NDMS Advanced Airway Course

Methods, Indications, Problems

Speakers

- Marc S Rosenthal, PhD, DO, FACEP
  - Wayne State University
  - Detroit Medical Center
  - EMS/WMD Director
- Dennis Wagner, MD, FASACC
  - Mid-Michigan Midland Hospital
  - Chief, Anesthesiology

Outline

- Introduction
- Didactic Lecture
  - Basic Airway info and anatomy
  - Basic Intubation
  - Advanced techniques
- Skill Practice
  - Basic
  - Advanced
  - Surgical

Introduction

- Airway control along with bleeding most important in assessing and managing a critical patient, medical or trauma.
- Without airway control, the patient will have a poor outcome.
- Most airways can be controlled by the patient. For those who can not protect their own airway or who require intubation/airway control 95% can be controlled successfully by Rapid Sequence Induction with direct laryngoscopy.

Introduction

- About 1-5% of patients will need more advanced techniques to secure an airway.
- This course addresses this issue.

Introduction

- Advanced Techniques:
  - Change position of patient
  - Change blade
  - Use proper medications

Introduction

- Advanced Techniques:
  - Bougie tube
  - Nasal Intubation
  - Digital Intubation
  - Lighted Stylet
  - Retrograde
  - Surgical
  - LMA/Fast Track
  - Fiberoptic
  - Intubating LMA

Introduction

- Advanced Techniques:
  - Glide Scope
  - Rigid fiberoptics
  - Jet Insufflation
  - Cordis System for Circ
  - BVM ventilation only
  - AirTraq
  - King LT, Combitube, EOAs

Introduction

- Final thought
  - Use combination of techniques
    - E.g., use a bougie with a king LT
  - Think outside the box

Introduction

- Anatomy
- Reasons for airway control
- Medications
- Direct Intubation
- Advanced techniques
  - Advantages
  - Disadvantages
  - usefullness

Introduction

- Consider thinking outside the box.
- Generally, want to use techniques/systems that are used in emergency departments.
- Disasters might change that.
  - Consider intubation, but no ventilation.
  - Use a cordis with 3.5mm ET tube connector to BVM if no equipment.
  - Etc.

Why

- The How when where why, etc. for intubation.
- You know this material already.

Indications

- Unstable Airway
- No gag reflex
- Hypoxia
- Ventilatory Failure, (hypercapnic)
- Borderline Airway, but long or difficult transfer
  - E.g. helicopter or fixed wing transport with high risk of airway compromise.
- Impending respiratory failure
- Elevated respiratory rate

Indications

- Advanced techniques
  - When standard techniques do not work
  - Can not ventilate or intubate the patient.

Indications

- Respiratory Failure
- Hypoxia
- Obstructed Airway
- Fatigue
- Loss of gag
- Unresponsive patient with potential transport
- Potential loss of airway, e.g., burns

Thyroid versus Cricothyroid Cartilage

- Thyroid cartilage used in "BURP" maneuver. Does not form a complete ring around the trachea.
- Cricothyroid Cartilage used in CricoidPressure, does form a full ring around the trachea allowing for the compression of the esophagus.

Difficult Airways - Assess the Risks

"The difficult airway is something one anticipates; the failed airway is something one experiences."

-Walls 2002

Some Predictors of a Difficult Airway

- C-spine immobilized trauma patient
- Protruding tongue
- Short, thick neck
- Prominent upper incisors ("buckteeth")
- Receding mandible
- High, arched palate
- Beard or facial hair

Dentures
Limited jaw opening
Limited cervical mobility
Upper airway conditions
Face, neck, or oral trauma
Laryngeal trauma
Airway edema or obstruction
Morbidly obese

Additional Predictors: Medical History

- Joint disease
- Acromegaly
- Thyroid or major neck surgeries
- Tumors, known abnormal structures
- Genetic anomalies
- Epiglottitis

Previous problems in surgery
Diabetes
Pregnancy
Obesity
Pain issues

Assess the Risk

- Identifying a potentially difficult airway is essential to preparing and developing a strategy for successful ETI and also preparing an alternate plan in the event of a failed ETI

Objectives

- Identify 4 areas of airway difficulty
- Predict a difficult airway using the following mnemonics:
  - MOANS
  - LEMONS
  - DOA

- Difficult to ventilate with a BVM
- Difficult laryngoscopy
- Difficult to intubate
- Difficult to perform cricothyrotomy

Difficult to Bag (MOANS)

- **M**ask Seal
- **O**besity or Obstruction
- **A**ge > 55
- **N**o Teeth
- **S**tiff

