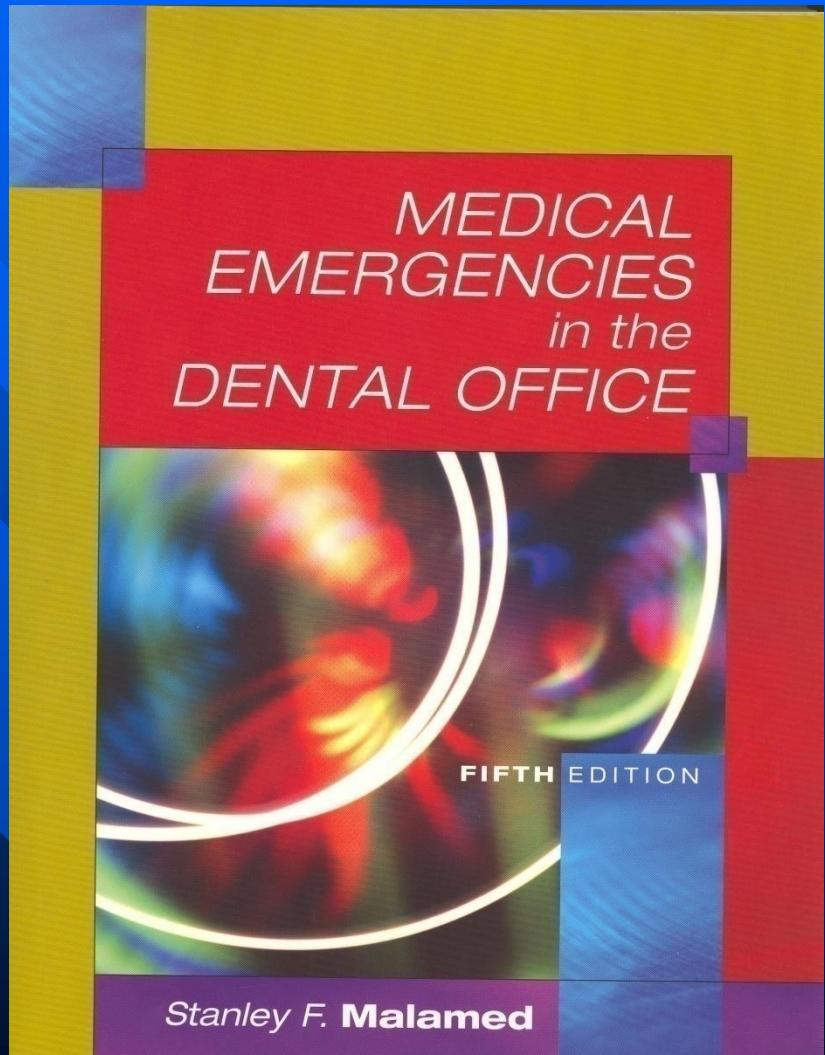
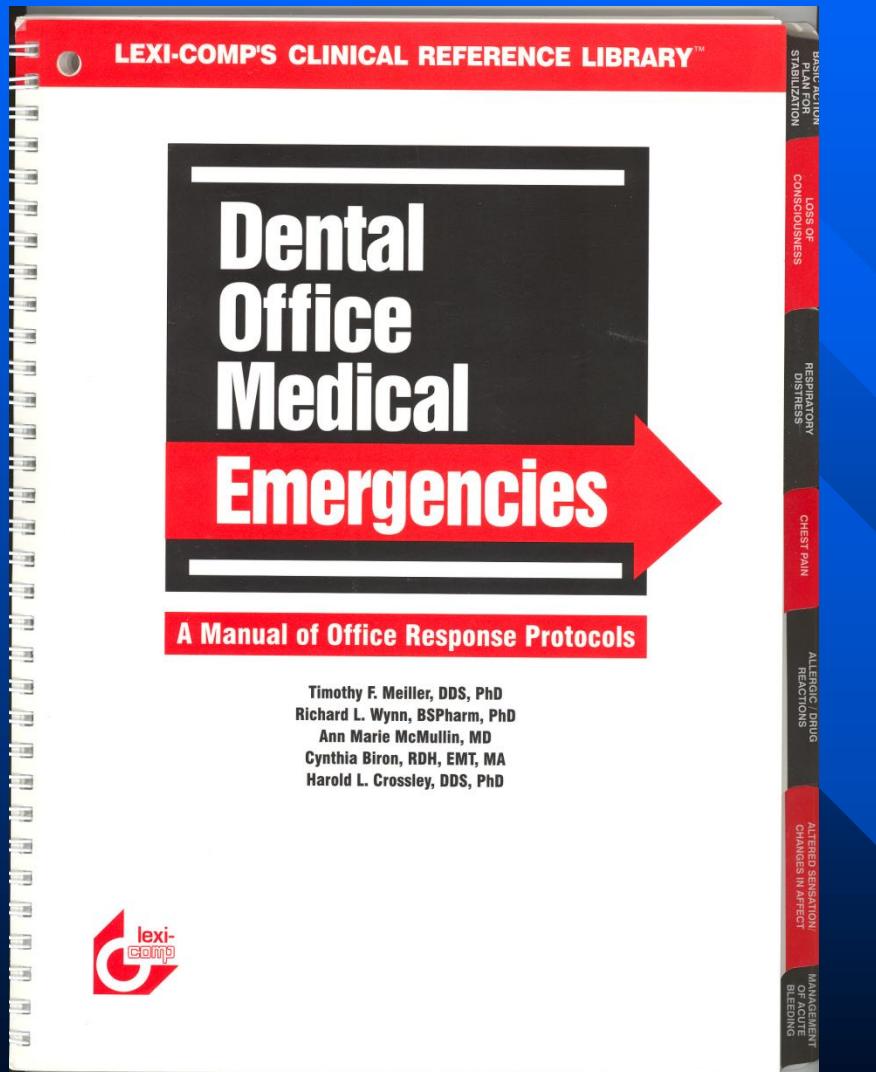


# Sedation and Emergency Management

# Emergency Prevention

- **Be prepared**
  - Know how long it takes EMS to get to your office
  - Offer to practice drills with local EMS team
  - Practice, practice, practice emergency drills with your staff
- The practitioner must have the training, skills, and equipment to identify and manage emergency events until either assistance arrives or the patient returns to the intended level of sedation without airway/cardiac complications

