Emergency Airway Algorithm
For The OMFS

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So, What Should You
Have For Emergencies
And Then, Let’s Focus
On Airway

Medications
Disclaimer: Specific Medications
& Equipment Vary By State

California GA Permit Required
- Vasopressor
- Corticosteroid
- Bronchodilator
- Muscle relaxant
- IV Tx of cardiopulmonary arrest
- Appropriate drugs antagonists
- Antihistaminic

California GA Permit Required
- Vasopressor – Epi, Ephedrine, Phenylephrine
- Corticosteroid – Solu-Cortef, Dex, (Solu-Medrol)
- Bronchodilator – Albuterol, Epinephrine
- Muscle relaxant – Sux and/or Rocuronium?
- IV Tx of cardiopulmonary arrest – Epi, Amio
- Drug antagonists – Flumazenil, Naloxone
- Antihistaminic - Diphenhydramine
California GA Required
- Anticholinergic – Atropine (Glycopyrrolate)
- Antiarrhythmic – Amiodarone, Adenosine, Lidocaine?
- Coronary artery vasodilator – Nitroglycerin
- Antihypertensive – Hydralazine, Nitroglycerin, Esmolol, Labetalol, Metoprolol
- Anticonvulsant – Midazolam, Propofol
- Oxygen
- 50% dextrose

Antagonists
A Brief Review

Naloxone - Narcan®
- FDA Approved For IV/IM/SC Administration
- How Supplied:
  - 0.4mg in 1 ml Ampule/Vial
  - 0.4mg/ml in 10 ml Multidose Vial
- Dosage:
  - Adult: 0.4mg IV/IM; Repeat to 2mg Total Dose
  - Partial Reversal With .04mg q2-3m
  - Children: 0.1mg/kg IV/IM; Repeat At Higher Doses As Needed For Full Reversal
- With Conventional Opioid Doses → Full Reversal Will Occur With 0.4 mg (0.1 mg/kg for Children)
- No Harm In Additional Doses
- Possibility for Re-narcotization Exists!!

Flumazenil - Romazicon®
- FDA Approved For IV Administration Only
- 0.1mg/ml in 5ml Vial → 0.5mg per Vial
- In Serious Emergency:
  - Unconscious, Crashing Patient, Poor Ventilation → 0.5mg
  - Repeat If Necessary
- In Controlled Emergency:
  - Unconscious But Breathing → 0.2mg IV Every 1 – 2 Minutes
  - Pediatric: 0.01 mg/kg → 0.2 mg IV
  - Repeat Every 1 – 2 Minutes
- Possibility For Re-sedation Exists!!
- Caution: Epileptic Patients
  - Reversal of GABAergic Antiepileptic Agents???

Reverse Benzo or Opioid First?
Which Is Causing The Most Respiratory Depression?
The Opioid!!!
Emergency Equipment

- Positive Pressure Ventilation Devices**
  - With Supplemental Oxygen
- Airway Adjuncts – Adult & Pediatric
  - Oropharyngeal Airways**
  - Nasopharyngeal Airways
  - Laryngeal Mask Airways?
  - King LT-D?
- Laryngoscope, Stylets And ET Tubes**
- Cricothyrotomy Kit**
- Magill Forceps**
- Yankauer Suction**

Oropharyngeal Airways

Nasopharyngeal Airways

Laryngoscope, Stylet & Tubes

Laryngeal Masks

Laryngeal Mask Airway - LMA

- Easier to place in emergency than ETT
- Easier to dislodge than ETT
- Doesn’t require laryngoscope
- Blocks esophagus & helps prevent regurgitation
- Can fold over larynx and obstruct airway
- Requires repeated training
**King LT-D**
- Size 2: 35 - 45”
  - 12-25 kg
- Size 2.5: 41 - 51”
  - 25 - 35 kg
- Size 3: 4 – 5 ft
- Size 4: 5 – 6 ft
- Size 5: > 6 ft

**Combitube**
- Combitube SA: 4 – 6 ft Tall
- Combitube: > 5 ft Tall

**Transtracheal Jet Ventilator**

**Cricothyrotomy Kit**

**Yankauer Suction**

**Where To Keep Emergency Drugs/Equipment**
- All Common Emergency Equipment And Drugs Could Be In One Place (Crash Cart)
How About The Operatory?