Mask Seal

- Small Hands
- Wrong Mask Size
- Oddly Shaped Face
- Bushy Beard
- Blood/Vomit
- Facial Trauma

Obesity or Obstruction

- Obesity
  - Heavy chest
  - Abdominal contents inhibit movement of the diaphragm
  - Increased supraglottic airway resistance
  - Billowing cheeks
  - Difficult mask seal
  - Quicker desaturation

Obesity or Obstruction

- 3rd Trimester Pregnancy
  - Increased body mass
  - Quick desaturation
  - Increased Mallampati Score
  - Gravid uterus inhibits movement of the diaphragm

- Obstructions
  - Foreign Body
  - Angioedema
  - Abscesses
  - Epiglottitis
  - Cancer
  - Traumatic Disruption/Hematoma/Burns

Age > 55

- Associated with BVM difficulty, possibly due to loss of tone in the upper airway

No Teeth

- Face tends to "cave in"
- Consider leaving dentures in for BVM and remove for intubation

Stiff

- Refers to Poor Compliance
- Reactive Airway Disease
- COPD
- Pulmonary Edema/Advance Pneumonia
- History of Snoring/Sleep Apnea
  - Also predicts a higher Mallampati score

Difficult Laryngoscopy & Intubation

- LEMONS
  - **L**ook Externally
  - **E**valuate 3-3-2
  - **M**allampati Score
  - **O**bstruction
  - **N**eck Mobility
  - **S**cene and Situation

LOOK Externally

- Beards or facial hair
- Short, fat neck
- Morbidly obese patients
- Facial or neck trauma
- Broken teeth (can lacerate balloons)
- Dentures (should be removed)
- Large teeth
- Protruding tongue
- A narrow or abnormally shaped face

EVALUATE 3-3-2

- Bottom of Jaw/Chin to Neck > 3 fingers
- Jaw/Palate > 3 fingers wide
- Mouth opens > 2 fingers wide

Any single indicator has poor specificity

EVALUATE 3-3-2

- Mouth Opens at least 3 finger widths.
- Three finger widths thyromental distance.
- Two finger widths mandibulohyoid distance.

EVALUATE 3-3-2

- **Will patients mouth open wide enough to accommodate 3 fingers?**
- **Will 3 fingers fit between the mentum and hyoid bone?**
- **Will 2 fingers fit between the hyoid and thyroid notch?**
  - ***If not, expect a difficult intubation***

Thyromental Distance

- Distance from the mentum to the thyroid notch.
- Ideally done with the neck fully extended. Can be done in-line
- Helps determine how readily the laryngeal axis will fall in line with the pharyngeal axis.

Thyromental Distance

If the thyromental distance is short, <3 finger widths, the laryngeal axis makes a more acute angle with the pharyngeal axis and it will be difficult to achieve alignment. Less space to displace the tongue.

Mandibulohyoid Distance- 2 fingers?

- Measured from the mentum to the top of the hyoid bone.
- The epiglottis arises from the thyroid and remains dorsal to the hyoid bone.
- Therefore, the position of the hyoid bone marks the entrance to the larynx

Mandibulohyoid Distance

- When the position of the hyoid bone is caudal or relatively caudal, a large portion of the tongue is situated in the hypopharynx instead of the mouth.
- During laryngoscopy, this large hypopharyngeal tongue mass further compromises the compliance needed for its displacement

- Patients who have a longer mandibulohyoid distance, greater then 2 finger widths, tend to be more difficult to intubate.
- A more caudal hyoid bone thus indicates a relatively caudal larynx Patients who have a longer mandibulohyoid distance, greater then 2 finger widths, tend to be more difficult to intubate.

Upper & Lower Face

- Measure the size of the upper face as compared to the lower face.
- Should be roughly the same.
- If the lower face is longer than the upper face then you should anticipate some degree of difficulty lining up the structures.

Mallampati Score

- Have patient sit up, and stick out tongue without phonating
- May be unable to properly assess this in an emergent field situation
- Modified version is to use a laryngoscope blade like a tongue blade to visualize the oropharynx – (not as sensitive or specific)

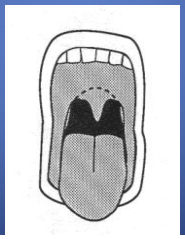
Mallampati Classification

- Relates to tongue size to pharyngeal size.
- Performed with patient in a sitting position, head neutral, mouth open wide and tongue protruding to the maximum.
- The Subsequent Classification is assigned based upon the pharyngeal structures visible.