# TEXT BOOKS



# BLS

- The starting point of all emergency treatment (ABCs)
  - Airway
  - Breathing
  - Circulation
- Supplemental oxygen is **always** good

# Requirements for Conscious Sedation in Tennessee

## Limited or Comprehensive

- **Written protocols** to manage emergencies must be established by the dentist
  - Laryngospasm
  - Bronchospasm
  - Emesis/aspiration
  - Airway occlusion by a foreign body
  - Angina pectoris/myocardial infarction/hypertension
  - Hypotension/syncope
  - Allergic reactions
  - Convulsions/seizures
  - Hyperventilation/hypoventilation

# Emergency Equipment Required By TN

- Equipment and Emergency drugs must be present and readily available for use
- If treating children, you must have appropriate sizes
  - Positive pressure oxygen delivery system
  - Oral and nasal airways of various sizes
  - Blood pressure cuff and stethoscope
  - AED (cardiac defibrillator)
  - Laryngoscope with current batteries
  - Intubation forceps and endotracheal tubes
  - Tonsillar suction tips
  - Back up suction and lighting system
  - Appropriate syringes (ie. to administer reversals)
  - Pulse oximeter for monitoring
  - Anesthesia equipment should be inspected each day it is used and in TN: a log recording the inspection and its results should be kept

# AED

- In TN – “Any person/entity which acquires an AED shall register the existence and location of the defibrillator with the emergency communications district or the ambulance dispatch center of the primary provider of emergency medical services the AED is to be located.”
  - TN Code Annotated, Automated External Defibrillators, 68-140-703 (2)

# Emergency Drugs Required By TN

- Epinephrine
- Atropine
- Lidocaine
- Antihistamine (Benadryl)
- Bronchodilator (Albuterol)
- Anti-hypoglycemic agent (Glucose)
- Vasopressor
- Corticosteroid
- Anti-convulsant (Diazepam or other benzodiazepine)
- Reversal agents (Naloxone and Flumazenil)
- Nitroglycerine

# Most Common Sedation Related Emergencies

- Airway Related Emergencies
  - Obstruction/Foreign Body
  - Bronchospasm/Asthma Attack
  - Laryngospasm
  - Hypo/Hyperventilation
- Emesis/Aspiration
- Angina Pectoris/MI
- Allergic Reactions
- Convulsions/Seizures

# Clinic Management of Medical Emergencies

- P Position
- A Airway
- B Breathing
- C Circulation
- D Drugs and/or definitive care

# Airway Obstruction

## ■ Symptoms

- Choking, gagging
- Violent expiratory effort
- Substernal notch retraction
- Cyanosis
- Labored breathing
- Tachycardia progressing to bradycardia
- May progress to respiratory and cardiac arrest

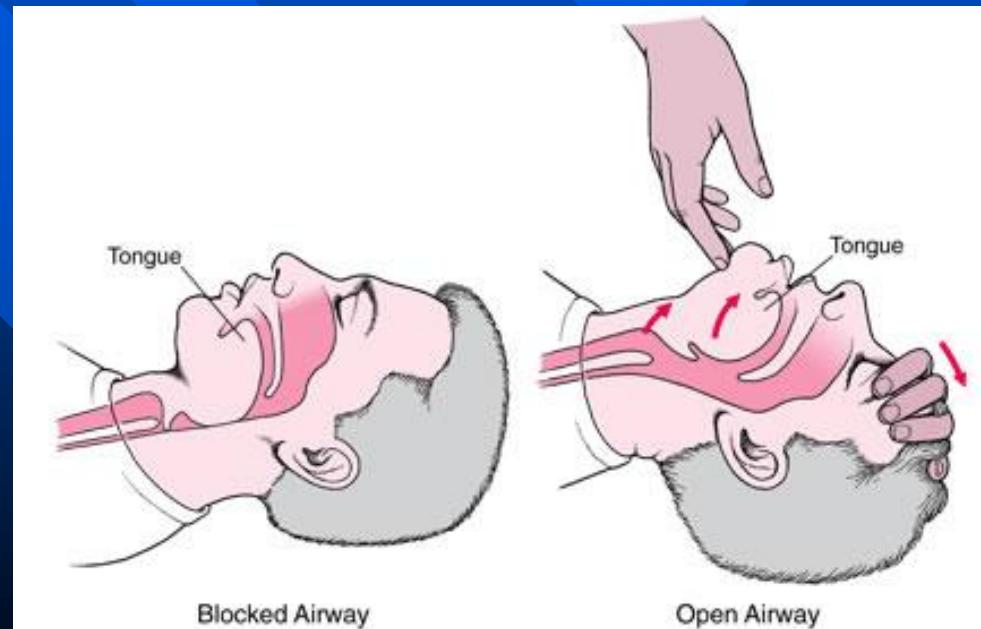
# Airway obstruction

## ■ Treatment

- Patient placement- upright/semi-reclining
- Airway/breathing- Heimlich maneuver until airway is clear or patient loses consciousness; try to clear airway manually or with suction
- If patient loses consciousness
  - » Call EMS
  - » Place supine on hard surface
  - » Open airway via headtilt: try to ventilate
  - » Abdominal thrusts

# Upper Airway Obstruction

- Most common cause is head position
- Airway needs to be open so that administered oxygen can diminish hypoxia
- Head tilt, chin lift



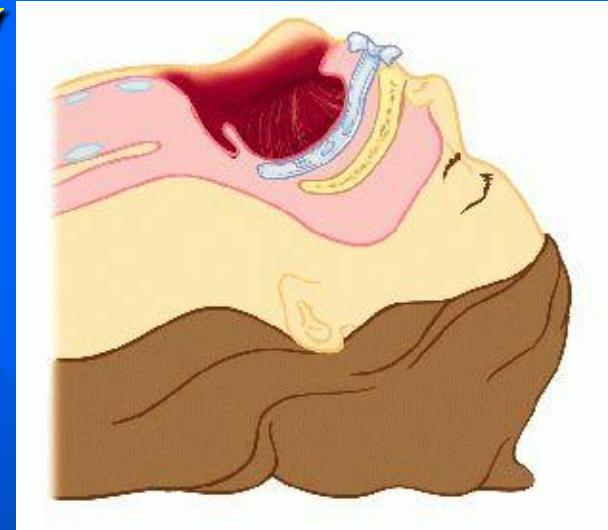
# Managing Airway Obstruction

- Most common cause of airway obstruction is posterior displacement of the tongue (snoring sound) as muscle tone is lost – reposition the patient, pull the tongue forward

