Failure of Emergency Preparedness by the OMS Team and Lack of In-Situ Simulation Training can have Catastrophic Consequences....
OMSNIC is an ardent supporter of education and training of the Specialty. We wish to thank OMSNIC for providing the brief synopsis of actual closed claims to illustrate the importance of emergency preparedness at this meeting. To maintain anonymity, specific case facts and outcomes were not provided by OMSNIC. The information presented here has been adapted with fictitious material for educational purposes. OMSNIC and its related, affiliated, and subsidiary companies disclaim all warranties, expressed or implied, as to the quality, accuracy, or completeness of the information provided therein. The views or opinions expressed by the speaker do not necessarily represent the views or opinions of OMSNIC or its subsidiaries.

Case #1 - History

Third Molar Removal  
19 yr-old male  
Medical History: Seasonal Allergies, Obesity, NKDA  
Medications: Loratadine  
Anesthetic History: None  
Airway: Mallampati III, Short Neck, Limited ROM  
PE: 5’ 9” 265lbs, Normal Heart & Lung Exam  
Vitals: BP 155/88, P 86, SPO₂ 99%  
Anesthetic Plan: Open Airway - Deep IV Sedation
Case #1 - History

Additional Medications Required to Deeply Sedate Patient
Tooth is Sectioned a Tooth with Irrigation
Patient Begins to Cough
High Pitched Inspiratory Stridor
Progresses to Abdominal Movement Only
No Air Exchange Seen
SpO₂ Declines

What is the Diagnosis?
Laryngospasm: Partial or Complete?

Laryngospasm Causes

• Combination of Factors...
  • Inadequate CNS Depression
  • Lack of Inhibition of Glottic Reflexes
• Increased Stimuli
  • Indirect Stimulation
  • Direct Airway Stimulation
Laryngospasm Causes

Indirect Stimulation
- History of URI
- Passive Exposure to Smoke
- Choice of Anesthetic Agent
- Pain - E.g. IV Placement

Direct Airway Stimulation
- Vocal Cord Irritation
  - E.g. Secretions, Blood
- Artificial Airway, Laryngoscope
- Suction Catheter

Laryngospasm Incidence

- Children > Adults
- Younger Children 3X > Adults
- Older Children 2X > Adults
- 17:1,000 Children <9 yo
- 64:1,000 Children with Asthma
- 96:1,000 Children with Acute URI
Laryngospasm - Recognition

- Tracheal Tugging
- Chest Wall Retractions: Sternal, Intercostal
- Paradoxical Breathing
- Flared Nostrils
- High Pitched Inspiratory Stridor
- Chest Movement with Little or No Bag Movement
- Hypoxemia

Management of Partial Laryngospasm

- Remove Nociceptive Stimulus - Suction Airway
- Open Airway - Chin Lift, Jaw Thrust
  - Consider Mandibular Pull, Laryngospasm Notch
- 100% Oxygen
- Deepen (or Lighten) Anesthetic Plane
  - 0.5mg/kg Propofol
- BVM with Continuous Mask Pressure
- Reassess Patient
Management of Complete Laryngospasm

• Call for Help - Inform, Direct Team
• Remove Stimulus, Suction Airway
• 100% Oxygen, Open Airway
  • Oral or Nasal Airway
• BVM with Continuous Airway Pressure
• Reassess Patient
Management of Complete Laryngospasm

• Administer Succinylcholine
• Continue BVM with CPAP
• Consider Additional Sedation
  • Provide Amnesia from Succinylcholine Effects
• Support Ventilation (6-15 Minutes)
• Reassess Patient
Case #1 Resolution

BVM with CPAP Given without Success
Unable to Intubate
  Patient Habitus - Difficult Airway
Hospital Team Able to Intubate with LMA
Patient Develops Postobstructive Pulmonary Edema (POPE)

Intubating LMA
Case #2 - History

Extraction of Wisdom Teeth - Earlier in the Day
17 yr-old female
Mom Calls Hours Later - Patient with N/V + Pain
OMS Meets Patient After Hours
Medical History: Asthma, Cold Last Week
Medications: Albuterol prn
Airway: Mallampati I, Good ROM
PE: 5’ 2” 120lbs, Normal Heart & Lung Exam
Vitals: BP 122/70, P 82, SPO2 99%