- Time Is Of The Essence
- Have Items Most Likely To Be Needed In Each Operatory
- Have Sux In Room From Refrigerator Storage As Needed
- Use Crash Cart For Less Likely Medications/Equipment

Recommended Emergency Drugs/Equipment For Operatory

- Naloxone
- Flumazenil
- Succinylcholine*
- Atropine
- Epinephrine
- Esmolol
- Diphenhydramine?
- Oral Airways
- Nasal Airways
- PPV for 100% O₂

*Store In Refrigerator When Not Needed

For Children In OMFS Office: Important!!!!

- Always Keep Succinylcholine and Atropine Immediately Available
- Labeled, Needled Syringes With Drug Vials On Counter
  - Better Yet, Have the Drugs Drawn Up, I Do
- Positive Pressure Oxygen Must Be Immediately Available
- Highly Recommend Styleted ETT Ready
- Depending On Technique, Reversal Agents Should Also Be Immediately Available

Basic Philosophy of Emergency Medicine

Protect the Brain!!!!

- The Brain Needs Two Things Short Term
  - Oxygen & Glucose
- The Blood Is The Brain’s Oxygen Delivery System
- The Heart Is The Pump For The Blood
- The Lungs Deliver Oxygen To The Blood

And If You Don’t Have An Airway............

You Don't Got Nothin’
DS/GA Emergencies
Airway, Airway, Airway!!

Sedation/GA Emergencies
- If the patient is ventilating and circulating
- You not only have time
- But the patient will survive.

General Principles
- If patient is conscious, ask them how they feel
- If very sedated, make them less sedated
- If not conscious, make them conscious
- Evaluate multiple indicators

Emergency Scenario

Oxygen Saturation Decreasing

Differential Diagnosis
- Hypoventilation
- Upper airway obstruction
  - Tongue
  - High foreign body
- Vocal cord obstruction
  - Laryngospasm
  - Foreign body at vocal cords
- Lower airway
  - Bronchospasm
  - Foreign body below vocal cords
More Differential Diagnosis

- Pulmonary Disease
- Profound Hypotension
  - Any CV Issue Leading to Low BP
    - E.g. Bradycardia, Heart Block, MI, Hypovolemia
- Acute Congestive Heart Failure
- Pulmonary Embolus
- Low FiO₂ (Fraction of Inspired Oxygen)
  - Diffusion Hypoxia
  - Gas Line Mixup
- Many Others

Case Scenario

Non-Intubated
GA/Deep Sedation

20 Year Old Male

- Medical History
  - History of Asthma With URI Only
    - Albuterol Only If Bad URI
    - Used Pulmicort & Albuterol As Child
  - Multiple Environmental Allergies/NKDA
- Very Anxious
- 5’11” & 176 lbs (80 kg)
- Other: + Mild Snoring
- Procedure: Extraction Four 3rd Molars

Anesthetic Plan

- Nitrous Oxide For IV Start
- Baseline Sedation – Midazolam & Fentanyl
- Intermittent Boluses of Propofol
- Local Anesthesia

Exam/Monitors/Vital Signs

- Consent, Escort, NPO
- Heart – RRR w/o Murmur; CTA Bilaterally
- Airway: Mallampati II – 50% Tonsils
- NIBP, SpO₂, ECG, Nasal Capnography
- HR 110, BP 137/85, RR 18
- Room Air SpO₂ 98%
- 50% N₂O/50% O₂ Via Nasal Hood
- 22 G IV Catheter Left ACF; Start Normal Saline

“IV Induction”

- 2.5 mg Midazolam & 50 mcg Fentanyl
- 2.5 mg Midazolam
- 50 mcg Fentanyl
- 1.25 mg Midazolam
- 30 mg Propofol
- Local Anesthetic Administration
**Initial Medications**
- Local Anes. Injection
- Patient Movement
- 30 mg Propofol
- Place Throat Screen
- Start Procedure

**20 YO; 80 kg Deep Sedation/GA**
- VS: 110/58, HR 85, SpO₂ 98%
- Begin Procedure
- Pulse Oximeter Decreases to 95%
- Next Step???