Sound	Probable Cause	Management
No respiratory efforts	Apnea	Controlled ventilation (PPO)
Exaggerated respiratory efforts	Complete obstruction	<ol style="list-style-type: none"><li>1. Head-tilt/chin-lift</li><li>2. Anterior displacement of tongue</li><li>3. Suctioning</li><li>4. Abdominal thrusts</li><li>5. Cricothyrotomy</li></ol>
Snoring	Soft tissue/tongue displaced posteriorly	<ol style="list-style-type: none"><li>1. Head-tilt/chin lift</li><li>2. Ant displacement of tongue</li></ol>
Gurgling	Fluid in airway	Pharyngeal suction
Wheezing	Bronchospasm (like in asthma)	Administer bronchodilator



# Oral Airway



- **Correct size = one that measures from the corner of the mouth to the tip of the earlobe**
- Open the patient's mouth using the cross-finger method, placing your thumb on the patient's bottom teeth and your index finger on the upper teeth, then push apart – with the patient's mouth open as wide as possible. **Begin inserting the airway upside down with the curvature toward the tongue to prevent pushing the tongue back into the pharynx.**
- Avoid dislodging teeth/damaging the mouth.
- **When the airway reaches the back of the tongue, rotate the device 180 degrees.** The tip should point down as it approaches the posterior wall of the pharynx, and the curvature should follow the contour of the roof of the mouth.
- **If the patient gags or appears to be gasping for air after insertion, remove airway immediately. Recheck the size before attempting reinsertion.**

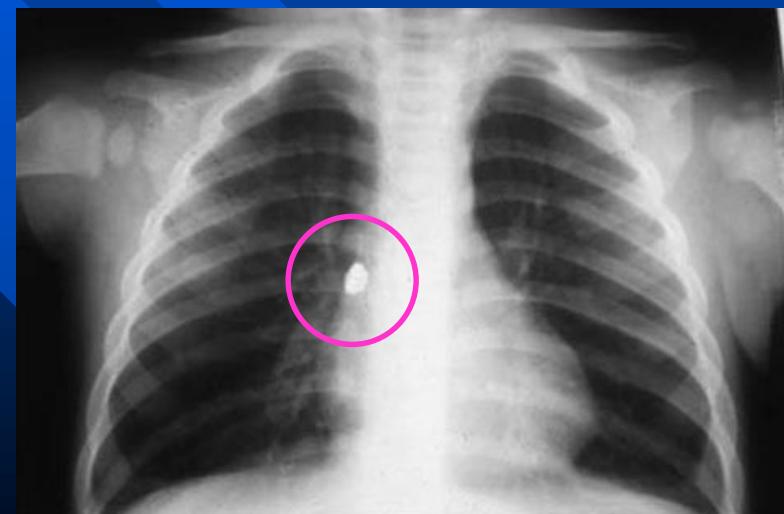
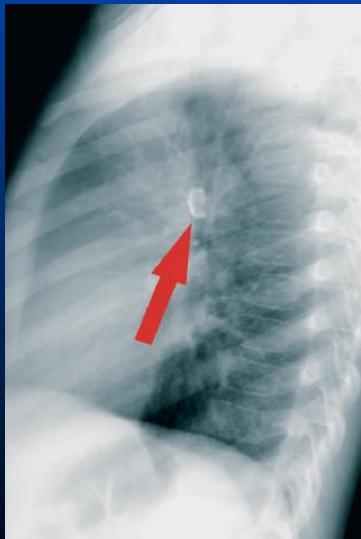
# Nasal Airways



# Managing Foreign Body Aspiration

- Use a **rubber dam\***
- Remove obstructive object (no blind finger sweep)
- Suction
- Abdominal thrusts
  - If child becomes unconscious, attempt ventilation with bag-mask

\*Adewumi and Kays. *Pediatr Dent.* 2008 Jan-Feb;30(1):59-62.  
Stainless steel crown aspiration during sedation in pediatric dentistry.



# Asthmatic attack/Bronchospasm

## ■ Symptoms

- Labored breathing
- Wheezing
- Bronchospastic cough
- Anxiety

# Asthmatic attack/Bronchospasm

## ■ Treatment

- Patient placement- upright or where patient is comfortable
- Airway/breathing- maintain open airway; oxygen 4-6L/min; breathe for patient prn
- Circulation- monitor pulse and BP; proceed with CPR prn
- Additional management- administer bronchodilator (Albuterol via metered dose inhaler 2-4 puffs initially, may repeat after 10-20 min)

# Managing Asthma Attack

- Sit pt upright; admin O<sub>2</sub>

- Use patient's inhaler

- If pt didn't bring inhaler:

Admin albuterol 4-8 puffs inhaled every 20 minutes  
as needed with spacer (albuterol is a bronchodilator)

- If bronchodilator not successful:

admin epi 1:1000  
.01mg/kg IM/SubQ  
every 15 mins



# Using the Albuterol Inhaler

- 1. Shake inhaler well before each puff
- 2. Remove cap from mouthpiece
- 3. Breathe out fully through mouth
- 4. While breathing in fully and slowly through mouth depress the top of the metal cannister
- 5. Hold your breath as long as possible
- 6. Wait 1 min., shake inhaler and repeat steps 3-5

