air.
- Effectively eliminates anatomic PEEP.
- Requires frequent assessment of tube placement as even the smallest amount of patient movement or movement of the head or neck could lead to tube displacement.
Complications of Endotracheal Intubation

- Equipment malfunction
- Teeth breakage and soft tissue lacerations
- Hypoxia
- Esophageal intubation
- Right mainstem intubation
- Tension pneumothorax
- Aggravation of spinal injury.
Laryngoscope Blades

There are many different types of blades and adjuncts available for use. Find the type that provide the highest success and most consistent performance for you.
ETT, Stylet, and Syringe (unassembled)
Engaging laryngoscope blade and handle

Align identification with bar, press-forward to lock

Press to lock
Activating laryngoscope light source

Elevate blade to a right angle
Review of Airway Anatomy

![Diagram of airway anatomy with labeled structures: Uvula, Soft palate, Nasopharynx, Oropharynx, Laryngopharynx, Tongue, Epiglottis.](image-url)
Laryngeal Anatomy

View of the larynx at laryngoscopy.
Preoxygenate the patient.

- If the patient is breathing, preoxygenate with a non-rebreather.
- If possible, avoid BVM ventilation with RSI, as this increases the potential for aspiration.
- If the patient needs ventilatory assistance, provide it.
Sellick’s Maneuver
Visualize larynx and insert the ETT.
Inflate cuff, ventilate, and auscultate.
Confirm placement with etCO$_2$ detector.
Secure tube
Unusual Anatomy

Normal Airway

Abnormal Airway
There will be patients that cannot be intubated. How do you identify them? What’s your back-up plan?
Identifying Difficult Airways

MEDICTUBES

- Mouth, Mandible
- Excessive Weight
- Deformity
- Incisors
- C-Spine
- Thyromental Distance
- Uvula
- Burns
- Emesis
- Stridor
Mouth, Mandible

- Measure the width of the mouth opening. Anything less than three (3) fingers width can complicate laryngoscopy.
- Mandible should be without deformity or dislocation.
Excessive Weight

- Overweight, pregnant, or patients with short, fat necks can be difficult. Complete repositioning of the patient may be required in order to visualize the airway.
Deformity

- Assess for any type of deformities, hematomas, tumors, goiters, or similar atypical manifestations of the face, head, and neck.
- This patient is a status-post burn victim.
- How would you manage c-spine?
Assess for any trauma to teeth, any type of overbite or overjet (buck teeth), dentures or other custom dental appliances.
Trauma patients with cervical collars in place have misaligned airway structures, landmarks, and pathways.

These patients must not be moved or manipulated when attempting intubation.
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Thyromental Distance

- Distance from chin to thyroid cartilage. Anything less than three (3) fingers width suggests difficult intubation.
Ideally, you should be able to see the entire oropharynx, including the uvula (Class 1 or 2). Airways with a partial or complete concealment of this structure may prove difficult to intubate.
Mallampati Scale

Figure 2: Mallampati views
If burns to the face or airway are present, intubate early! Airway swelling may make intubation difficult if you delay.
Emesis

The Full Stomach Theory:

- All patients in the prehospital setting have a full stomach.
- This makes airway management potentially difficult, but essential.
**Stridor**

- Classic sign of upper airway obstruction.
- Can be caused by foreign bodies, tumors, cysts, inflammation or trauma.
Trust me on this one... you gotta pull back on the tube.
External Laryngeal Manipulation
Head Elevation Laryngoscopy Position (HELP)

- Vocal cords can be brought into view with head flexion and elevation. This facilitates slack of jaw and tongue, allowing better viewing of vocal cords. Head can then be supported by caregiver's body.
- NOT used if cervical trauma is suspected!
Backwards, Upward, Rearward Pressure (BURP)

- Similar to ELM, aim towards right ear or right parietal area.
- Can be done by another caregiver.
- Preferred for patients in spinal motion restriction.
C-Spine Considerations

An east coast field study found that when a patient is in full spinal immobilization, elevating the head about 7 degrees improved success rates for initial intubation from 84% in the supine patient to 95% in the elevated patient, and were generally done 10 seconds faster than non-elevated patients.
Nasotracheal Intubation
Indications for Nasotracheal Intubation:

- Possible spinal injury
- Clenched teeth
- Fractured jaw, oral injuries, or recent oral surgery
- Facial or airway swelling
- Obesity
- Arthritis preventing sniffing position
- Patient must be breathing!
Nasal Intubation
Nasal Intubation