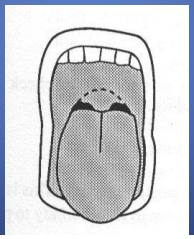
Mallampati Classification

- Class I: Visualization of the soft palate, fauces, uvula, and anterior & posterior pillars

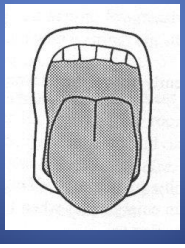
- Class II: Visualization of the Soft palate, fauces and uvula.



- Grade III: Visualization of the soft palate and the base of the uvula.



- Grade IV: The soft palate is not visible at all.



Obstruction

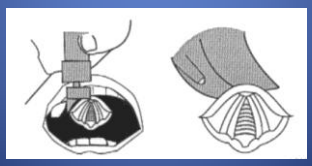
- Laryngoscopy or intubation may be more difficult in the presence of an obstruction
  - Anatomy
  - Trauma
  - Foreign body obstruction
  - Edema (burns)

Obstructions
Laryngoscopic View Grades

- Grade 1: Full aperture visible
- Grade 2: Lower part of cords visible
- Grade 3: Only epiglottis visible
- Grade 4: Epiglottis not visible

Graded in order from the best view to worst.

- Grade 1: Visualization of the entire laryngeal aperture



- Grade 2: Visualization of just the posterior portion of the laryngeal aperture.
- Grade 3: Visualization of only the epiglottis
- Grade 4: Visualization of the soft palate only.

Obstructions
Laryngoscopic View Grades

- A severe grade III or IV view with failed endotracheal intubation occurs in 0.05-0.35% of patients

Neck Mobility

- Ideally the neck should be able to extend back approximately 35°
- Problems:
  - Cervical Spine Immobilization
  - Ankylosing Spondylitis
  - Rheumatoid Arthritis
  - Halo fixation

Scene and Situation **(SEE)**

- Scene safety
- Environment
  - Do you have a reasonable chance to get the tube?
  - Space, positioning, access
- Egress
  - Will you be able to ventilate during egress?
  - A respiratory rate of 4 is better than a rate of 0!
  - Enough meds for a long extrication?

Difficult Cricothyrotomy

- DOA
  - Disruption or Distortion
  - Obstruction
  - Access Problems
- If you can't bag and can't cric, they're DOA

Disruption / Distortion

- Distortion
  - Surgeries
  - Radiation Therapy
  - Scarring
  - Burns

- Disruption
  - Hanging
  - Crush Injuries
  - Penetrating Trauma
  - Other Soft Tissue Trauma
    - Burns
    - Laceration

Obstructions

- Hematoma
- Abscess
- Tumor
  - Tumors can also create distortions & extra bleeding

Access Issues

- Obesity
- Halo
- Short neck
- SC Emphysema
- Bushy beard
- Flexion deformity of the spine

BURP" – a.k.a. "External Laryngeal Manipulation

Backward, Upward, Rightward Pressure: manipulation of the trachea
90% of the time the best view will be obtained by pressing over the thyroid cartilage

Differs from the Sellick Maneuver

- Airway assessment is a critical part of the RSI process
- The difficult airway assessment must be performed prior to ALL RSI attempts.
- While this criteria helps identify difficult airways, it does not guarantee an easy intubation—***Be Prepared***!

Equipment

- Airway management is equipment dependent.
- Actual equipment depends on what you have available.
- Will consider the basics

Equipment

- Suction
  - Hard and ET tube suction catheters
- BVM
- Oxygen with tubing
- CO2 monitor/indicator
- Stylet
- ET tubes
  - Cuffed and uncuffed

Equipment

- Laryngoscope
- Blades
  - Curved
  - Straight
- Tool tape, ET tube lock system
- Ventilator
- Backup plan
- Syringes
- SpO2 Monitor

Verification

- Following Airway Control, must verify tube placement
  - Condensation
  - Breath Sounds bilaterally
  - No breath sounds over epigastric area
  - SpO2, shows baseline or improved oxygenation
  - End tidal CO2 shows appropriate CO2 levels or color change times 10
  - Chest X-Ray
  - Most important- See the tube go through the cords.

Verification

- Any question about appropriate intubation
  - Take a look
  - Remove ET tube and bag patient and make new attempt.
  - Use all your techniques to verify. No one technique is absolute.

BVM

- Bag Valve Mask Ventilation
  - Effective method of ventilation
  - Best technique requires two persons
    - One to bag patient
    - One to make proper seal
  - Connect to O2
  - Place mask with proper seal, start at chin and lay across nose.
  - Watch for air leaks.