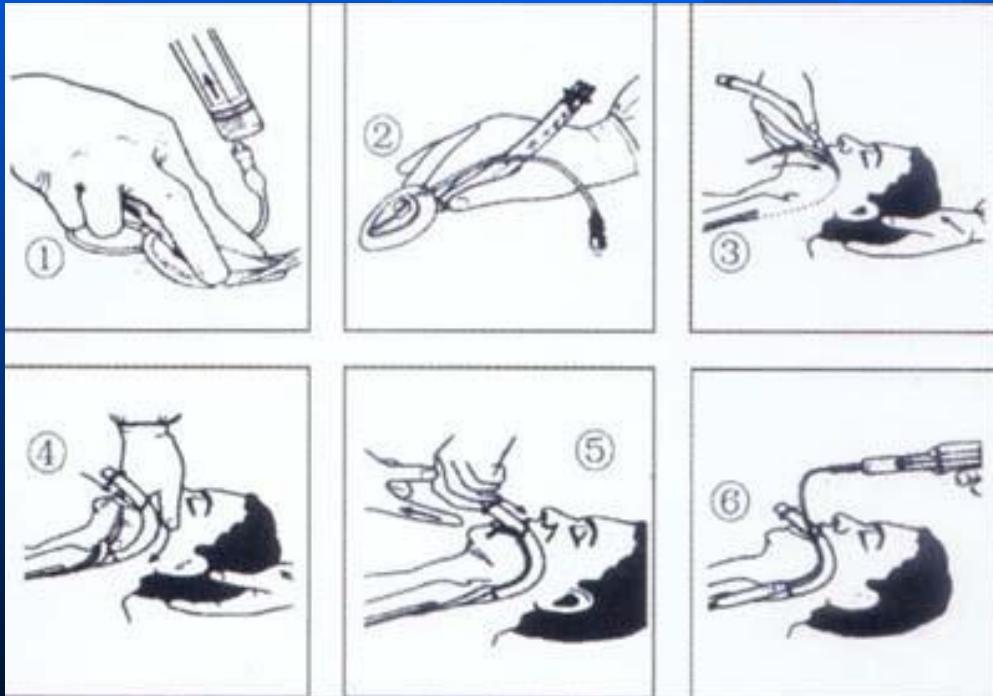
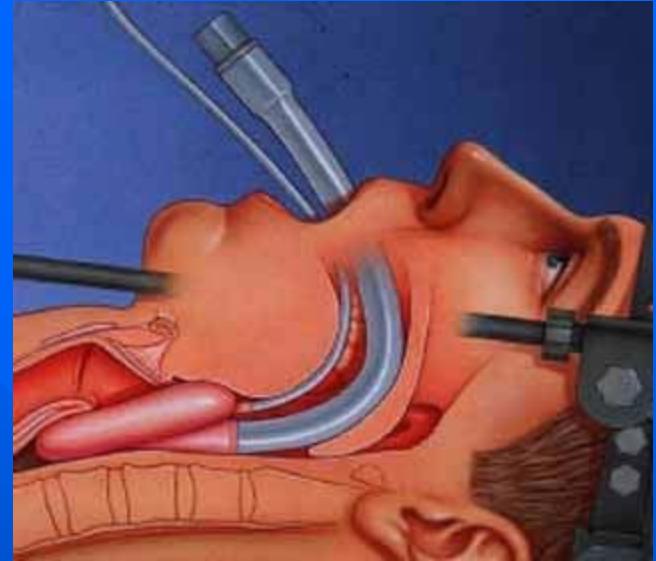


# Laryngospasm

- Extraordinarily uncommon in conscious sedation
- Due to secretions, fluids, foreign bodies in posterior pharynx
  - Suction, Rubber Dam, Gauze Screen
- Administer oxygen
- Displace the tongue
- Evaluate the airway (suction fluids)
- Positive pressure oxygen
  - If PPO doesn't break, desaturation will eventually



# LMA VS. Intubation



The LMA was designed for “field” workers who didn’t regularly intubate – less technically difficult to secure an airway than intubation

## Technique

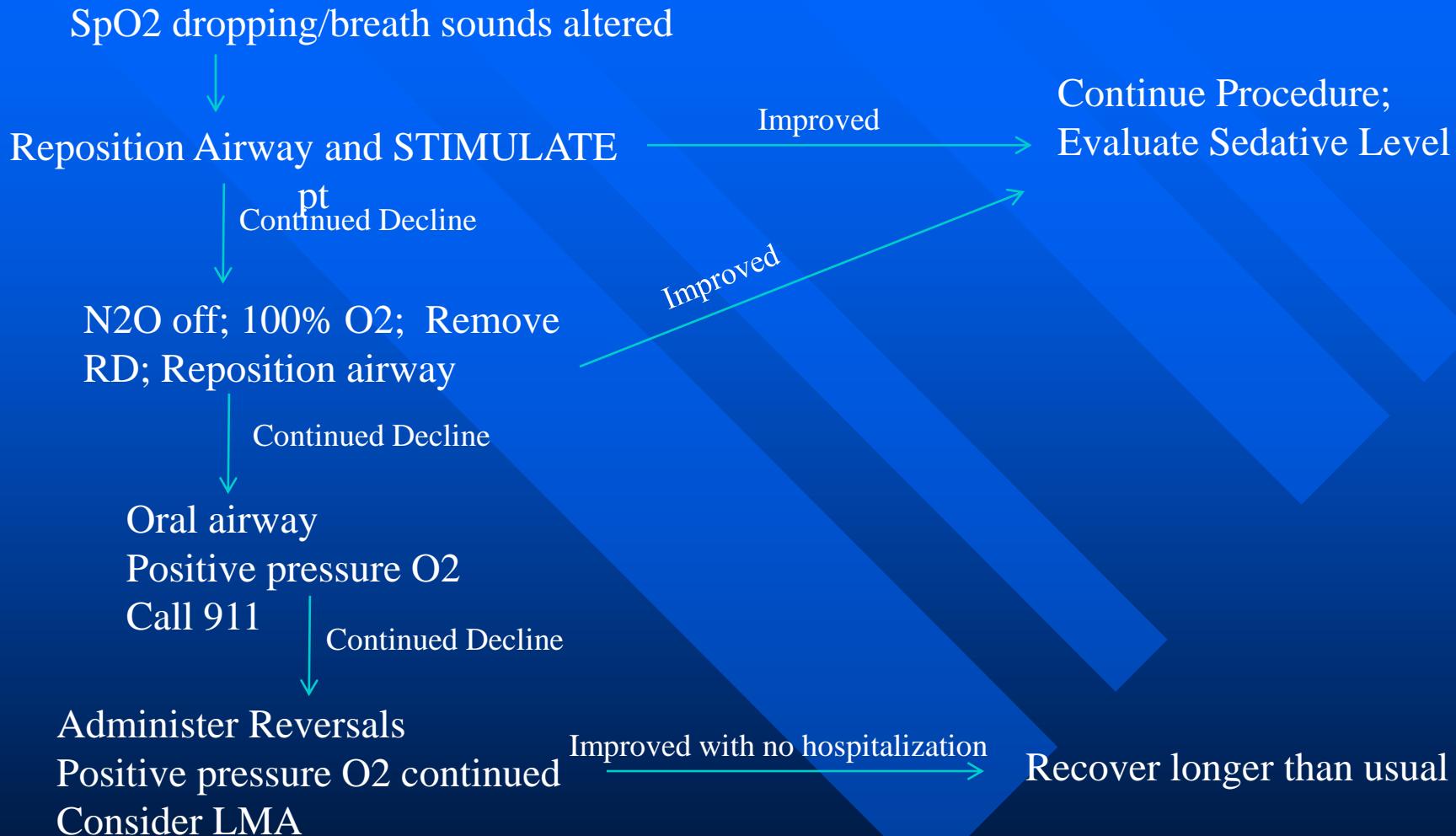
1. Attach syringe and deflate
2. Lubricate well
3. Insert with opening facing tongue
4. Once posterior to tongue, inflate
5. Ventilate with bag mask