**20 YO; 80 kg Deep Sedation/GA**
- Capnograph Shows Apnea
- Head Tilt/Jaw Thrust
- Patient Takes Deep Breath
- Pulse Oximeter 98%
- What Next??
- Continue Surgery
- Consider Nasopharyngeal Airway

**Back To Case**
- VS: 120/65, HR 98, SpO₂ 98%
- Patient Moving
- Additional 30 mg Propofol
- Continue Procedure
- Pulse Oximeter Decreases to 95%
- Head Tilt/Jaw Thrust *Does Not* Arouse Patient

**20 YO; 80 kg Deep Sedation/GA**
- Pulse Oximeter Now 93%

**What is Most Likely Going On?**
- Let’s Look At Our Differential Diagnoses
### Differential Diagnosis
- Hypoventilation
- Upper Airway Obstruction
  - Tongue
  - High Foreign Body
- Vocal Cord Obstruction
  - Laryngospasm
  - Foreign Body At Vocal Cords
- Lower Airway
  - Bronchospasm
  - Foreign Body Below Vocal Cords

### Ventilation Monitors
- Nasal Capnography
  - Evaluates Expired CO₂
  - Delay In Apnea Detection
  - Sometimes Poor Waveform
- Pre-Tracheal (Pre-Cordial) Stethoscope
  - Continuous, Immediate Evaluation of Ventilation
  - Chest Excursions
    - Difficult with Draped Patient

### Is the Patient Ventilating?
- Look For Chest Excursions
- Diaphragmatic Breathing vs. Paradoxical Breathing Pattern?
- Respiratory Rate?
- If Pre-Tracheal Stethoscope, Breath Sounds
  - Not Sure
  - Turn Off Nitrous Oxide, If On!!

### Unsure If the Patient Is Breathing Well?
**Open the Airway!!!!!!!**
Deep Mandibular Angle Stimulation

### Patient Resumes Good Respiration → SpO₂ 98%
Continue, But What If………

### Patient Does Not Appear To Be Ventilating!!
Even With Deep Jaw Thrust.
Pulse Oximeter Now 90%
Multiple Tasks Simultaneously
- Make Sure Nitrous Oxide Is Off
- Remove Throat Pack, Pack Surgical Site, Suction Airway
- Get Succinylcholine Ready!!
- Start Positive Pressure Ventilation
  - Is Airway Adjunct Needed?
  - Nasopharyngeal vs. Oropharyngeal
  - Emergency PPV, Always Use Airway Early!
- Is Ventilation Possible?

Differential Diagnosis
- Yes, With Airway Adjunct
  - Hypoventilation
  - Upper Airway Obstruction
    - Tongue
    - High Foreign Body
  - Vocal Cord Obstruction
    - Laryngospasm
    - Foreign Body At Vocal Cords
  - Lower Airway
    - Bronchospasm
    - Foreign Body Below Vocal Cords
- No

Assume Laryngospasm
- Occurs During Deep Sedation/Light GA
- Usually Due To Secretions on Vocal Cords
- Usually Respiratory Effort
  - But Paradoxical Breathing Pattern
- Management
  - Stimulate Patient With Vigorous Jaw Thrust
  - Suction Airway (Yankauer)
  - Positive Pressure Oxygen
- For Children → Don’t Wait To Give Succinylcholine → Give It!!
Succinylcholine

- Low Dose vs. High Dose; What's the O₂ Sat???
  - Low: 20 mg = 1 ml = 0.25 mg/kg for 80 kg Patient
    - If Atropine Not Drawn Up, Get It Ready
      - Especially for Children
  - Intubating Dose 1 mg/kg = 80 mg = 4 ml for 80 kg Patient
  - Continue Positive Pressure Ventilation
    - With Oral Airway!!!
  - 2nd Dose of Sux May Cause Bradycardia
    - MUST Pre-Treat With Atropine 0.04 – 0.5 mg
      - Children 0.01 mg/kg (Minimum 0.2mg) MUST Get
  - If Ventilation Possible, Suction Again (Emesis?)
  - If Yes, Continue Case?

But What If Still Unable To Ventilate ...............