Case #2 - History

OMS Meets Patient After Hours
IV Placement - Toradol, Zofran
After Administration of Demerol
Tongue Swelling, Hypotension, Wheezing
OMS Calls 911
Using Bag-Valve-Mask and Positive Pressure $\text{O}_2$ With Oral Airway, Patient is difficult to ventilate

Bilateral Wheezing in all Lung Fields on Auscultation

What to Do Next?

What To Do Next?

Reposition & Expose Patient
Address Airway
Physical Assessment

What is Your Diagnosis?
Anaphylaxis

- IgE-mediated severe systemic allergic reaction
- Incidence 1:10,000 general population
- Pruritis, rash, tingling, flushing
- Cramps, nausea, vomiting, diarrhea
- Airway obstruction due to edema, bronchospasm
- Cardiovascular collapse

Anaphylaxis Pathology

- Glossal edema
- Laryngeal edema
- Bronchospasm
  - Smooth muscle spasm
  - Effort but dyspnea, wheezing

Mucosal Swelling
- Effort but dyspnea, crowing

After Treatment
Case #2 - Resolution

OMS Able to Ventilate with an Oral Airway
Administers Benadryl
EMS transports patient to ER

Case #2 - What Was Done Well?

Quick Diagnosis
Immediate EMS Notification
Oral Airway
Emergency Medication Available
Case #2 - What Else Could Be Done?

Intubate Early? - Secure Airway
Patient Positioning
  Recumbent position with the lower extremities elevated unless SOB or vomiting
Fluid Boluses (10-20mg/kg) May Be Necessary
Other Medications to be Given?

Epinephrine

- 0.01mg/kg (Adults 0.3mg-0.5mg 1:1000 or 1mg/ml solution) administered intramuscularly every 10-20 minutes as necessary
- Control symptoms & maintain blood pressure
- Intramuscular better than subcutaneous!
- Anterior lateral thigh is the preferred intramuscular location

What about Intravenous Epinephrine?
Epinephrine Considerations

<table>
<thead>
<tr>
<th>Complication</th>
<th>Alpha</th>
<th>Beta-1</th>
<th>Beta-2</th>
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<tbody>
<tr>
<td>Laryngeal edema</td>
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<tr>
<td>Bronchospasm</td>
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<tr>
<td>Hypotension</td>
<td>X</td>
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**IM route preferred, even if IV is in place!**

**Adult IM Dose = 0.3 mg**

\[
1:1000 = 1 \text{ mg/mL} \\
0.3 \text{ mL} = 0.3 \text{ mg} \\
Peds: 0.01\text{mg/kg}
\]


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**Intravenous Epinephrine**

- Indicated for patients with severe hypotension, cardiac arrest, or unresponsive to intramuscular doses
- No precisely established dose
- 0.2mg-0.5mg of a 1:10,000 IV to effect - repeated every 5 minutes as needed
- Continuous cardiac monitoring recommended
Case #2 - CRM Concerns

Medications Readily Available After Hours?
Do You Know Where They Are?
Staff Available to Help?
Drug Dosages - Where is the Equipment?
Fluid Resuscitation - What Size IV is in Place?

IV Fluid 20 Gauge IV 65ml/hr
22 Gauge IV 35ml/hr

LV 3 - Allergic Reaction / Anaphylaxis
Mild - slow to development of rash and itchiness
Major - rapid development of hives, flushing, swelling, shortness of breath, hypotension, wheezing, decreased oxygen saturation

Mild or Major?
MILD
MAJOR

ACTIONS
1. Call 911
2. Remove potential causative agents
3. Administer 100% oxygen
4. Administer IM/IV epinephrine; additional doses likely needed
5. Intubate (if unable and airway swelling developing, consider surgical airway)
6. Continue epinephrine administration as indicated
7. Administer corticosteroid/antihistamines
8. Administer IV fluid