BVM

- BVM Use
  - Second person bags patient.
  - Make sure use proper head positioning
  - Consider use of nasal trumpet or oral airway to facilitate ventilation.
  - Do not be over aggressive in ventilation, watch for stomach rise.
  - Slow ventilation, long exhalation. Breath about 12 times per minute.

Rapid Sequence Induction and Intubation

- Indications for intubation confirmed
  - Failure of airway maintenance
  - Failure of ventilation or oxygenation

Rapid Sequence Induction and Intubation

- Evaluation of Airway
  - Mallipatti Scores
  - Hyomental Distance
  - Mouth Opening
  - Neck extension

Rapid Sequence Induction and Intubation

- Difficult Airway vs. Failed Airway
- Key Question: Can the patients' oxygenation be maintained (SpO2>90%)
  - Spontaneous
  - Bag Valve Mask (BVM)
  - Transtracheal Jet Ventilation

Rapid Sequence Induction and Intubation

- "Can't intubate, can't oxygenate"
- Require emergency oxygenation to prevent patient morbidity.
- Cricothrotomy should be considered first although intubating LMA or Combitube may allow time to prepare.

Rapid Sequence Induction and Intubation

- Rapid Sequence induction and intubation is the administration of a potent induction agent followed immediately by a rapidly acting neuromuscular blocking agent to induce unconsciousness and motor paralysis for tracheal intubation.
- RSI is the cornerstone of emergency airway management.

Rapid Sequence Induction and Intubation

- Assessment of the relative contraindications of RSI
  - Is there spontaneous respiration and do I want to produce apnea in this patient?
  - Is patient capable of being oxygenated by BVM?

Rapid Sequence Induction and Intubation

- 7-11 Plan
  - Seven P's "Prior Proper Planning Prevents Piss Poor Performance"
    - The Eleven P's of Rapid Sequence Induction
    - 1. Preparation
    - 2. Positioning
    - 3. Personnel
    - 4. Plan

Rapid Sequence Induction and Intubation

5. Pre oxygenation
- 6. Pre treatment
- 7. Paralysis with Induction
- 8. Protection
- 9. Placement
- 10. Proof
- 11. Post Intubation

Rapid Sequence Induction and Intubation

- Description of Technique
- 1. Preparation
  - Assessment as Described Intubate vs. Ventilate
  - Prepare all Equipment (The importance of a difficult airway cart)
  - Appropriate monitoring (BP, EKG, Pulse Ox, ETCO2)

Rapid Sequence Induction and Intubation

- IV x 2
- Check laryngoscopes for batteries and bulbs
- Multiple Size Blades (straight and curved based on patient's size)
- Endotrachial tubes of various sizes

Rapid Sequence Induction and Intubation

- Stylets as needed
- Suction
- All should be laid out in easy reach to the operator on their right side.

Rapid Sequence Induction and Intubation

- 2. Positioning
  - Patient in antatomical "sniffing" position with towel rolls under shoulders and head
  - Height of bed just below nipple line of operator with elbows freely mobile

Rapid Sequence Induction and Intubation

- 3. Personnel
  - Should be most experienced operator
  - This is not the time for a "teaching" experience which should be done in the O.R. Under controlled conditions
  - Should request additional back up (IE. Another ER physician, anesthesiologist, ENT or general surgeon

Rapid Sequence Induction and Intubation

- Medication nurse to administer drugs
- Experienced assistant to provide cricoid pressure and mouth displacement from the right side of patient

Rapid Sequence Induction and Intubation

- 4. Plan
  - Verbalize with team members their assignment
  - Demonstrate procedures to unfamiliar personnel (ie cricoid pressure)
  - Verbalize the plan for rescue if unable to intubate prior to induction
  - Make a plan and stick to it!
  - "No not another algorithm"

Rapid Sequence Induction and Intubation

- 5. Pre oxygenation
  - Should begin while other preparations are being made
  - Administer 100% oxygen for three minutes to replace nitrogen form the patient's functional residual capacity.

Rapid Sequence Induction and Intubation

• FRC	2500cc	2500cc
• FiO2	.20	1.00
• cc O2	500 cc	2500cc
• ccO2/min	250 cc/min	250 cc/min
• Time to eliminate		
• O2	2 minutes	10 minutes

Rapid Sequence Induction and Intubation

- Age/Weight/Size/Pregnancy affect volume of FRC and O2 utilization

Rapid Sequence Induction and Intubation

- 6. Pretreatment
  - Blunt normal reflex responses to airway manipulation.
  - Stimulation of airway produces tachycardia, hypertension, increased intracranial pressures and bronchospasm.

