Chapter 29
Advanced Airway Management

Learning Objectives
- Describe indications for advanced airway management
- List complications associated with advanced airway management
- Explain rationale for securing endotracheal tube
- State consequence of and need to recognize unintentional esophageal intubation

Learning Objectives
- State consequence of and need to recognize unintentional esophageal intubation
- List equipment required for orotracheal intubation
- Describe proper use of curved blade for orotracheal intubation
- Describe proper use of straight blade for orotracheal intubation
Learning Objectives

- Describe methods of choosing appropriate-size endotracheal tube in an adult patient
- State reasons for proper use of stylet in orotracheal intubation
- Explain rationale for use of the stylet
- Describe skill of orotracheal intubation in the adult patient

- Describe skill of confirming endotracheal tube placement in adult, infant, child
- Differentiate airway anatomy in infant, child, adult
- State formula for sizing an infant/child endotracheal tube
- Define various alternative methods for sizing infant, child endotracheal tube

- Describe skill of orotracheal intubation in infant, child
- Describe skill of securing endotracheal tube in adult, infant, child patient
- Describe indications, contraindications, technique for insertion of nasogastric tubes
Introduction

- Most essential skills EMT brings to patient:
  - Airway management
  - PPV with mask devices
  - Oxygenation

- Unresponsive patients who require continuous PPV or when mask device fails to provide adequate ventilation:
  - More definitive airway management techniques may be needed:
    - ET
    - Dual-lumen intubation device
    - Pharyngotracheal lumen airway
    - Laryngeal mask/King LT-D supraglottic airway
Introduction

Most systems do not allow EMT to use advanced airway skills
- Determined by:
  - State rules
  - System medical director
  - Leadership within EMS system

Factors guiding use of particular intervention:
- Time, difficulty training providers
- Ability to maintain skill proficiency, based on frequency of use
- Cost to EMS system

Advanced and alternative airway devices are only as good as the skill level of the provider who is using them
- Inappropriate use can be fatal to the patient
- Must well trained and well practiced
  - Preparation
  - Practice
  - Reinforcement
  - Continued evaluation of your competency
Cricoid Pressure

- Developed for use in OR to prevent passive regurgitation of food related to medication and paralysis
- Useful for patient without cough/gag reflex to help prevent regurgitation and aspiration during ET intubation

- Can be used while patient is being ventilated with bag-mask
- Pressure is applied to cricoid cartilage
  - Complete circle of rigid cartilage
  - Presses esophagus against the spine
  - Closes esophagus, helps prevent gastric inflation and regurgitation
Cricoid Pressure

- Cricoid cartilage is inferior to the cricothyroid membrane
  - To find it, locate thyroid cartilage
  - Slide finger to the depression just below the cricothyroid membrane
  - Prominence below cricothyroid membrane is cricothyroid cartilage

Cricoid Pressure

- During application of cricoid pressure, perform the following measures:
  - Verify correct anatomy to avoid damage to other structures
  - Avoid excess pressure in infants and children
- Use technique only when sufficient personnel are available
Endotracheal Intubation

- Most effective form of airway management

- Properly placed ET tube rests in the trachea and seals against the internal wall with inflated cuff

- Seal around the ET tube helps prevent aspiration of liquids and other material into lungs

Endotracheal Intubation

- Nasotracheal intubation
  - ET tube passed through nose into the trachea
  - Considered “blind” placement technique
    - ET tube is placed into the trachea through the nose without the EMT being able to see where the tube is going
    - Carries higher risk of complications and injury

Endotracheal Intubation

- Purpose
  - Orotracheal intubation is the most effective way of controlling the patient’s airway
  - EMTs perform orotracheal intubation for patients in respiratory or cardiac arrest
  - Provides complete control of airway and minimizes risk of aspiration
Endotracheal Intubation

- Permits better O₂ delivery, more effective ventilation, and deeper suctioning than other methods

- Indications for use:
  - Prolonged PPV required and cannot be achieved by other methods
  - Apneic patients
  - Unresponsive patients who cannot protect their airway

Endotracheal Intubation

- Advantages of use:
  - Prevents gastric distention
  - Minimizes aspiration risk
  - Allows access to lower airway for suctioning