EMERGENCY DRUGS
Case #3 - History

Single Tooth Extraction - Very Anxious
65 yr-old Female
Medical History: HTN, Type II DM, A-Fib, ‘Poor Health’
Medications: HCTZ, Lisinopril, Metformin, Coumadin
Allergies: PCN, ASA
Airway: Mallampati II, Normal ROM
PE: 5’ 8” 180lbs, Normal Heart & Lung Exam
Vitals: BP 145/92, P 92, SPO₂ 98%
Anesthetic Plan: Open Airway - Moderate IV Sedation

Stopped taking Coumadin 3 Days Prior to Her Appointment - Per Her Cardiologist
Cardiac Event 37 Minutes into Procedure
911 Summoned, Reversal Agents Given, CPR Began
AED Applied
Patient Had Pacemaker Attempting to Fire
How do we stratify risk for our patients?

Guidelines of the American College of Cardiology / American Heart Association

Perioperative Cardiovascular Evaluation for Noncardiac Surgery


Stratifying Cardiac Risk...

1. What is the urgency of the surgery?
2. Does patient currently have Acute Coronary Syndrome (ACS)?
3. Estimate perioperative risk of Major Adverse Coronary Event (MACE)
4. Patient’s functional capacity?
5. What is surgery-specific risk?
Calculators for Predicting Perioperative Cardiac Morbidity?

- A validated risk-prediction tool can be useful in predicting the risk of perioperative MACE in patients undergoing non-cardiac surgery
- For patients with low risk of perioperative MACE, further testing is not recommended before the planned operation
- RCRI- Revised Cardiac Risk Index
  - [www.mdcalc.com/revised-cardiac-risk-for-preoperative-risk](http://www.mdcalc.com/revised-cardiac-risk-for-preoperative-risk)
- NSQIP Risk Calculator
  - [www.surgicalriskcalculator.com](http://www.surgicalriskcalculator.com)

Functional Capacity to Assess Cardiac Risk

- **Metabolic Equivalents for Aerobic Activity**
  - One MET = 3.5 ml/kg/min of oxygen consumption
  - Increased cardiac risk if patient can’t meet 4 METS
- Duke Activity Status Index (DASI)
  - <4 METS = Poor Reserve
  - >4 METS = Moderate/Excellent Reserve
**Exercise Tolerance: 3-4 METs**

- Shower
- Climb Stairs Slowly
- Driving
- Vacuuming
- Mop
- Light Gardening
- Dock Fishing
- Golfing with Cart
- Wash Laundry
- Light Repair Work
- Lifting 20lbs. Max

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**Exercise Tolerance: 4-5 METs**

- Heavy Gardening
- Pushing Mower
- Moving Furniture
- Raking
- Doubles Tennis
- Slow Dancing
- Fly Fishing
- Bicycling
- Light Shoveling
- Wash Windows
Dentoalveolar Surgery - Low-Risk Surgery

No Cardiac Testing/Intervention Recommended Except...
• Newly Detected Cardiac Chest Pain
• Severe Aortic Stenosis
• Indications for Pacing
• Symptomatic SVT

Delay Elective Surgery
• Elective PCI - 6 Months
• Acute Coronary Syndrome - 12 Months

Case #3 - CPR Highlights
• Rate: 100-120 Compressions per Minute
• Compression-Ventilation Ratio for Unprotected Airway 15:2
  One or Two Rescuer CPR
• With Advanced Airway - Continuous Chest Compressions
• Epineprine 1mg IV Given after Second Shock
  Then Every 3-5 Minutes
• Amiodarone 300mg IV or Lidocaine 1mg/kg IV Given 2 Minutes
  after Epinephrine
What about BLS / ACLS and Pacemakers?

Perform standard BLS/ACLS except...
• Avoid placing AED electrode pad directly over the device
  • Place AED at least 1 inch (10-15cm) to side of the device
  • Device may block delivery of the shock or the pulse generator may be damaged

What about BLS / ACLS and AICD?