# Managing Hyperventilation

- Calm patient
- Rebreath own air:
  - Pt cups hands in front of mouth and nose and rebreathes
- Slow breathing – pinch one nostril and breathe through the nose using only one nostril or breathe through pursed lips to slow breathing down to about one breath every five seconds.
- Paper bag no longer recommended



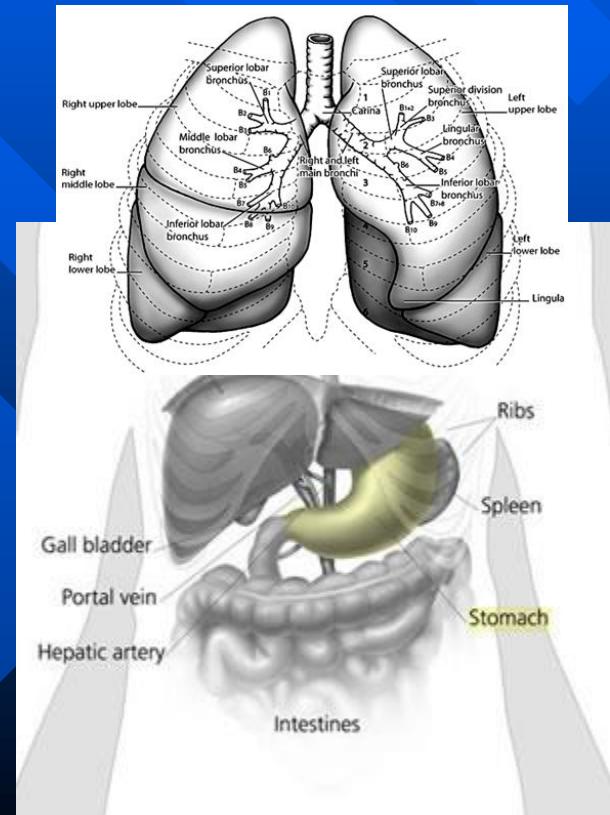
# Flow Chart for Managing Airway Emergencies



# Managing Emesis

- When protective airway reflexes remain intact, aspiration of vomitus is unlikely
- Pt should be rolled onto **left** side (most likely away from you) – if papoosed, roll whole board while asst attempts to unwrap
- Suction

The position is called the left lateral recumbant for EMTs; left side due to anatomy of lungs (angled right stem, straighter left stem) and curvature of stomach (curves to the left, so vomit would have an extra curve to overcome and so contents won't be pushing against sphincter)  
If you forget which side, it doesn't really matter as long as the airway is protected



# Angina pectoris

## ■ Symptoms

- Pain involving chest, upper extremities, neck, or jaws that is crushing in nature
- Shortness of breath
- Nausea and vomiting
- Pain usually lasts 3-5 min.
- Pain diminishes when physical or emotional stress ends

# Angina pectoris

## ■ Treatment

- Patient placement- upright or semi-reclining
- Airway/breathing-administer oxygen 4-6L/min. via nasal cannula
- Circulation- monitor pulse and BP; proceed with CPR prn
- Additional management- administer nitroglycerine 0.2-0.6 mg sublingually (may be repeated q 5min. times 3 doses); if no improvement, episode is considered an MI until proven otherwise (activate EMS)

# Myocardial infarction

- Symptoms- same as angina
- Treatment
  - Patient placement- upright/semi-reclining
  - Airway/breathing- activate EMS; proceed with CPR, oxygen 4-6 L/min via nasal cannula or 15 L/min via face mask
  - Circulation-monitor pulse and BP; CPR if necessary
  - Additional management- nitroglycerine as above; ASA 160-325mg chewed and absorbed in mouth; monitor VS, CPR until EMS arrives

# Myocardial infarction

## ■ Treatment- call MONA

- Morphine
- Oxygen
- Nitroglycerine
- Aspirin

# Allergic reaction

## ■ Symptoms

- Red eruptions on face, neck, and extremities
- Itching

## ■ Treatment

- Patient placement- upright/semi-reclining
- Airway/breathing- administration of oxygen not necessary
- Circulation- monitor pulse and blood pressure
- Additional management- administer benadryl 25-50 mg po, continue 25-50 mg every 6-8 hrs for 3 days

# Anaphylactic shock

## ■ Symptoms

- Itching
- Labored breathing
- Hypotension
- Cyanosis
- Sometimes angioneurotic edema
- Progressing to respiratory and circulatory failure

# Anaphylactic shock

## ■ Treatment

- Patient placement- supine
- Airway/breathing- administer oxygen and ventilate manually prn
- Circulation-monitor vital signs
- Additional management
  - » Epinephrine 0.3-0.5 ml 1:1000 SL/SC/IM
  - » For bronchospasm or laryngospasm-Albuterol inhaler, 2-4 puffs initially, may repeat in 10-20 min
  - » Benadryl
  - » Possible steroids
  - » Cricothyroidotomy