Endotracheal Intubation

- Complications
  - Esophageal intubation
    - Most dangerous is unrecognized intubation of the esophagus
    - Tube passes into the esophagus rather than trachea
    - Important to confirm proper placement after every attempt at intubation and periodically thereafter
    - If tube becomes dislodged and not corrected within minutes:
      - Inadequate ventilation
      - Severe hypoxia
      - Gastric inflation
Endotracheal Intubation

- Complications
  - Inadequate ventilation and oxygenation
    - Produced by prolonged attempts at intubation without intervening periods of PPV
    - Results in hypoxia, hypoxemia
    - Attempt no longer than 30 seconds without intervening periods of ventilation with mask device

- Complications
  - Soft tissue trauma
    - Lips, teeth, tongue, gums, and airway structure damage can occur if laryngoscope is used forcefully
    - Also occurs when top teeth are used for leverage to view the vocal cords
    - Laryngoscope must be carefully inserted in the mouth and used gently to lift the jaw and epiglottis, without tilting the blade back over the teeth

- Complications
  - Right main stem bronchus intubation
    - If tube is inserted too far, it enters the right main stem bronchus because of its straight angle off the trachea and larger size
    - Results in ventilation of only 1 lung
    - After intubation, check breath sounds on both sides
    - Stop insertion of the tube when the proximal end of the cuffed ET tube passes vocal cords
    - Use reference marks on ET tube to assist in estimating location
Endotracheal Intubation

- Complications
  - Vomiting
    * Laryngoscope can induce gag reflex in unresponsive patients
    * Results in vomiting and possible aspiration of stomach contents into the lungs
    * Always have suction ready
  
- Bradycardia & dysrhythmias
  * React to stimulus of intubation because of stimulation of the autonomic nervous system
  * Check heart rate periodically

- Tube dislodgement
  * Potential hazard during patient movement
  * Always reassess and confirm tube position after moving patient
  * Never blindly attempt to reposition or reinset the tube
  * If any doubt about tube placement, remove the ET tube and ventilate with a bag-mask device and oral adjunct
  * Continuous monitoring using waveform capnography is the standard to confirm proper tube placement
Endotracheal Intubation

- Equipment
  - PPE
    - Gloves
    - Mask
    - Protective eyewear

- Laryngoscope
  - Handle & blade attached by locking bar at end of handle
  - When in use, blade hooks around locking bar and extends to a 90° angle

- 2 types blades used: straight and curved
  - Blade is used to sweep the bulk of the tongue to the side and lifts the remainder of the tongue and jaw upward
  - Also lifts the epiglottis and allows direct visualization of the vocal cords and glottic opening.
Endotracheal Intubation

Equipment

- Laryngoscope
  - Straight blade (Miller blades)
    - Narrow with curved central channel
    - Available sizes: 0 to 4
    - Directly lifts epiglottis upward, allows visualization of vocal cords
    - Tube should be inserted in right side of mouth to maintain visualization of glottis opening until point of insertion

- Curved blade (MacIntosh blade)
  - Available sizes: 0 to 4
  - Inserted into vallecula
  - Indirectly elevates epiglottis away from larynx, allowing visualization of vocal cords and glottis opening

- Assembled by:
  - Inserting notch on blade onto locking bar or handle
  - Lift blade up until it locks into place and light comes on
Endotracheal Intubation

- **Equipment**
  - Endotracheal tubes
    - Come in variety of sizes
    - Have universal features, important to procedure
    - Sizes 2.5 to 10 mm, internal diameter
  - Components
    - 15-mm adapter
    - Larger tubes have a cuff filled with air to seal space between the tube and the tracheal wall
    - Murphy’s eye
    - Adult length is 33 cm
    - Markings on the tube assist in proper placement after insertion

- **Equipment**
  - Stylet
    - Malleable metal tube that is inserted into ET tube
    - Provides stiffness & shape to help guide tube during intubation
Endotracheal Intubation

- Equipment
  - Water-soluble lubricant
    - Eases insertion of the ET tube into the airway
    - Place liberally over the cuffed end of the tube

Endotracheal Intubation

- Equipment
  - Syringe
    - 10-mL syringe is used to test cuff for leaks before insertion
    - Remains attached and can be used to reinflate the cuff after placement
    - After cuff is inflated, remove the syringe and test the pilot balloon near syringe insertion point for fullness
    - If it remains attached after inflation, air may bleed back into syringe, reducing the seal of the cuff in the trachea
    - If pilot balloon collapses, select a new tube