• Closely monitor EKG - 15 seconds of lag time until an ICD recognizes a rhythm and delivers a shock
• If ICD discharges - a mild electric shock may be felt on the patient’s body surface
• If ICD is delivering shocks to the patient - allow 30-60 sec for ICD to complete tx before using an AED
  • Prevents conflict between analysis and shock cycles of the devices
Case #4 - History

Implant Placement
62 yr-old male
Medical History: HTN, Obesity, Type II DM
Medications: HCTZ, Losartan, Lisinopril, Metformin
Recent HgB A1C: 7.2
Airway: Mallampati II, Normal ROM
PE: 5’ 9” 235lbs, Normal Heart & Lung Exam
Vitals: BP 148/96, P 75, SPO₂ 97%
Anesthetic Plan: Open Airway - Moderate IV Sedation

Case #4 - History

Patient Feels Dizzy, Seems Confused, Complains of Nausea
New Vital Signs: BP 79/43, P 45, SPO₂ 96%
Breathing Appears Inadequate
BP and SPO₂ Recycling - Not Reading on Monitors
BVM Initiated
911 Called - AED Applied - ‘No Shock Indicated’
What to do Next?

Case #4 - What To Do Next

- Check for Pulse
- Administer Fluids
- Patient Position Supine - Raise Legs
- Stimulate Patient
Bradycardia Causes...

- Hypoxia
- Cardiac Disease
  - Sick Sinus Syndrome
  - Acute MI
- Drugs
  - Fentanyl
  - Beta-Blockers
  - Calcium Channel Blockers
- Parasympathetic Activity

*Decision to Treat based on Symptoms*
Hypotension Causes...

- Hypovolemia
- NPO Status
- Dehydration
- Orthostasis due to position
- Anaphylaxis
- Acute MI
- Drugs - Beta Blockers

**Decision to Treat based on Symptoms**

ACE & ARB Can Cause Hypotention Refractory to Vasopressors
**Drugs for Bradycardia/Hypotension**

- **Atropine**
  - Anticholinergic Action Blocks Vagal Slowing of Heart Rate
  - 1 mg/mL SDV

- **Ephedrine**
  - Mixed Action: Alpha and Beta Agonist & Stimulates Release of Norepinephrine
  - 50 mg/mL SDV

**Administering Ephedrine and Phenylephrine**

- **Ephedrine (alpha/beta receptor agonist)**
  - 50mg/ml: dilute 1ml in 5ml = 10mg/ml
  - Administer 5-10 mg Q 5 min (up to 50mg)
  - 1 mm Rise in MAP per 1 mg administered

- **Phenylephrine (selective alpha agonist)**
  - 10mg/ml: dilute 10 mg in 10ml, discard 9ml, dilute remaining 1ml in 10 ml = 0.1mg/ml
  - Or dilute 10 mg in 100 ml bag
  - Administer 50-100 mcg Q 3 min
**Bradycardia / Hypotension**

**Primary Assessment**

- ☑ Airway
- ☑ Breathing
- ☑ SpO₂
- ☑ Supplemental Oxygen
- ☑ Pulse
- ☑ Blood Pressure

**Hypotension Persists:** Confirm HR

- Elevate Legs / IV Fluids
- HR < 60
- HR > 60

**If Symptomatic:** Administer Drug

- **Atropine**
  - IV: 1.0 mg Q3-5 Min
  - Maximum Dose 3mg

- **Ephedrine**
  - IV: 5-10 mg Q5 Min
  - Maximum Dose 50mg

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**Case #4 - CRM Concerns**

EMS Arrived, Turned Monitors Off, Monitoring Data Lost

Office Roles - Circulating Assistant to Watch/Control Monitor

Administrative Staff - Copy Records for EMS Staff

Who is Qualified to Prepare/Administer Medications?
Case #5 - History

Third Molar Removal
22 yr-old female
Medical History: Generalized Anxiety Disorder
Medications: Sertraline
Anesthetic History: None
Airway: Mallampati II
PE: 5’ 4” 130lbs
Vitals: BP 100/54, P 90, SPO₂ 98%
Anesthetic Plan: Open Airway-Deep IV Sedation/Infusion Pump

During the Procedure, Patient Desaturated
Positive Pressure Oxygen Given, without Effect
CPR Began, EMS Activated
No Intubation Attempt
EMS Arrived
Airway Evaluation

All methods used to predict difficult airways lack specificity and sensitivity

What to do?