# Managing Allergic Reactions

- HIVES: diphenhydramine (Benadryl®)
  - 1mg/kg PO up to 50 mg
- ANAPHYLAXIS:
- Epi 1:1000
  - 0.01 mg/kg every 5 mins until recovery or help arrives
- Epi Pen Jr. (0.15 mg epi) –for child 10-30 kg (20-65 lbs)
- Epi Pen (0.30mg epi) for child over 30kg (over 65 lbs)



# Syncope

## ■ Symptoms

- Anxiety
- Diaphoresis
- Initial tachycardia slowing to bradycardia as event progresses
- Decreased BP
- Loss of consciousness

# Syncope

## ■ Treatment

- Patient placement- Trendelenberg
- Airway/breathing- Maintain open airway; oxygen 4-6 liters/minute via nasal cannula
- Circulation- Monitor pulse and blood pressure
- Additional management- ammonia ampule; cold compress on forehead or back of neck

# Managing Seizure

- Recline patient or move to floor
- Support airway by repositioning if necessary
- Call 911
- If status epilepticus: Diazepam
  - IV dose
    - » child up to 5: 0.2-0.5 mg every 2-5 mins; max 5 mg
    - » Child 5 and up: 1mg every 2-5 mins; max 10 mg
  - What's practical for us?
    - » IM midazolam: 0.5mg/kg up to 15 mg
      - Not heavily supported by literature\*
    - » INH midazolam: 0.2 mg/kg every 3-5 mins

\*Shah and Deshmukh. Indian Journal of Pediatrics, Volume 72—August, 2005, pg667-670.

The mean interval to cessation of convulsions with IM midazolam was 97.22 seconds whereas in diazepam group without prior IV access it was 250.35 seconds and in diazepam group with prior IV access it was 119.4 seconds. IM midazolam acted faster in all age groups and in patients with febrile convulsions, which was statistically significant. IM midazolam was equally effective in various types of convulsions be it GTC or focal convulsions. 7 patients (10.8%) had thrombophlebitis associated with IV diazepam administration whereas none of the patients in the midazolam group had any side effects, which was statistically significant

# Seizure

## ■ Treatment

- Patient placement- supine; prevent from falling or injuring self
- Airway/breathing- maintain open airway; administer oxygen by mask; suction prn
- Circulation- monitor vital signs
- Additional management- loosen clothing; ensure patient safety; support respiration prn; active EMS if condition deteriorates

# Intranasal Route for Seizure Mgt

- Is intranasal midazolam an effective rescue medication in adolescents and adults with severe epilepsy?  
Scheepers M, Scheepers B, Clarke M, Comish S, Ibitoye M.  
Seizure. 2000 Sep;9(6):417-22.
  - “This field trial confirms that IN mid is effective at terminating prolonged seizures . . .  
**The IN route has been demonstrated to be accessible, acceptable, and apparently free of adverse experiences and complications.”**
- A comparison of midazolam nasal spray and diazepam rectal solution for the residential treatment of seizure exacerbations.  
de Haan GJ, van der Geest P, Doelman G, Bertram E, Edelbroek P.  
Epilepsia. 2010 Mar;51(3):478-82. Epub 2009 Oct 8.
- Intranasal midazolam vs rectal diazepam in acute childhood seizures.  
Bhattacharyya M, Kalra V, Gulati S.  
Pediatr Neurol. 2006 May;34(5):355-9.
- Effects of intranasal midazolam and rectal diazepam on acute convulsions in children: prospective randomized study.  
Fişgin T, Gurer Y, Teziç T, Senbil N, Zorlu P, Okuyaz C, Akgün D.  
J Child Neurol. 2002 Feb;17(2):123-6.
- Comparison of intranasal midazolam with intravenous diazepam for treating febrile seizures in children: prospective randomized study.  
Lahat E, Goldman M, Barr J, Bistritzer T, Berkovitch M.  
BMJ 2000;321:83-6.

# Anesthetic Overdose

## ■ Signs/Symptoms

- Initial CNS excitement
- Then CNS depression
- Rapid pulse
- Anxiety
- Confusion
- Rapid breathing
- Seizures

## ■ Treatment

- Mild
  - Oxygen
  - Monitor vital signs
- Severe
  - Activate EMS
  - Maintain airway
  - Manage seizures
  - CPR

# ADA maximum daily dosage recommendations for Lidocaine/Mepivacaine

2 mg/pound

up to a maximum of 300mg

Weight	Mg dose
20	40
40	80
100	200
<u>150</u>	<u>300</u>
200	300

“If you are going to err, do it on the safe side”

# ADA Maximum Doses

- Lidocaine 2mg/lb up to 300mg/300mg=15ml=**8.3 cartridges @2%**
- Mepivacaine 2mg/lb up to 300mg / 300mg=10 ml=**5.5 cartridges @3%**
- Articaine 2mg/lb up to 300mg=7.5ml=  
**4.4 cartridges @ 4%**
- “Cardiac patient” 0.4mg epinephrine=4ml=  
**2.2 cartridges @ 1:100,000**

# Rule of 20

- You may safely use 1 carpule of any local anesthesia for every 20 lbs. of patient weight

# Local Anesthetic Toxicity

- Initial symptoms include tremors, muscle twitching, shivering, and convulsions. Following the initial phase, respiratory depression, lethargy, and LOC are possible. CV depression may induce hypotension. Hypoxia secondary to respiratory depression can rapidly produce acidosis leading to CV collapse, brain damage, and death
- Allergic rxns are extremely rare – urticaria can be treated with diphenhydramine; angioedema and respiratory depression = epi pen (not allergic to epi – it's an endogenous hormone; allergic to sulfite in preservative); sulfite reactions can also cause asthma-like signs like tachypnea, wheezing, and bronchospasm.