Endotracheal Intubation

- Equipment
  - Securing device
    - Tape
      - Tape loosens when wet
      - After securing the ET tube in place, use an oral airway as a bite block
    - Commercial devices
      - More likely to secure tube in place
      - Function as bite block and securing device
      - Learn and use the one advocated in your system protocols
Endotracheal Intubation

**Equipment**

- **Suction**
  - Should be readily available during intubation procedure.
  - Rigid, large-bore catheter should be available to evacuate secretions, blood, or vomitus from the upper airway during ET tube placement.
  - After tube placement, attach a soft, sterile French (Fr) catheter to the suction unit for ET suctioning.

**Towels**

- Helps place head in sniffing position.
- Elevates shoulders in infants/small children.
- Elevating the back of the head in adults and shoulders in infants often necessary to achieve visual alignment of structures between the mouth and glottis opening.

Endotracheal Intubation

**Procedure**

- Orotracheal intubation is most frequently used by advanced EMTs.
  - Secures the airway and ventilates an apneic patient in respiratory or cardiac arrest.
  - May be used for anyone unresponsive to painful stimuli or lacks gag reflex to facilitate PPV and prevent aspiration.
Skill 29-1: Inserting an Orotracheal Tube

- Take appropriate personal precautions
- Provide adequate PPV by bag-mask @ 100% O₂

Skill 29-1: Inserting an Orotracheal Tube

- Assemble, test all equipment
- Check cuff for leaks by inflating
- Deflate cuff after checking

Skill 29-1: Inserting an Orotracheal Tube

- Assemble blade, handle
- Make sure light is "tight & bright"
Skill 29-1: Inserting an Orotracheal Tube

- Place head in head-tilt/chin position to allow visualization
- Holding laryngoscope handle in left hand, insert blade into right corner of mouth

- With right hand, gently insert ET in right side of oral cavity, through vocal cord
- Remove laryngoscope blade, extinguish lamp, remove stylet if used
- Inflate cuff with 5 to 10 mL of air, remove syringe

- 2nd EMT, attaches bag-mask, delivers artificial ventilation while you confirm tube placement
- Confirm placement with end-tidal CO2 monitor, EDD, or both
- Secure tube, ventilate at appropriate rate
Skill 29-1:
Inserting an Orotracheal Tube

- If trauma is suspected, use jaw thrust maneuver, maintaining neck in inline position

Endotracheal Intubation

- Confirming proper tube placement
  - After intubation, you must ensure the ET tube has entered the trachea
  - Primary confirmation
    - Direct visualization of tube passing between the vocal cords
    - Observation of the rise and fall of the chest with breathing
    - Auscultation of breath sounds

Endotracheal Intubation

- Confirming proper tube placement
  - Secondary confirmation
    - CO₂ detectors
    - End-tidal CO₂ monitoring
    - Esophageal detector devices
    - Pulse oximetry
  - Confirmation of proper placement is critical
Endotracheal Intubation

- Confirming proper tube placement
  - If sounds are present only in the epigastrium, assume an esophageal intubation
  - Unrecognized esophageal intubation results in profound hypoxia, possible brain damage, death
  - In this situation, deflate cuff and remove tube
  - Hyperoxygenate with bag-mask device with 100% O₂
  - Attempt to reintubate
  - Only make 2 attempts at intubation

- CO₂ detectors
  - Checking for CO₂ is helpful in confirming proper placement of E.T tube
  - CO₂ exists in minimal amounts in ambient air, compared with amount present in exhaled air
  - Designed to monitor and identify amount of CO₂ present in exhaled air

- CO₂ detectors
  - Some devices provide numeric value
  - Other devices express quantity with a wave on a monitor
  - Colorimetric end-tidal detector, uses color change on paper to express presence or absence of CO₂ in exhaled air
  - Can also be built into bag-mask device
Endotracheal Intubation

- Confirming proper tube placement
  - Esophageal detector devices
    - Consists of suction mechanism attached to opening of the ET tube
    - Extending from the top of the device is a large syringe/bulb
    - Generates suction needed to confirm placement of ET tube
    - After placement of the ET tube and primary confirmation, the device is attached to the opening of the tube
    - Bulb is then squeezed and released, or the syringe is pulled back