Rapid Sequence Induction and Intubation

- Lidocaine 2% solution
- Dose 1.5 mg/kg IV 90-180 seconds prior to intubation.
- No significant contraindications.

Rapid Sequence Induction and Intubation

- Fentanyl 50 mcg/cc
- Dose 3 mcg/kg IV
- No effect on ICP blunts hypertension and tachycardia.
- Significantly decreases respiratory drive
- Muscle rigidity in this low dose is unlikely but possible.
- Chest wall rigidity can make ventilation impossible.

Rapid Sequence Induction and Intubation

- Defasciculating Agents
  - i.e. competitive neuromuscular blocking agents
  - Used to block increased intracranial, intragastric and intraoccular pressures caused by succinylcholine.
  - No effect on reflex sympathetic response to laryngoscopy.
  - Appropriate dose is 10% of the normal paralyzing dose.

Rapid Sequence Induction and Intubation

- May cause respiratory weakness or apnea.
- Commonly used drugs.
  - Rocuronium 0.06 mg/Kg
  - Vecuronium 0.01 mg/Kg
  - Must be given at least 3 minutes prior to initiation of succinylcholine.

Rapid Sequence Induction and Intubation

– 7. Paralysis with Induction
- Administer Rapid Acting Induction Agent
  - Not given by Titration method but rapid IV push
  - Agents must be highly lipophilic and rapid onset 15 to 30 seconds.
  - Target is to have patient's brain with a high blood flow.

Rapid Sequence Induction and Intubation

- Thiopental Sodium (pentothal) -GABA Stimulator.
- Induction Dose 3-6 mg/KG
- Onset <30 seconds
- Duration 5-10 minutes
- Positives
  - Cerebral protective in hypoxia by decreasing cerebral oxygen demand.
  - Attenuates increases in ICP

Rapid Sequence Induction and Intubation

- Negatives
  - Releases histamine and has adverse effects with reactive airway disease
  - Significant myocardial depressent

Rapid Sequence Induction and Intubation

- Benzodiazepines-GABA stimulator
- Midasolam (Versed) Best
- Initial Dose 0.2-0.3 mg/KG
- Onset 30-60 seconds
- Duration 15-30 minutes

Rapid Sequence Induction and Intubation

- Versed con't
- Positives
  - Significant amnesia
  - No histamine release
  - Minimal cardiodepressive effects
  - Attenuates increased ICP
- Negatives
  - Slower onset than other agents

Rapid Sequence Induction and Intubation

- Etomidate (Amidate)

- Induction Dose 0.3 mg/KG
- Onset 15-45 seconds
- Duration 3-12 minutes

Rapid Sequence Induction and Intubation

- Etomidate (Amidate)
- Positive
  - Current Drug DuJour
  - Stimulates GABA activity
  - Second to Ketamine in hemodynamic stablity
  - No histamine release
  - Attenuates increased ICP

Rapid Sequence Induction and Intubation

- Etomidate (Amidate)
- Negatives
  - Myoclonic movement
  - Possible adrenal suppresion
  - No analgesia

Rapid Sequence Induction and Intubation

- Induction Dose
  1-2 mg/KG
  - Onset 45-60 seconds
  - Duration 10-20 minutes
  - Positives

  ¡Ketamine (PCP)
    - Minimal effect on respiratory drive
    - Significant analgesia
    - Stimulates sympathetic nervous system
      - » Augments heart rate and BP

Rapid Sequence Induction and Intubation

Ketamine (PCP)

- » Maintains airway reflexes

- Negatives
  - Increases cerebral Oxygen demand
  - Lowers seizure threshold
  - Hallucinations on emergence

Rapid Sequence Induction and Intubation

- Propofol (Diprivan)
- Induction Dose 1.5-3 mg/KG
- Onset 15-45 seconds
- Duration 5-10 minutes
- Positives
  - Decrease cerebral oxygen requirements
  - Decreases ICP
  - Enhances GABA activity

Rapid Sequence Induction and Intubation

- Propofol (Diprivan)
- Negatives
  - Direct myocardial depression
  - Vasodilation
  - Both greater than pentothal
  - Pain with injection

Rapid Sequence Induction and Intubation

- Paralyzing Agents
- Two types
  - Non competitive-Depolarizing Agents
    - » Succinylcholine
  - Competitive Non Depolarizing Agents
    - » Vecuronium (Norcuron)
    - » Rocuronium (Zemuron)