Predicting the Difficult Airway

Look over as much information as possible and make an educated guess based on the preponderance of evidence
Predictors of Difficult Masking

- Obesity
- History of Snoring
- Retrognathia
- Beard
- Mallampati III, IV
- Edentulism
- Age > 60 years old

Predicting the Difficult Airway

- Large Tonsils
- Large Tongue
- Edentulous
- Class II Mandible
- Short Thyromental Distance
- Short Neck
- Limited Neck Mobility

- Obesity
- Facial Hair
- Mallampati III, IV
- Limited Opening
Airway Obstruction

Chin lift
Jaw thrust
Tongue grasp
Use of Oral & Nasal Airways

Bag-Valve-Mask (BVM)

Correct Technique
Emergency Airway Management Tools

Supraglottic Airway Devices

**Invaluable**: Routine and Difficult Airway Management

**1st generation**: low pressure pharyngeal seal, may not protect against aspiration (Classic LMA, Combitube)

**2nd generation**: high pressure pharyngeal seal, reduces the risk of aspiration (Supreme LMA, I-Gel)
LMA Indications

- Alternative Airway
- Difficult Airway
- Failed BVM
- Failed Intubation
- Minimal Neck ROM
- No Laryngoscope

LMA Advantages

- Minimal Training
- Shortest Placement Time
- Can Be Used In Pediatric Patients
- Least Amount of Tissue Trauma
- ACLS Class 2B Airway Control
- Can Use To Intubate
I-Gel Supraglottic Airway

• Developed in January 2007
• Supraglottic component is made of soft medical grade thermoplastic elastomer gel
• Does not require inflation with air
• Designed to conform to the pharyngeal and laryngeal structures but retain its shape enough to facilitate insertion

Case #6 - History

Multiple Extractions - Restorative Dentistry
Itinerant Anesthesia with OMS / General Dentist
46 year-old Male
Medical History: Smoker, HTN, Dyslipidemia
Medications: Metoprolol, Losartan
Airway: Mallampati II, Normal ROM
PE: 5’ 11” 165lbs, Normal Heart & Lung Exam
Vitals: BP 144/84, P 71, SPO₂ 97%
Anesthetic Plan: Open Airway - Deep IV Sedation
Case #6 - History

Patient Desaturated under GA

EMS Activated - CPR Initiated with the Assistance of the General Dentist

Is the Office Prepared?

Anesthesia Team Model

OMS - Team Leader
Airway Anesthesia Assistant
Circulator - Monitoring Assistant
Administrative Staff

*Roles are Clearly Defined in an Anesthetic Emergency...*

But What About the Itinerant Anesthesia Model?
**OMS - Team Leader**

- Establish Diagnosis
- Direct Course of Action
- Manage the Airway
- Communicate Effectively
- Summon Assistance If Needed
- Oversee and Administer medications, CPR, etc.

**Airway Anesthesia Assistant**

- Packing the Surgical Site
  - Suction
- Head Tilt, Chin Lift
- Assist with Airway
- Assist in Placement of Airway Adjuncts
- Stays with Patient at all Times
Circulator - Monitoring Assistant

- Preparing & Passing Airway Adjuncts - Emergency Equipment
- Retrieval of Medications from the Emergency Cart
- Preparation of Medications for Administration
- Chest Compressions Under the Direction of the OMS

Administrative Staff

- Fill out Necessary Emergency Records/Forms
- Make 911 Call
- Direct Emergency Personnel Into and Through the Office
- Direct Staff Member to Move the Patient’s Family/Escort to the Proper Area
Anesthesia Team Responsibilities

- **OMS**: Establishing Diagnosis
  - Providing airway support, Positive Pressure with Bag-Valve-Mask, Airway Maneuvers
  - Communicating Need for Help, Succinylcholine
- **Airway Assist**: Providing Airway Assistance
  - Suction
  - Ready to help with airway adjuncts
- **Circulator**: Retrieving Emergency Medications
  - Communicating dose with OMS
  - Ready to Prepare Correct Dose