Endotracheal Intubation

- Secondary confirmation
  - Pulse oximetry
    - Monitors O\textsubscript{2} saturation through measurements of light transfer through capillary beds and hemoglobin
    - Attach to tip of the patient's finger over the nail bed or attached to an earlobe
    - Reads transmission of red/IR light through capillary bed below
    - Uses colorimetric method of red/IR light waves to determine percentage of O\textsubscript{2} saturation of hemoglobin
**Endotracheal Intubation**

- Secondary confirmation
  - Pulse oximetry
    - Not useful as only tool for confirmation of the effectiveness of O₂ therapy or ET tube placement
    - Data from devices are too slow
    - Unreliable as source of feedback and decision making
  - Use as adjunct to assessment

**Alternative Airway Devices**

- Alternative airway devices
  - Esophageal tracheal combitube (ETC)
  - Pharyngotracheal lumen (PTL)
  - Laryngeal mase airway (LMA)
  - King LT-D supraglottic airway
  - Often, basic airway maneuvers and a bag-mask device are adequate to maintain airway until hospital arrival
Alternative Airway Devices

- **ETC & PTL**
  - Look similar to ET tube but have 2 internal lumens
  - After insertion, 2 balloons are inflated
  - When bag-mask device is attached to the proper port, air is forced into the pharynx and lungs
  - Esophageal balloon prevents air from entering the esophagus and prevents regurgitation from vomiting
  - If inadvertently inserted into the trachea, device can be used the same as an ET tube

Complications and contraindications
- Most significant: ventilation through the wrong port after attaching the device
- It is critical to check for primary placement and secondary confirmation after insertion
- May cause esophageal wall damage because of its invasive nature
Alternative Airway Devices

- **ETC & PTL**
  
  **Complications and contraindications**
  - May cause esophageal wall damage because of its invasive nature
  - Do not use if patient:
    - Is less than 5 feet tall
    - Is less than 14 years
    - Has a history of caustic ingestion
    - Has esophageal disease
    - Has inactive gag reflex

- **Equipment needed to insert ETC or PTL:**
  - PPE: gloves, eyewear, mask
  - Stethoscope
  - Suction
  - End-tidal CO₂ monitoring device
  - Water-soluble lubricant
  - 2 syringes to inflate the pharyngeal and distal cuffs
  - Bag-mask device with O₂ tubing
  - O₂
  - Securing device

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Alternative Airway Devices

- **Esophageal-tracheal combitube (ETC) & (PTL)**
  
  **Procedure**
  - Insertion is indicated when prolonged PPI is required but cannot be achieved by other methods
  - Either device can be used as a backup to ET intubation
  - Laryngeal mask airway
  - Tube with small, air-filled mask at distal end
  - Tip of mask rests above upper end of esophagus and surrounds opening of larynx
  - Mask is inflated, creating seal around laryngeal opening
  - Bag-mask attached to external port, air is directed into larynx, lungs
Skill 29-2: Inserting Esophageal-Tracheal Combitube

- Take appropriate personal precautions
- Hyperoxygenate (10 to 20 breaths/min) for 30 sec with bag-mask device, supplemental $O_2$

Skill 29-2: Inserting Esophageal-Tracheal Combitube

- Check, prepare device for insertion
- Place head in neutral position
- Perform tongue-jaw lift

Skill 29-2: Inserting Esophageal-Tracheal Combitube

- Insert device midline, following natural curvature of pharynx
- Insert until teeth are between black rings on tube
Skill 29-2: Inserting Esophageal-Tracheal Combitube

- Inflate distal cuff using syringe

Skill 29-2: Inserting Esophageal-Tracheal Combitube

- Attach bag-mask to appropriate port (assuming esophageal placement), ventilate

Skill 29-2: Inserting Esophageal-Tracheal Combitube

- Obtain secondary confirmation with end-tidal CO2 monitoring
- Secure device/confirm that device remains properly secured
Alternative Airway Devices

- Laryngeal mask airway
  - Tube with small, air-filled mask at distal end
  - When properly inserted, the tip of the mask rests above the upper end of the esophagus and surrounds the opening of the larynx.

Alternative Airway Devices

- Laryngeal mask airway (LMA)
  - Complications and effectiveness
    - Failure to achieve adequate placement
    - Not as effective as other devices in preventing gastric inflation and regurgitation
    - Mask seal does not provide same degree of protection afforded by a tracheal tube or ETC
    - LMA is better than a bag-mask in preventing regurgitation
    - Patients should be monitored carefully for patency of the airway with suction immediately available in case of vomiting.