Rapid Sequence Induction and Intubation

- Succinylcholine (Anectine)
  - Drug of Choice in Emergency RSI
  - Minimal cardiac depressant
  - Minimal histamine release
- Succinylcholine (Sch) reaches the neuromuscular receptors producing depolarization manifested by fasciculations and then paralysis by prolonged binding of the receptors

Rapid Sequence Induction and Intubation

- Succinylcholine (Anectine)
- Intubating Dose 1.5-2 mg/KG
- Onset 45-60 seconds
- Duration 11 minutes
- Positives
  - Rapid Onset-better than all over neuromuscular blocking agents

Rapid Sequence Induction and Intubation

- Negatives
  - May precipitate malignant hypothermia (70% mortality)
  - FasciculationsSuccinylcholine (Anectine) produce increased ICP, intraocular and intragastric pressures
  - Hyperkalemia-normal rise of 0.5 meq/L with induction

Rapid Sequence Induction and Intubation

- Succinylcholine (Anectine)
- Negatives
  - Pathological conditions cause receptor upregulation that leads to prolonged and easier opening of the potassium channels and a rise of 4 meq/L leading to rapid cardiac arrest

Rapid Sequence Induction and Intubation

- Succinylcholine (Anectine)
- Negatives
  - Receptor Upregulation
    - » Burns % does not reflect the degree of hyperkalemia
    - » Denervation- spinal cord injury, stroke, MS, ALS
    - » Inherited myopathies
    - » Crush injuries with rhabdomyalisis

Rapid Sequence Induction and Intubation

- Succinylcholine (Anectine)
- Negatives
  - Receptor Upregulation
    - » Intra abdominal infections
    - » Renal failure???
- Succinylcholine is safe in the first 5-7 days after injury.

Rapid Sequence Induction and Intubation

- Succinylcholine (Anectine)
- Other negatives
  - Prolonged muscular blockade
    - » Acquired reduction pseudocholinesterase
    - » Atypical pseudocholinesterase
  - Bradycardia-common in children with monosynaptic stimulation of vagus nerve

Rapid Sequence Induction and Intubation

- Vecuronium/Rocuronium-nondepolarizing
  - Blocks alpha subunit
  - Used in low doses as pretreatment
  - Most useful if Sch contraindicated
  - There are no known contraindications

Rapid Sequence Induction and Intubation

- Vecuronium/Rocuronium-nondepolarizing
- Rocuronium
- Intubating Dose 1 mg/KG
- Onset 55-70 seconds
- Duration 30-60 minutes
- Vecuronium
- Intubating Dose 0.15 mg/KG
- Onset 90-120 seconds
- Duration 60-75 minutes

Rapid Sequence Induction and Intubation

- 8. Protection
  - Cricoid pressure (Sellicks Maneuver) is an essential part of RSI
  - Prevents passive regurgitation of gastric contents
  - Cricoid cartilage is a solid ring at the level of C6 which is pushed posteriorly to occlude the esophagus below or at the level of the glottis

Rapid Sequence Induction and Intubation

- 9. Placement
  - Successful placement of a cuffed endotracheal tube in the trachea is the gold standard of airway management and the sole reason for RSI
  - Direct larygoscopy
  - Innumerable blades but mainly either straight or curved
  - Straight blades used to pick up epiglottis and expose glottis

Rapid Sequence Induction and Intubation

- Placement
  - Curved blades placed in vallecula and elevate the epiglottis to expose glottis
  - The epiglottis is the anatomical target for all larygoscopy
  - The tongue is the enemy of successful intubation
  - No tongue should be visible to the right side of the blade

Rapid Sequence Induction and Intubation

- Placement
  - Once glottis or epiglottis is visualized, the operator should not take their eyes off the target
  - Assistant should hand suction, ETT, intubating stylet to the operator

Rapid Sequence Induction and Intubation

- Placement
  - BURP Maneuver
    - Means Backward Upward Rightward Pressure to cricoid
    - BURP can be combined with Sellick Maneuver

Rapid Sequence Induction and Intubation

- Placement
  - ETT passed from far right side of mouth with gentle traction to mouth by an assistant who is applying cricoid pressure
  - ETT should not be passed down the flange of the blade
  - ETT should have bevel in a horizontal plane and rotated 90 degrees only after tip of the tube passes the vocal cords.