Case #7 - History

Multiple Implant Placement
22 yr-old Female
Medical History: Environmental/Food Allergies, NKDA
Medications: None
Anesthetic History: None
Airway: Mallampati I, Normal ROM
PE: 5’ 7” 145lb, Normal Heart & Lung Exam
Vitals: BP 114/74, P 90, SPO₂ 99%
Anesthetic Plan: Open Airway - Deep IV Sedation
Case #7 - History

Upper Airway Obstruction
Patient Desaturates - SpO2 86%
Head Tilt / Chin Lift - BVM - Sats Improve
Second Obstructive Event
Succinlycholine Administered

What Succinylcholine Dose to Give?
Succinylcholine

IV Access Present: 0.5mg/kg - Break
IV Access Present: 1.5mg/kg - Intubating Dose
IV Access Absent: 3.0mg/kg IM
Continue BVM with CPAP

Case #7 - Resolution

Airway Patent - Sats Improve with BVM
Bloody Frothy Sputum from Mouth
Patient Intubated with Video Laryngoscope
EMS Activated
Video Laryngoscope

- Video-Assisted Intubation
- Meta-Analysis: Improved Visualization and Improved 1st Time Intubation
- Sized, Disposable Channeled Blade
- Reusable Display
- Expensive

McGrath MAC Video Laryngoscope
Airtraq

- Reusable Optics
- Disposable Blade
- Size-Specific
- Inexpensive

Postobstructive Pulmonary Edema

✓ Causation is Sequence of Events...
  Airway Obstruction
  Negative Intra-thoracic Pressure
  Increased Pulmonary Blood Flow
  Increased Pulmonary Microvascular Pressure
  Pulmonary Edema

✓ Incidence may be up to 12% of Significant Obstructive Events - Onset in Minutes to Hours
**POPE**

**Clinical Findings**
- Bloody, Foamy Sputum
- Persistent, Often Small Oxygen Desaturation
- Wheezing/Rales/Rhonchi

**Treatment**
- Supplemental Oxygen
- Diuretics
- Consider Tracheal Intubation
- CPAP
- Prompt Recognition results in Resolution in 12-24 Hours

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**LV 3 - Pulmonary Edema**

Decreased SpO2, rales or wheezing, frothy sputum, respiratory distress, tachycardia, agitation (most likely negative pressure pulmonary edema will often occur following a laryngospasm)

**ACTIONS**
1. Call 911
2. Administer 100% oxygen
3. Intubate
4. Suction as needed
5. Consider diuretics

**EMERGENCY DRUGS**

- Furosemide IV
Case #8 - History

Primary Molar Surgical Extractions
12 yr-old Male
Medical History: Asthma, Environmental Allergies
Medications: Albuterol Prn
Anesthetic History: None
Airway: Mallampati II, Short Neck, NL ROM
PE: 4’ 11” 115lbs, Normal Heart & Lung Exam
Vitals: BP 102/62, P 89, SPO2 99%
Anesthetic Plan: Open Airway - Inhalation Induction GA

Case #8 - History

Extreme Anxiety
Oral Premedication with Midazolam
Inhalation Induction with 6% Sevoflurane/Nitrous Oxide
Patient Cough on Induction - Clear Fluid from Mouth/Nose
Aggressive Suctioning
Inspiratory Stridor - Partial Laryngospasm
Jaw Thrust - Anesthetic Deepened
Copious Clear Fluid Again from Mouth/Nose
Case #8 - History

Complete Laryngospasm - BVM Unsuccessful
Anesthetic Agent - Sevoflurane Discontinued
Poor Anatomy - Difficult IV Placement Successful - IV Lost
Attempted Another IV Placement - Patient Awoke - Combative
Sats Low 90s/High 80s with O₂ from Face Mask
EMS Summoned
Barking Non-Productive Cough

Case #8 - CRM Concerns

Day of Event: Surgical Assistant Called in Sick
Bad Weather - Snow on Roads
How Close is BVM and Airway Equipment?
   Airway Equipment in Office - Shelves Closest to Surgical/Airway Assistant
   After Case Experience - Moved to other Side - Closest to Circulating Assistant
Turn Off or Deepen Anesthetic?
Case #8 - CRM Concerns

How Many Staff if Patient is Combative?
Where is Emergency Cart?
Who Available to Call 911 - Manage EMS?
  Front Staff Heard Commotion, Came to Help
  Additional Staff Member Met with Fireman/EMS - 2x
Accompany Patient to ER?
Communicate with ER Doc in Route?