Alternative Airway Devices

- Laryngeal mask airway (LMA)
  - Equipment needed to insert an LMA
    - PPE: gloves, eyewear, mask
    - Stethoscope
    - Suction
    - End-tidal CO₂ monitoring device
    - Water-soluble lubricant
    - Syringe to inflate mask
    - Bite block/bite stick
    - Bag-mask O₂ tubing
    - O₂
    - Securing device
Alternative Airway Devices

- Laryngeal mask airway
  - Procedure
    - Indicated for patients in whom prolonged PPV is required
    - Indicated for apneic and unresponsive patients who cannot protect airway
    - Valuable backup for failed tracheal intubation

Skill 29-3
Inserting a Laryngeal Mask Airway

- Take appropriate personal precautions
- Tightly deflate cuff so that it forms smooth "spoon shape"

Skill 29-3
Inserting a Laryngeal Mask Airway

- Lubricate posterior surface of mask with water soluble lubricant
- Hold laryngeal mask airway like pen
Skill 29-3
Inserting a Laryngeal Mask Airway

- With patient’s head extended and neck flexed, carefully flatten LMA tip against hard palate
- Use index finger to push cranially

- Advance mask until definite resistance felt at base of pharynx
- Gently maintain cranial pressure with nondominant hand while removing index finger

- Attach bag-mask, ventilate
Alternative Airway Devices

- King LT-D supraglottic airway
  - Disposable supraglottic airway created as an alternative to tracheal intubation or mask ventilation
  - Designed for PPV and spontaneously breathing patients
  - Easy to insert and results in minimal airway trauma

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Alternative Airway Devices

- King LT-D supraglottic airway
  - Complications & contraindications
    - Similar to other blind placement, multilumen devices
    - Correct-size airway must be used to avoid damage
    - Must not be used on patients with esophageal varices or damage to the throat and neck
    - Once placed, ensure the airway and lungs are inflating and patient is being ventilated
    - Has only 1 ventilation port
    - If the tube is improperly placed, it must be removed

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Alternative Airway Devices

- King LT-D supraglottic airway
  - Equipment
    - Rigid tube with 2 distal cuffs
    - Both cuffs are inflated through 1 port
    - Side port allows for gastrostomy tube placement
    - Designed to slide into the trachea and provide a seal around the trachea, allowing patient to be ventilated
Alternative Airway Devices

- King LT-D supraglottic airway
  - Procedure
    - Place the patient’s head in a neutral position
    - Ensure both cuffs on the tube are deflated
    - Slide tube into throat until ventilation port is at the patient’s teeth
    - Inflate the cuffs
    - Attempt to ventilate the patient

- Continue ventilation attempts while pulling the tube gently and slowly out of the mouth
- Auscultate breath sounds and secure tube in place
- Document the procedure
- If chest does not rise as the tube is slowly pulled back, remove the tube and ventilate with GPA and bag-mask
Suctioning

- Used for patients intubated with a tracheal tube
- Deep suctioning is indicated when a patient has aspirated material into the lungs or copious amounts of water after a submersion incident

Suctioning

- Once intubated, insert the catheter through the ET tube
  - Size of the catheter must be small enough to fit through the tube
  - Should be soft as to not damage airway

Suctioning

- Pay particular attention to sterile technique
  - Entering deep into body cavity
- Use low to medium suction
  - Hypoxia is a common side effect
  - Limit attempts to no more than 15 seconds
Suctioning

- Indications for endotracheal suctioning
  - Obvious secretions
  - Poor compliance when using bag-mask technique

Suctioning

- Complications of oro-tracheal suction
  - Abnormal heart rhythms
  - Hypoxia
  - Coughing
  - Mucosal damage
  - Bronchospasm

- Proper technique minimizes potential for complication

Skill 29-4
Performing Orotracheal Suctioning

- Check equipment before proceeding, use sterile technique
Skill 29-4
Performing Orotracheal Suctioning

- Insert catheter without suction on
- Advance catheter just above carina
- Apply suction, withdraw catheter with twisting motion

Skill 29-4
Performing Orotracheal Suctioning

- If necessary, stop hyperoxygenate patient
- Repeat suctioning

Advanced Airway Management in Infants/Children

- Intubation
  - Airway management is particularly important because respiratory problems are common cause of death
Advanced Airway Management in Infants/Children