- Pre-oxygenate the patient. Do not attempt this procedure in patients under the age of 12 or patients with known liver disease or bleeding disorders. Avoid nasotracheal intubation in patients that may be candidates for fibrinolytic therapy, i.e. AMI and CVA.
- With a suspected head injury, consider Lidocaine 1.5 mg/kg IV.
- Lubricate the tube with Viscous Lidocaine jelly.
- Instill Neo-Synephrine into each nare to vasoconstrict blood vessels.
- Listen and watch for patient breathing. Insert the tube and advance the tube during inspiration.
- A BAAM device may be helpful to assist with proper placement.
- Listen for breath and epigastric sounds. Attach capnography and secure the tube.
Frontal Intubation

- Sometimes referred to as inverse intubation. Used when patients are pinned in the upright position and need aggressive airway management.
- Scope is held in the right hand, advanced toward uvula, then pulled forward or toward the anterior to displace the mandible forward and provide visualization of the cords.
- Blade will find “home”
- Vocal cords will be inverted-watch for it!
Digital Intubation
Rapid Sequence Induction

- RSI is used to produce neuromuscular blockade to facilitate placement of an endotracheal tube in those patients in which the airway could not otherwise be managed.

- Candidates for RSI include:
  - Adults and children
  - Full or partially conscious
  - Seizures resulting in status epilepticus unresponsive to benzodiazepines.
  - Hypoxia and combative, unable to intubate by other means.
  - Trauma with seizures or trismus
Indications for RSI

First, “Do No Harm.” RSI should only be done if absolutely necessary. The paramedic must choose the option that produces the greatest benefit with the least risk.

- Inadequate oxygenation
- Inadequate ventilation
- Inability to maintain a patent airway
- Protection of the lower airway
- Treatment of elevated ICP
- Impending airway collapse
- Control of the patient
- Head injuries
- Drug overdose
- Status epilepticus
General Order of RSI

1. Brief History
2. Equipment Preparation
3. Preoxygenation
4. Premedication
5. Sedation
6. Cricoid Pressure
7. Muscle Relaxation
8. Intubation
9. Verification of Tube Placement
10. Tube Security
Brief History

- ABC’s have been checked if a decision to intubate has been made
- History of present illness or injury
- Inspection of head and airway
  - Difficult airway? Use BVM and transport!
  - Use LEMON acronym
- Assessment of neck for possible trauma
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No equipment, no matter how advanced, is error proof. Be prepared for failure.

- Suction
- Oxygen
- Airway (laryngoscope, ET tubes, stylet, BVM, tube holder, back-up airways)
- Pharmacology (mix, draw-up and label)
- Monitoring equipment (ECG, SaO², etCO²)
Preoxygenation

- 3 - 5 minutes of 100% oxygen via non-rebreather mask before initiation of sedation and neuromuscular blockade
- BVM only if necessary. Mortality due to aspiration is 30% - 62%. Utilize the Sellick Maneuver.
Premedication

- **Atropine** (typically only used in children)
  - Due to vagal stimulation causing bradycardia

- **Lidocaine**
  - Prevention of increased ICP

- **Defasciculating Agent**
  - Muscle fasiculations due to the administration of a depolarizing agent could complicate injuries with trauma. Succinylcholine administered at 0.1 mg/kg is considered a defasciculating dose.
Atropine

- Bradycardia may be caused by hypoxia, succinylcholine or vagal stimulation during laryngoscopy or vagal stimulation
- Atropine reduces vagal tone
- Atropine decreases secretions
- *Atropine may be indicated before a second dose of succinylcholine in adolescents and adults
- Adult: 0.5 – 1.0 mg IV, Pediatric: 0.02 mg/kg with a minimum dose of 0.1 mg.
Lidocaine

- Is believed to blunt the increased ICP response to intubation and control arrhythmia.
- It is required in all cases of suspected head trauma.
- Dosage: Adult 1.5 mg/kg IVP. Pediatric dose is 0.5 mg/kg.
Sedation

- Administered to eliminate the sensation of paralysis and decrease sympathetic tone
- Remember that paralytics do not alter consciousness. They do not work on the central nervous system. Your patient is aware of everything that is going on!
Sedation Options

- Sedative selection must be made on an individual patient basis with consideration of hypovolemia, hypotension, increased ICP, age and underlying medical conditions.
- Sedatives should never be withheld from the patient about to undergo paralysis!
Midazolam (Versed)