Case #8 - Resolution

Transferred to ER - Awake Communicating
  Complaining of Sore Throat, Cough
Receiving 100% O₂ Nasal Cannula - Sats Low 90s
What About POPE/Bronchospasm Too?
Accompany Patient to ER?
Communicate with ER Doc in Route?
Discharged ER Same Day - Back to School Next Day
Case #9 - History

Implant Placement
55 yr-old male
Medical History: HTN, Excellent Exercise Tolerance
Medications: Lisinopril
Airway: Mallampati II, Normal ROM
PE: 5’11” 1776lbs, Normal Heart & Lung Exam
Vitals: BP 133/84, P 75, SPO₂ 98%
Anesthetic Plan: Open Airway - Deep IV Sedation

Case #9 - History

In Recovery - Unresponsive
Does Not Respond to Physical Stimuli
BP/HR/O₂ Normal
Foam Suctioned from the Mouth
CPR/EMS Summoned
EMS Arrived - Cardiac Arrest with Patient Upright
Receiving BVM
   Start at the Beginning - ABCs, Patient Position
EMS attempted ETT/King Airway - Significant Bleeding
EMERGENCY AIRWAY MANAGEMENT TOOLS

ENDOTRACHEAL TUBE

Appropriate Size of ETT
(age in years + 16) divided by 4

Appropriate Length of Insertion
(age in years divided by 2) + 12 cm
ENDOTRACHEAL TUBE

Signs of Intubation
✓ Breath Sounds
✓ Humidity in ETT on Expiration
✓ Chest Rise and Fall
✓ Hearing Air Exit ETT
✓ Reservoir Bag with Appropriate Compliance

Near Fail-Safe Signs
✓ ETCO2 Waveform
✓ Rapid Expansion of a Tracheal Indicator Bulb

Fail-Safe Signs
✓ ETT visualized between cords
✓ Fiberoptic Visualization of trachea, carina

COMBITUBE

Double Lumen Airway
Blindly Inserted
Patient Ventilated Regardless of Tracheal or Esophageal Placement
Case #10 - History

Impacted Mesiodens Removal
10 yr-old Male
Medical History: Asthma, Severe Anxiety
Last ER Visit - Age 7 - No Hospital Admission
Medications: Albuterol Prn
Airway: Mallampati II, Normal ROM
PE: 4’ 11” 115lbs, Normal Heart & Lung Exam
Vitals: BP 103/60, P 92, SPO₂ 99%
Anesthetic Plan: Open Airway - Deep IV Sedation
Case #10 - History

Titrate Fentanyl/Midazolam/Propofol
Pain on Local Anesthetic Injection
Patient Complaining of Pain and Difficulty Breathing/Chest Tightness
Respiratory Rate Increase - Expiratory Wheezing on Exam - Slope Change EtCO₂
100% O₂ - Non-Rebreather Face Mask

What is the Diagnosis?
BRONCHOSPASM

Paroxysmal Decrease in Airway Diameter
- Smaller Airway Diameter
- Inflammatory Thickening of Mucosa
- Production of Thick, Viscous Mucus

Signs and Symptoms
- Wheezing
- Diminished Breath Sounds
- Prolonged Expiration
- Increased Airway Pressures with Positive Pressure Ventilation

Phase II is prolonged
Slope of Phase III increased

BRONCHOSPASM

Non-Allergic Mechanisms

Susceptible Airways
- History of Asthma
- Recent Significant Asthma Symptoms
- Passive Smoking
- Upper Respiratory Infection

Precipitating Factors
- Inadequate depth of anesthesia
- Airway irritation
- Anesthetic technique

Allergic - Anaphylaxis
BRONCHOSPASM

What Else Could This Wheezing Be?
✓ Obstruction
✓ Aspiration
✓ Pulmonary Edema
✓ Tension Pneumothorax
✓ Pulmonary Embolism

IF BRONCHOSPASM OCCURS...