- Intubation
  - Anatomic and physiologic considerations
    - All structures are smaller and more easily obstructed than adults
    - Suctioning is particularly important
    - More difficult to create a single, clear visual plane from the mouth through the pharynx to view the glottis opening for orotracheal intubation
    - Children have narrower and softer tracheas
    - Cricoid ring is the narrowest portion of airway
    - Because cartilage is less rigid and developed, a cuff is not inflated

- Intubation
  - Equipment
    - Special considerations to help determine proper type and size of bag-mask device, laryngoscope blade and ET tube
    - Proper size of bag-mask is necessary
    - Markers on the tube assist in placing tube at proper depth in trachea

- Intubation
  - Procedure
    - Orotracheal intubation is the most effective means to secure the airway
    - In apneic patients, the use of orotracheal intubation allows:
      - Complete control of airway
      - Protection from aspiration
      - Better delivery of O₂
      - Deeper suctioning
Advanced Airway Management in Infants/Children

- Intubation
  - Procedure
    - Confirmation of tube placement is the same as adults
    - For infants and small children, assess for symmetrical rise and fall of chest
    - Best indicator of tube placement because breath sounds may be misleading

Skill 29-5: Intubating an Infant/Child

- Take appropriate personal precautions
- Ensure adequate ventilations by bag-mask at age-appropriate rate
- Administer 100% O₂

Skill 29-5: Intubating an Infant/Child

- Align patient’s head to ensure ease of visualization
- Unless trauma is suspected, tilt head, lift chin, attempt to visualize vocal cords
Skill 29-5: Intubating an Infant/Child

- Use minimal force for intubation (touch is critical)
- Holding laryngoscope handle in your left hand, insert laryngoscope blade into right corner of mouth

Skill 29-5: Intubating an Infant/Child

- Visualize glottic opening, vocal cords

Skill 29-5: Intubating an Infant/Child

- Do not lose sight of vocal cords
Skill 29-5: Intubating an Infant/Child

- With right hand, gently insert ET until glottic marker, if present, is placed at level of vocal cords

Skill 29-5: Intubating an Infant/Child

- If breath sounds are equal bilaterally and no sounds are heard in epigastrium
  - Secure ET in place

Advanced Airway Management in Infants/Children

- Intubation
  - Complications
    - In 1 study in an urban EMS system, ET did not improve survival over bag-mask ventilation
    - Continuously monitor heart rate during intubation attempts
    - If a slow heart beat is noted, interrupt the intubation attempt and rev ventilate with a bag-mask
Advanced Airway Management in Infants/Children

- Orotracheal suctioning
  - Use rigid catheter
  - Do not touch back of the airway
  - Suctioning time should be less than adults
  - Can become significantly hypoxic if prolonged
  - Perform nasal suctioning with:
    - Bulb suction
    - Small French catheter with low-medium suctioning

Advanced Airway Management in Infants/Children

- Nasogastric tube insertion (NG)
  - Removes air and decompresses the stomach
  - If unresponsive, used when there is difficulty performing PPV due to gastric inflation

Advanced Airway Management in Infants/Children

- Nasogastric tube insertion
  - Complications and contraindications
    - Tracheal insertion of the tube
    - Nasal trauma
    - Bleeding
    - Induced vomiting
    - Passage into the cranium in basilar skull fractures
    - Presence of major head, facial/spinal trauma
Advanced Airway Management in Infants/Children

- Nasogastric tube insertion
  - Equipment
    - Nasogastric tubes in assorted sizes
    - 20-mL syringe
    - Water-soluble lubricant
    - Emesis basin
    - Tape
    - Stethoscope
    - Suction unit: suction catheter
    - Towels to pad the shoulders, as needed

Skill 29-6: Inserting NT tube

- Prepare/assemble equipment

- Measure tube from tip of nose, around ear, to below xiphoid process

- Lubricate distal end of tube

- If trauma not suspected, place patient supine, with head turned to side, pass tube along the nasal floor
Skill 29-6: Inserting NT tube

- Check placement of tube by aspirating stomach contents, auscultating over epigastrium while injecting 10 to 20 mL of air into tube.