Rapid Sequence Induction and Intubation

- Placement
  - Intubating Stylet
    - Very useful in Grade 3 or 4 larygeal view
    - Improve success rates from 66% to 96%
    - Some are hollow and allow ventilation with a 15 mm adapter.
    - Lighted stylets can be used to confirm tracheal intubation
    - Operator must maintain larygoscope in position as ETT is passed

Rapid Sequence Induction and Intubation

- 10. Proof
  - Confirming intubation of trachea
    - Visual confirmation of ETT through cords
    - Detection of end-tidal CO2
      - Capnography
      - Colorimetric-changes purple to yellow
    - Fog in tube-unreliable
    - Chest rise
    - Breath sounds

Rapid Sequence Induction and Intubation

- Proof
  - Confirming intubation of trachea
    - Esophageal Detecting Device
      - Piston syringe or self inflating bulb
      - Trachea is firm esophagus flexible and can be aspirated into ETT

Rapid Sequence Induction and Intubation

- 11. Post intubation Management
  - Operator should not leave go of ETT until securely taped in position and depth noted
  - Most extubation take place with removal of larygosope
  - Consider sedation with amnesia and further paralysis

Rapid Sequence Induction and Intubation

- Special considerations for the pediatric airway
  - Few significant differences but most import for under 2 years of age after which the pediatric airway resembles the adult
  - Equipment selection-Difficult to remember and rarely used
    - Best performed with the Broselow-Luten System-Tape and appropriate color coding

Rapid Sequence Induction and Intubation

- Special considerations for the pediatric airway
  - Airway is smaller and more susceptible to obstruction
  - Narrowest area of airway is cricoid cartilage
  - Crying increases the work of breathing 32 times
  - Extrathoracic airway is pliable and easy to kink

Rapid Sequence Induction and Intubation

- Special considerations for the pediatric airway
  - Glottis high at C1 in infancy, C4 at age 7 and C5 in adult
  - Large intraoral tongue
  - Large occiput which flexes the neck
  - Pediatric basal O2 consumption is twice that of an adult (6 cc/KG/min vs. 3 cc/KG/min) and therefore desaturation occurs more quickly.

Rapid Sequence Induction and Intubation

- Special considerations for the pediatric airway
  - Endotracheal tube sizing
    - Formula- 16 +age/4=tube size
    - Clinically the size of the small finger equals the size of the endotracheal tube
    - Uncuffed tubes < 8 years of age

Rapid Sequence Induction and Intubation

- Special considerations for the pediatric airway
  - Anticipate high anterior glottic opening
  - Do not hyperextend the neck
  - Straight blades/uncuffed tubes
  - Always use pretreatment with Atropine (0.02 mg/KG) for children < 10 years.
  - NG Tube is important

Rapid Sequence Induction and Intubation

- Special considerations for the pediatric airway
  - Major controversy is the use of Sch
  - Major concerns were hyperkalemic cardiac arrest with undiagnosed neuromuscular disease.
  - FDA 1993 warning to avoid Sch in children for elective anesthesia
  - Because of somewhat higher extracellular fluid volume the dose of Sch is 2 mg/KG

Rapid Sequence Induction and Intubation

- Rescue Plans
  - Primary for anesthesiologists is LMA and intubating LMA
  - LMA=Larygeal Mask Airway
  - 3 Basic types
    - Classic
    - Proseal with gastric port
    - Fastrach-Intubating

Rapid Sequence Induction and Intubation

- Rescue Plans
  - Advantages
    - Easy to use and learn
    - No additional equipment needed
    - Little cardiac sympathetic response
    - Intubating rate with fastrach is > 95%
    - Effective in pediatric patients
    - Tolerated by awake patients
    - Can be inserted remotely (i.e. entrapped MVA or collapsed building)

Direct Technique

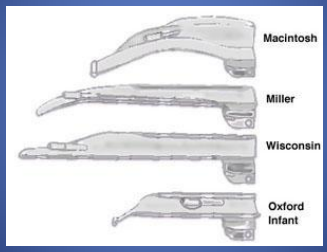
- Most intubation is done using direct layrngoscopy.
- Consider type of blade, straight, curved or adjustable tip.
- Consider size of blade.
- Evaluate patient.
- Prepare to intubate.
- Have basic equipment and backup techniques ready.

Direct Intubation

- Pre-oxygenate patient as much as possible
  - Optimal 5 minutes
- Set up equipment
- Use RSI
- Intubate patient
- Verify placement
- Use BVM or Ventilator.

Direct Intubation

- Choice of Blade
  - Look at airway, does patient have probable anterior cords.
    - Use 3 finger technique
      - Chin greater than or equal to 3 fingers probable normal cord position.
      - Chin less than 3 finger widths, anterior cord probable.
    - If anterior use Miller (Straight) Blade 1st.
    - If normal position, use McIntosh (Curved) Blade 1st.
    - Choose correct size for your preference and patient size.