100% Oxygen

Deepen anesthetic using...
   Propofol, Ketamine, Volatile Agents

Provide adequate expiratory time

Use of inhaled beta-2 agonist

IM Epinephrine (1:1000) for severe symptoms (0.01mg/kg)

IV Epinephrine may be required

Consider corticosteroid therapy (4mg/kg hydrocortisone IV or equivalent)
Case #10 - CRM Concerns

Albuterol MDI 2-4x - 90mcg/Dose - Patient Uncooperative Reversal?
Epinephrine 300mcg IM - Vastus Lateralis (10mcg IV)
How is Epinephrine Packaged?
Syringe, Container, How to Draw Up?
When to Call 911? - If Unresolved and/or Unstable
Rule Out Causative Problem - Rule Out Chest Rigidity
**Case #11 - History**

Removal Wisdom Teeth #17,32  
21 yr-old Male  
Medical History: Generalized Anxiety  
Describes ‘Racing Heart’ Symptoms at Age 8 - No Treatment  
Medications: Escitalopram  
Airway: Mallampati I, Normal ROM  
PE: 5’5” 127lbs, Normal Heart & Lung Exam, Normal ECG  
Vitals: BP 110/65, P 94, SPO$_2$ 99%  
Anesthetic Plan: Open Airway - Deep IV Sedation

**Case #11 - History**

After Administration of Local Anesthetic (4% Articaine with 1:100K Epi)  
Patient Confused, States Her Heart is ‘Beeping’  
BP 124/74 P 188 Respiratory Rate: 18 SpO$_2$ 98%  
100% O$_2$ Via Face Mask - Nasal Cannula Removed  
Vagal Maneuvers  
When to Call 911?  
(If SVT starts after the first year, it is likely to persist)  
If the episode persists several hours, Unstable
Case #11 - Resolution

ACLS Tachycardia Protocol
Consider Adenosine if Rhythm Regular (1st Dose 6mg IV, 2nd Dose 12mg IV - Give rapidly)
Consider B-Blocker/Calcium Channel Blocker
Synchronized Cardioversion if Unstable
  Regular Narrow 50-100J
  Irregular Narrow 120-200J Bisphasic 200J Monophasic
  Regular Wide 100J
  Irregular Wide Defibrillation Dose
Do you have Equipment for Synchronized Cardioversion?

Case #12 - History

Surgical Removal Lesion Lower Lip - Submit to Pathology
28 yr-old Female
Medical History: Type I DM, Insulin Pump with CGM
Medications: Basal Rate 0.35-0.50 U/Hr
Airway: Mallampati II, Normal ROM
PE: 5’6” 139lbs, Normal Heart & Lung Exam
Vitals: BP 123/69, P 75, SPO₂ 98%
Anesthetic Plan: Open Airway - Deep IV Sedation
**Case #12 - Recommendations**

**Diabetic Recommendations**
- Minor Procedure: Anticipated Return to Oral Intake: 2 Hours
- Last Seen in March of This Year: HgBA1C - 8.9% - Moderate Control
- Continue Insulin Pump
- Schedule as Early in Day as Possible
- No Short-Acting Boluses While Patient is Fasting
- Follow NPO Recommendations to Avoid Case Delay

**Carbohydrate-containing Clear Oral Liquids, Glucose Gels Prn**
- Avoid Less Than 2 Hours Prior
- Hold Oral Hypoglycemic Agents 24 Hours Prior to Procedure
- Patient Family Should Change System to Open Loop
- Point of Care BG Should be Checked Upon Arrival to Confirm CGM?
- Confirm CGM - Sensor Located in Available Area Outside the Surgical Field
- Check BG in Recovery - Finger Stick vs CGM