Skill 29-6: Inserting NT tube

- Aspirate stomach contents
- Secure tube in place

Summary

- Cricoid pressure (Sellick maneuver) helps prevent regurgitation/aspiration in unresponsive patient without cough/gag reflex during intubation.
- Cricoid pressure is applied to cricoid cartilage, which presses esophagus against spine. This closes esophagus, helps prevent gastric inflation, regurgitation.
**Summary**

- Most effective form of airway management is endotracheal intubation
- ET can be passed (orotracheal)

**Summary**

- Indications for ET intubation include situations in which prolonged PPV is required and cannot be effectively achieved by other methods
  - Indicated for apneic patients & unresponsive patients who cannot protect airway, as evidenced by absence of cough or gag reflex

**Summary**

- Advantages of orotracheal intubation include:
  - Preventing gastric distention
  - Minimizing risk of aspiration
  - Allowing for suctioning of airway
### Summary

- Complications of intubation include:
  - Esophageal intubation
  - Inadequate ventilation
  - Oxygenation from prolonged attempts
  - Soft tissue trauma
  - Right main stem bronchus intubation
  - Vomiting
  - Bradycardia, dysrhythmias
  - Tube dislodgement
  - Self-extubation

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### Summary

- Esophageal intubation is most dangerous complication of endotracheal intubation because it leads to inadequate ventilation, severe hypoxia, gastric inflation if not corrected within minutes.

- Intubation attempts should take ≥30 sec without intervening periods of ventilation with mask device.

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### Summary

- It is important to secure ET tube after intubation to prevent tube dislodgement during patient movement.

- Straight laryngoscope blade directly lifts epiglottis upward to allow visualization of the vocal cords, often used when intubating infant & children.
Summary

- Curved blade is inserted into vallecula, which indirectly elevates epiglottis away from larynx, allows visualization of vocal cords, glottic opening
- ETs vary in size from 2.5 to 10 mm in internal diameter

Summary

- Stylet is a malleable metal tube inserted into ET tube to provide stiffness, shape to help guide tube during intubation, should not protrude from end of ET tube
- ET tube should be lubricated with water-soluble lubricant before insertion into trachea

Summary

- Confirmation of tube placement includes:
  - Direct visualization of tube passing between vocal cords
  - Observation of rise and fall of chest
  - Auscultation of breath sounds
  - CO₂ detectors
  - Esophageal detector devices
  - Pulse oximetry
Summary

- Confirmation of proper tube placement is critical because unrecognized esophageal intubation results in profound hypoxia, possible brain damage/death.

- Alternative airway devices include:
  - Esophageal-tracheal Combitube (ETC)
  - Pharyngotracheal lumen (PTL)
  - Laryngeal mask airway (LMA)
  - King LT-D supraglottic airway

Summary

- ETC, PTL are dual-lumen devices that are blindly inserted into esophagus/trachea.
  - Different ports are used to ventilate depending on where tube is inserted.

- Most significant complication of ETC and PTL use is ventilating through wrong port after attaching device.
  - EDD cannot be used to check placement with these devices.

Summary

- Primary complication of LMA is failure to achieve adequate placement.

- Indications for endotracheal suctioning are obvious secretions, poor compliance, which may indicate an obstructed airway.

- Complications include abnormal heart rhythms, hypoxia, coughing, mucosal damage, bronchospasms.
Summary

- Infants/children have smaller anatomic airway structures that are more easily obstructed
  - Tongue is larger, can impede visualization of vocal cords with intubation
  - Narrower, softer tracheas, swelling can more easily obstruct their tracheas
  - Cricoid ring - narrowest portion of airway
  - Because cartilage is less rigid, developed, uncuffed ET is used

Summary

- To estimate ET tube size for children, use this formula:
  - 16 plus the patient’s age divided by 4
  - Other methods include selecting tube the size of child’s little finger/nasal opening
  - Uncuffed tube should be used in children younger than 8 y/o

Summary

- In unresponsive infants/children, NG tubes are used when there is difficulty performing PPV because of gastric distention
- Contraindications to NG tube insertion include:
  - Presence of major facial, head/spinal trauma
Summary

- Complications of NG tube insertion include:
  - Tracheal insertion of tube
  - Nasal trauma
  - Bleeding
  - Vomiting
  - Passage into skull

- Providers must weigh risks vs. benefits of placing an advanced airway
  - In many cases, basic airway procedures are adequate for prehospital airway maintenance

Questions?