# Managing LA Toxicity

- PREVENT it by doing your calculations
- If it occurs, you must manage convulsions and respiratory depression
- If pt unconscious – use positive pressure O<sub>2</sub>
- Monitor vital signs
- If convulsions persist, use a benzodiazepine like in seizure management
- Seek immediate ER treatment (if pt hypoxic which leads to acidosis, pt may need IV sodium bicarb)

# **Epinephrine Reaction**

- **Signs/Symptoms**
- Rapid rise in Blood Pressure/Pulse
  
- **Treatment**
- Oxygen
- Monitor vital signs
- (may take 20 minutes to return to normal)
- Activate EMS for other symptoms- arrhythmia

# Managing Overdoses

- What does OD look like?
  - Somnolence (nonarousable sleeping)
  - Diminished reflexes
  - Respiratory depression
- Death from OD almost always results from respiratory arrest; cardiac almost always comes after hypoxia
- Steps of management:
  - Terminate treatment
  - ABCs
    - » Position patient supine legs slightly elevated
    - » Open airway with head tilt/chin lift
    - » Administer supplemental oxygen through nasal hood
      - If this doesn't immediately correct the breathing issue, have staff call EMS
    - » Monitor vital signs
    - » Administer reversals
    - » Have AED ready – cardiac follows respiratory

# Naloxone (Narcan)

- Pure antagonist that reverses sedative and analgesic properties of narcotics.
- Will not reverse hypotension
- Short  $t_{1/2}$  (1-2 hours) may result in repeated doses with longer acting narcotics
- Dosage (may be given subQ, IM, IV)
  - Adult dose-0.1-0.2 mg IV at 2-3 min intervals until desired result is obtained

# Naloxone

- PALS Dosing Schedule:

- IV Dose: 0.1mg/kg up to 2 mg/dose

- » IV route states to repeat (up to 2mg/dose) every 2 mins PRN; up to 10mg total

- Formulations: (\$25 for 10mL vial)

- 0.4 mg/mL vial at 1 mL or at 10 mL (4 mg)
  - 0.4 mg/mL prefilled syringe (\$3)



# Naloxone IM/SQ Calculation

$$0.1\text{mg/kg} \times \underline{\quad\text{kg}\quad} = \underline{\quad\text{mg}\quad} \div \underline{0.4\text{ mg/mL}} = \underline{\quad\text{mL}\quad}$$

- If pt weighs 20kg; you'll give the entire 2mg (5mL)
- If max total is less than 5mL, naloxone is only given once. If it is greater than 5mL, you can give remaining mLs every 4 minutes up to the calculated max total (but not to exceed 25mL (10mg) – this is the total mLs that can be given to an adult)
- Example: 15kg child and 25kg child
  - $0.1\text{mg/kg} \times 15\text{kg} = 1.5\text{mg} \div 0.4\text{ mg/mL} = 3.75\text{ mL}$
  - $0.1\text{mg/kg} \times 25\text{kg} = 2.5\text{mg} \div 0.4\text{ mg/mL} = 6.25\text{ mL} \rightarrow$  you'll give 5mL first dose, 1.25 mL second dose

# Flumazenil (Romazicon)

- Benzodiazepine antagonist
- Does not reverse the hypoventilation induced by the benzodiazepines
- Dosage
  - 0.2 mg IV initially and then 0.2 mg per minute to a maximum dose of 1 mg total given over a 5 min period

# Flumazenil

- Serum level of 10-30 ng/mL is needed for reversal
- Lowers seizure threshold
- Shorter half-life than BZDs; **concern for resedation**
  - recover longer if you gave reversal
- Dose
  - **the IV dose is 0.01mg/kg/dose up to 0.2mg/dose every minute up to 1mg**
- Formulations
  - 0.1 mg/mL vial at 10 mL (1 mg)
  - 0.1 mg/mL vial at 5 mL (0.5mg)



# Alternative Delivery Routes for Reversals

- Often in pediatric dental sedations, an IV line is not established and it is more practical for dentists who don't regularly place IVs to use alternative routes (Intranasal/Intramuscular).
- Studies conclude that the delay in response to submucosal (SM)/ intramuscular (IM)/ intranasal (IN) administration is compensated for by the time it takes to establish IV access
  - Heniff et al. Acad Emerg Med. 4: 1115-8: 1997;  
Comparison of routes of flumazenil administration to reverse midazolam-induced respiratory depression in a canine model
    - » Intramuscular – 5.17 minutes
    - » Sublingual – 4.37 minutes
    - » Intravenous – 120 seconds

# Other Routes for Reversals (IN/SM)

## ■ FLUMAZENIL:

- Scheepers et al. Plasma concentrations of flumazenil following intranasal administration in children. Can J Anesth, 2000; 47(2):120-124.
  - » 0.4mg per kg administered IN every 2 minutes, the mean plasma (blood) concentrations of flumazenil were similar to those attained with the IV route
- Unket et al, 2006, Ped Dent:
  - » Animal study, Submucosal route – injected flumazenil into the maxillary buccal molar region (approx 1.8ml) and found adequate reversal
- IM route not supported in the literature

## ■ NALOXONE:

- Barton et al. Efficacy of Intranasal Naloxone as a needless alternative for treatment of opioid overdose in the prehospital setting. J Emer Med;2005;29(3):265-271.
  - » IN 2mg – 1mg/mL in each nare; adults only
  - » IN naloxone is alternative for drug administration in prehospital setting with good overall effectiveness; several pts needed no IV access after IN admin; comparable times from arrival at patient's side to clinical response for IV and IN
- Wagner et al. Intravenous vs. subcutaneous naloxone for out of hospital management of presumed opioid overdose. Acad Emerg Med 1998;5:293-9.
  - » Concludes that delay in response to SQ admin was compensated for by the time it took to est IV access

# IN/SM Route Recommendations

- There are no recognized guidelines; these are recommendations based on published studies:
- **NALOXONE:**
  - IN/SM route **0.1mg/kg up to 2mg/dose; repeat every 4 mins**
  - IN naloxone often takes 4 minutes to arouse a patient  
Barton et al. Efficacy of intranasal naloxone as a needleless alternative for treatment of opioid overdose in prehospital setting. J Emer Med; 2005;29(3):265-271.
- **FLUMAZENIL:**
  - **IN/SM route 0.2mg; repeat every 2-4 minutes PRN**
    - » Because our children are at least 10kg, that would be a dose of 0.1mg and usually IM/IN doses are higher than IV so the recommendation is to double the IV dose which puts us at giving the max dose of **0.2mg/dose** and we need to **wait 2-3 mins for IN and possibly 4-5 mins for IM** before giving a second dose
    - » The presumed bioavailability of intranasally administered flumazenil is approx 50% (Scheepers et al, 1999. Intranasal flumazenil