- Benzodiazepine
- Provides sedation, amnesia and anticonvulsant properties
- No analgesia

Advantages over other benzodiazepines
- Faster onset than Ativan or Valium
- Shorter duration than Ativan or Valium

Adverse effects:
- Cardiovascular depression
- Respiratory depression
- Broad dosing range and need for titration

Dose: Adult 0.1 mg/kg IV. Repeat for appropriate effect. Pediatric dose is 0.05 – 0.1 mg/kg IV.
Etomidate (Amidate)

- Rapid-onset
- Short-acting
- Sedative-hypnotic agent
- Not approved for children under 10 years
- Reduces cardiorespiratory depression
- Minimizes increased ICP during intubation
- Adverse Effects:
  - transient reduction in plasma cortisol levels
  - transient reduction in aldosterone levels
- Dose in adults and pediatrics over one year of age: 0.3 mg/kg IV. Typical adult dose is 20 – 40 mg.
Cricoid Pressure

- Sellick’s Maneuver prevents passive regurgitation during intubation
- Place digital pressure over the cricoid cartilage to occlude the esophagus
- Cricoid pressure is released after the patient has been successfully intubated
Muscle Relaxation

- Neuromuscular Blockade allows for easier intubation and ventilation
- A muscle relaxant is given in rapid sequence with a sedative before intubation is attempted
Indications for Paralysis

- To facilitate intubation
- Agitation so severe that patient is at risk of injury despite appropriate sedation
- Severe hypoxemia, to reduce oxygen consumption by muscle movement
- Increased ICP
- Seizures, trismus
Categories of Neuromuscular Blocking Agents

- **Depolarizing**
  - (noncompetitive and nonreversible)
  - produces a brief period of excitation resulting in fasciculations followed by a brief period of neuromuscular blockade

- **Nondepolarizing**
  - (competitive and reversible)
  - slower onset than depolarizing agent
  - no fasciculations
Depolarizing Agents

- Mimic acetylcholine
- Cause sustained depolarization at synapse
- Prevents repolarization
- Muscle fiber refractory
- Example:
  - succinylcholine
Non-depolarizing Agents

- Block cholinergic transmission at synapse
- Binds to acetylcholine receptors on muscle
- Examples:
  - Atracurium
  - Mivacurium
  - Rocuronium
  - Vecuronium
  - Rapacuronium
  - Doxacurium
  - Pancuronium

  Short and Intermediate
  Long acting
All patients receiving paralytic drugs must also receive sedation.
Succinylcholine (Anectine)

- Depolarizing agent
- Rapid onset
- Short duration

**Adverse Effects:**
- increased ICP
- increased intraocular pressure
- increased intragastric pressure
- hyperthermia
- muscarinic stimulation of the SA node causing bradycardia especially in children
- release of potassium
Contraindications:

- patients with burns more than 24 hours old
- massive muscle injury
- patients with upper motor neuron diseases such as Muscular Dystrophy
- penetrating eye, globe injury
- history of malignant hyperthermia
- other agents are preferable in children

Adult and pediatric dose is 1.0 mg/kg IVP.
Vecuronium (Norcuron)

- Non-depolarizing agent
- Slower onset
- Longer duration, 90 – 120 minutes
- Minimal cardiovascular effects
- Produces no histamine release
- Adult and pediatric dose is 0.1 mg/kg IV.
Intubation

- Visualization with direct laryngoscopy
- Introduction of the appropriate sized ET tube
Verification of Placement

- Visualize placement of the tube through the cords
- Auscultation of bilateral breath sounds
- Equal chest rise
- Tube condensation (not reliable finding)
- Absence of epigastric air movement
- Use other methods besides auscultation
  - Pulse oximetry
  - End-Tidal CO₂ monitoring
  - Esophageal Detector Device
- Clinical improvement
Security of ET Tube

- Chart the depth of the ET tube at the patient’s teeth.
- Use tape or an approved ET tube holder to secure the ET tube at the correct depth.
- Re-evaluate tube placement by checking the depth of the ET tube and auscultating breath sounds at regular intervals.
Back-up Airway

- If unable to get the patient intubated, utilize a back-up airway like the King Airway or the Combitube.
- If unable to place an airway, maintain sellicks maneuver and provide BVM ventilations.
- A Rusch Quick Trach or surgical airway is also an option.
Summary

- Be prepared
- Re-assess frequently
- Be vigilant
Questions?