Direct Intubation

- Use laryngoscope in left hand.
- Remove Dentures
- Insert blade on right, sweep across and pull tongue anterior and to the left.
- Keep blades off of teeth.
- Do not pivot, use lifting technique.
- Blade use:
  - Miller blade, lift epiglottis and visualize cords.

Direct Intubation

  - McIntosh blade, place blade between epiglottis and anterior neck in valecula.
  - Lift up to visualize cords.
  - Intubate patient.
- Insert ET tube until cuff is just past cords.
- Inflate cuff.
- Mark ET tube position.
- Verify intubation.

Direct Intubation

- Tie down ET tube
- Place oral gastric tube following successful intubation to decompress the stomach.
- Re-verify tube placement after any patient movement.

Nasal Intubations

- Nasal Intubations
- Method of choice in suspected C-spine injury or if sedation is contraindicated
- Requires spontaneous respirations
- Recognize inspiration and expiration
- Mid face trauma
- Safe in cribiform plate fractures

Nasal Intubations

- Drawbacks
- Requires proper prep of nasal mucosa
- Often requires multiple attempts
- Significant epistaxis can occur
- Patient is awake-uncomfortable

Nasal – Procedure

- Prep nasal mucosa
- Pre-oxygenate
- Choose largest nare
- Slowly advance until fogging in ET tube
- Can inflate balloon in posterior pharanx-can be used in unconscious patients

Advanced Techniques

- Retrograde intubations

Advanced Techniques

- Fiber Optic intubations

Advanced Techniques

- Digital intubations

Advanced Techniques

- Lighted Stylet

Advanced Techniques

- AirTraq

Advanced Techniques

- King LT
- Laryngeal Tube Airway
- Single lumen, silicone tube with esopharyngeal and esophageal low pressure cuffs
- Available in newborn to adult sizes

Advanced Techniques

- EOA

Advanced Techniques

- Cricothyrotomy
- Percutaneous transtracheal ventilation

Advanced Techniques

- Failed Airway
- Primary airway when nasotracheal or orotracheal intubations are contraindicated

Advanced Techniques

- Will this be a difficult cricothyroidomy?
- Surgery
- Hematoma
- Obesity
- Radiation
- Trauma

Advanced Techniques

- Surgical Airway

Advanced Techniques

- Jet insufflations

Mixed Techniques

- This course provided exposure to many airway techniques, simple and difficult.
- Generally no one technique is best.
- The one that works is best for you.
- Think outside the box.
- Assess the airway prior to placing an airway to determine the patient's best option.
- Consider mixing techniques in difficult situations.

Mixed Techniques

- Examples:
  - Digital intubation using lighted stylet
  - King LT with Bougie
  - Percutaneous Cricothyroidemy kit with standard ET tube.
  - AirTraq with Bougie
  - Ultrasound guided intubation, Direct Technique
  - Etc.
  - What ever works.

Mixed Techniques

- Always have a backup plan
- Review patient's anatomy prior to intubation and especially prior to sedation or paralysis.
- Be prepared.
- Think Outside the box.

Ethic Issues

- Disaster teams have potential for multiple patients with airway problems but only 1-2 ventilators.
- What do you do?
- Consider all options.
- Time for more ventilators?
- How many can bag patients?
- How many BVMs do you have?

Ethics Issues

- If resources not sufficient,
  - Prioritize care
    - Those requiring excessive amount of care and time with probable death, allow to die?
    - Those with need for airway protection only, consider intubation without ventilator support.
      - E.g., facial burn patient with stable vital signs.
    - Use personnel to bag patients.
    - If too many vented patients, consider, decreasing ventilator rate with BVM to allow one person to ventilate two patients.

Ethics Issues

- When to do a surgical airway?
  - How much time to try other techniques?
    - Again, if can not intubate or ventilate, do surgical airway.
    - Consider chance of survival given current conditions.
    - Might be better to let the patient die.
  - When to sedate or paralyze patient?
    - Look at airway.
    - Consider an awake intubation.
    - Consider fiber-optic awake intubation.

Ethics Issues

- Consider more aggressive medical management
- Consider not attempting intubation
- If need to intubate, be ready for a surgical airway and using multiple techniques
- Know your limits.
- Know patients will die.

Conclusion

- Advanced techniques only needed from 1-5% of intubations.
- Simpler advanced techniques work in 1-4% of intubations.
- Surgical airways are needed in fewer than 1% on intubations.
- Think outside the box.
- Prepare for the worst, you'll sleep better.