Differential Diagnosis

- Hypoventilation
- Upper Airway Obstruction
  - Tongue
  - High Foreign Body
- Vocal Cord Obstruction
  - Laryngospasm
  - Foreign Body At Vocal Cords
- Lower Airway
  - Bronchospasm
  - Foreign Body Below Vocal Cords

Ventilatory Emergency

- Direct Laryngoscopy
  - Determines Foreign Body At Vocal Cords
  - Vocal Cords Should Be Open
    - IF You Gave A Full Intubating Dose of Sux
  - Allows Placement of Endotracheal Tube
  - DO IT!!!
  - Consider Atropine If Hypoxia Progressing And Heart Rate Slowing
  - If Unable to Ventilate Through ETT.....
    - ETT In Esophagus
    - Bronchospasm
    - Foreign Body
    - Consider LMA/King LT-D
    - Consider TTJV For Oxygenation

Differential Diagnosis

- Hypoventilation
- Upper Airway Obstruction
  - Tongue
  - High Foreign Body
- Vocal Cord Obstruction
  - Laryngospasm
  - Foreign Body At Vocal Cords
- Lower Airway
  - Bronchospasm
  - Foreign Body Below Vocal Cords
Treat As Bronchospasm
- Assume Saw ETT Pass Vocal Cords & Unable to Ventilate
- More Likely In Patient With Hx of Asthma
- But Can Occur In Any Patient With Aspiration
- Treatment??
  - Epinephrine
  - CV Stimulation May Help or Hurt
  - If Hypoxia Profound, Will Treat Bradycardia Too

What About Epinephrine?
- Adult: IV 0.025 – 0.05 mg (25 – 50 mcg); Titrate
  - ¼ - ½ ml of 1:10,000 Solution
  - Double Dose As Needed
  - Rapid Onset But Short Duration of Action
- Pediatric IV 0.01 – 0.025 mg (10 - 25 mcg); Titrate
  - Dilute 1:10,000 by 1:10 to 10 mcg/ml
- Consider Intramuscular Administration In Addition
  - Intramuscular** (Subcutaneous) 0.01mg/kg (Max 0.3 mg)
    - Use 1:100 Solution IM**
    - Allows Slow Release
    - IM Faster Onset Than SC

What About Epinephrine?
- 1:1000 = 1 mg/ml for SC/IM/IV (Ampule)
- 1:10,000 = 0.1 mg/ml for IV (Pre-filled Syringe)
- 1:100,000 = 0.01 mg/ml for Local Hemostasis
- Adult IV Doses:
  - 0.05 mg (50 mcg ) → Urgencies (Start 25 – 50 mcg)
  - 0.5 mg → Near Death Dose
  - 1 mg → Death Dose
- Pediatric IV Doses
  - 0.001 mg/kg → Urgencies (Start 10 – 25 mcg)
  - 0.005 mg/kg → Near Death Dose
  - 0.01 mg/kg → Death Dose
- Caution: Cardiovascular Effects

What About Epinephrine?
- Anaphylactic Shock
  - Requires Multiple, High Doses of Epinephrine
  - Airway!!
  - IV Fluids
  - IV Corticosteroids, Antihistamines Secondary
- ACLS for Cardiac Arrest
  - Ventricular Fibrillation
  - Pulseless Ventricular Tachycardia
  - Asystole
  - PEA
  - 1 mg Every 3 - 5 minutes With CPR and Defibrillation

ETT Tube In Place
- ETT In Place & Able to Ventilate
  - Wheezing?
    - Bronchospasm Or Aspiration
  - Negative Pressure Pulmonary Edema?
- ETT In Place & Unable to Ventilate
  - Despite Epinephrine → Foreign Body
  - Push Endotracheal Tube Past Carina?
EMERGENCY AIRWAY ALGORITHM FOR OMFS

But, Patient Does Well.........
Important Take Home Lessons

- During Emergency PPV, Always Use Oropharyngeal Airway If Unable To Ventilate
- Keep Needed Emergency Drugs In Operatory
- For Children, Have Atropine & Sux On Counter With Labeled Syringes
- Always Have PPV 100% O₂ In Operatory
- If You Can’t Intubate, What Is Plan B?

Questions?