# Intranasal Reversals

Drug	Response Time	Dosage
Naloxone	3 minutes	0.4mg/kg
Flumazenil	2 minutes	100 mcg (1mL) per nare (0.2mg total)

- **Divide medication and administer ½ in each nare** (Otherwise, due to the large volume of liquid, some medication will be absorbed via the GI tract and decrease it's bioavailability)
- Naloxone: can give up to 2mg/dose every 3-4 minutes
- Flumazenil: can repeat dose every 2 minutes up to 10 ml (1 mg)
- See case report: Intranasal flumazenil and naloxone to reverse over-sedation in a child undergoing dental restorations.  
Heard et al, Pediatric Anesthesia 2009; 19:795-799



# IM injections

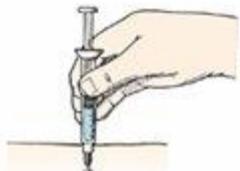
## How to Give an Intramuscular Injection



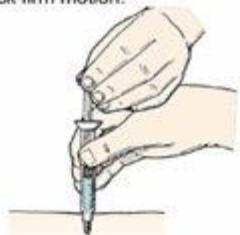
1. Use an alcohol swab to clean the skin where you will give yourself the shot.



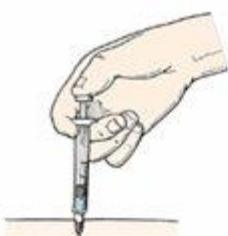
2. Hold the muscle firmly and insert the needle into the muscle at a 90° angle (straight up and down) with a quick firm motion.



3. After you insert the needle completely, release your grasp of the muscle.



4. Gently pull back on the plunger of the syringe to check for blood. (If blood appears, withdraw the needle and gently press the alcohol swab on the injection site. Start over with a fresh needle.)



5. If no blood appears, inject all of the solution by gently and steadily pushing down on the plunger.



6. Withdraw the needle and syringe and press an alcohol swab on the spot where the shot was given.



### Insulin injection sites:

- Outer arm
- Abdomen
- Hip area
- Thigh

A.D.A.M.

# **RECOVERY AND ADVERSE EVENTS**

# RECOVERY AND ADVERSE

## EVENTS

- Pt should be monitored until no longer at risk for cardiorespiratory depression
- A member of the staff must be able to observe the patient at all times during recovery
- **Continue monitoring** pt if not fully alert (move pulse ox with pt or have a separate one in the recovery room)

## Recovery Room Requirements

- Child who received **conscious** sedation must be recovered in a facility which has functioning suction and the capacity to deliver oxygen and positive pressure ventilation.  
(ie. put your “back up suction,” pulse ox and ambu bag on wheels)

# How long do we recover?

- The longer the half life of the drug, the longer you should recover
- AAPD: **Maintenance of wakefulness test (MWT)** – ability to stay awake for 20 minutes in a quiet, dim room
- 30 minutes after last administration of medication if no adverse effects have occurred\*
  - \*Newman et al, Ann Emerg Med. 2003 Nov;42(5):627-35.
    - Found that serious adverse effects rarely occurs after 25 minutes from the final medication administration (looked at 1367 sedations in ED)
    - Only 8% of all adverse events occurred after the procedure
    - All of the children who had a potentially serious postop adverse effect had had a similar effect earlier in the sedation
    - Concludes “discharge from the ED may be safe at approximately 30 minutes after final sedation medication administration if no adverse effects have occurred”

# Aldrete Recovery Score

Post Anesthesia Care Unit: <b>MODIFIED ALDRETE SCORE</b>					
Patient:	Final score:				
Room:	Surgeon:				
Date:	PACU nurse:				
Area of Assessment	Point Score	Upon Admission	After		
			1 h	2 h	3 h
<u>Muscle Activity:</u> Moves spontaneously or on command: • Ability to move all extremities • Ability to move 2 extremities • Unable to control any extremity	2				
	1				
	0				
<u>Respiration:</u> • Ability to breathe deeply and cough • Limited respiratory effort (dyspnea or splinting) • No spontaneous effort	2				
	1				
	0				
<u>Circulation:</u> • BP + 20% of preanesthetic level • BP ± 20%–49% of preanesthetic level • BP ± 50% of preanesthetic level	2				
	1				
	0				
<u>Consciousness Level:</u> • Fully awake • Arousalable on calling • Not responding	2				
	1				
	0				
<u>O<sub>2</sub> Saturation:</u> • Able to maintain O <sub>2</sub> sat >92% on room air • Needs O <sub>2</sub> inhalation to maintain O <sub>2</sub> sat >90% • O <sub>2</sub> sat <90% even with O <sub>2</sub> supplement	2				
	1				
	0				
Totals:					

Required for discharge from Post Anesthesia Care Unit: 7–8 points

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Time of release \_\_\_\_\_ Signature of nurse \_\_\_\_\_

# Recommended Discharge Criteria

- Cardiovascular function and airway patency are stable
- Pt is easily arousable; protective reflexes intact
- Pt can talk and sit up unaided (if age appropriate)
- For a very young child or child with special needs, the pre-sedation level of responsiveness or a level as close as possible to normal should be achieved
- Adequate hydration
  
- The future? Bispectral index monitoring – may eventually move from the operating room to the outpatient setting
  - Uses encephlogram to determine brain activity – has a numerical score of 0 (coma) to 100 (fully awake); can tell us when pt goes to a deeper level of sedation and can tell us when brain activity is sufficient for discharge

# Risk Factors for Adverse Events\*

- Very young patient (12 months and below)
- Sick patient (ASA 3 and higher)
- Non-hospital setting
- Inadequate rescue (after initial respiratory depression)
- Using multiple drugs
- Overdosing
- Inadequate monitoring
- Administering medications at home
- Premature discharge

\*Doyle and Colletti, 2006