Basic Considerations Of Sedating Children In The Dental Setting

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Emergency Management

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Challenge of Pediatric Dental Care

• Essence of our situation
  
  – Healthy children

  – Need for pharmacological management of the children is a minority incidence in our practice

  – Fewer opportunities for adjunctive support of other professionals

  – Training not directed toward frequent management of patients via deeper levels of sedation or GA

• Hence we focus on mild to moderate levels of sedation
Problem that arises

• Problem/issue
  – Very young children, on average, need deeper levels of sedation or GA
  – Older children with significant anxiety/fear also need “deeper” levels of moderate sedation

• Our common responses to these situations is to
  – extend the envelope of drugs, with hope of producing significant changes in children’s behaviors.

• Our response can lead to deeper levels of sedation where we are more likely to encounter sedation emergencies
Most Probable Sedation Emergencies

- Airway obstructions
  - Soft tissue blockage
  - Laryngospasms
- Respiratory depression
  - Hypoventilation
    - Hypercapnia
    - Hypoxemia
  - Apnea
  - Respiratory arrest
  - Bronchospasm
    - asthma
More Remote Sedation Emergencies?

- Cardiovascular depression
  - Local anesthesia toxicity
  - CNS depression
- Allergy-anaphylaxis w/laryngeal edema
- Hypoglycemia
  - Prolonged fastings
Unlikely Sedation Emergencies

• Cardiac arrhythmias
  – Higher doses of chloral hydrate?
  – Undiagnosed heart issues?
Emergency Management Summary Index

• Professionals performance associated with management of complex, rapidly unfolding situation

• Little or no direct educational training in preparing for performance of real life emergency

• Infrequency of practicing the performance of rescue

• Likelihood of continuing sedations or even practice subsequent to mismanagement of a significant adverse event (i.e., significant morbidity or mortality), albeit those events are relatively rare...but they do happen.
Incidence of Emergencies

• No central reporting except to ins. co. for liability issues

• No one knows the real answer for morbidity

• Mortality reports to state boards and are available

• Some practitioners do not recognize problems or choose not to acknowledge them
  – Think they are too minor
  – Practices are not consistent despite guidelines

• Published numbers are available, but these cases usually are extremes and outside of the envelope of sedation guidelines.
RESCUE

• The purpose of all emergency treatment is RESCUE or the ability to manage and stabilize the patient until help arrives

• 911 is not an adequate response to rescue a patient

• The office must have the resources and training necessary to perform the rescue from unintended sedation level changes

• Neither BLS nor PALS guarantees success

• By the time you get to the need for rescue, is it too late? Identification of an impending problem is key.

Stephen Wilson DMD, MA, PhD
Suggested Emergency Drugs*

- Oxygen E tank *
- Glucose (tablets, juice or insta-glucose)*
- Atropine (antidysrhythmic)*
- Epinephrine 1:1000 (1:2000), 1:10000*
- Phenylephrine (Neo-Synephrine 10mg)
- Diazepam*
- Succinylcholine
- Dopamine
- Isoproterenol

* AAPD guidelines
Suggested Emergency Drugs*

- Lidocaine (cardiac * and infiltration doses)
- Diphenhydramine HCl*
- Hydrocortisone*
- Albuterol inhaler*
- Aminophylline
- Ammonia spirits*
- Antagonists*
  - Naloxone
  - Flumazenil

*AAPD guidelines
Some Basics
Oxygen

• #1 drug of choice

• Room air 21% O₂

• Transported through blood stream
  – Attached to hemoglobin
  – Dissolved in serum

• 100% O₂
  – Saturates reserves to diminish chance of hypoxia
  – Prevents diffusion hypoxia
Bag-Valve-Mask

• Bag-valve-mask
  – Proper size mask for patient

  – “C” with index finger & thumb
    • Other fingers on lower border of mandible

  – Tilt head & pull jaw forward to the mask
    • Do not push mask down on face!!!
    • Two-handed technique actually requires 2 people

  – Compress bag and watch for elevation of chest
    • Do not squeeze rapidly and deeply on bag – stomach!!!
**Laryngeal Mask Airway**

- **LMA**
  - Proper size for child (1.5 – 3)
  - Slightly inflate cuff
  - Lubricate cuff with very thin layer of water soluble material
  - Insert into mouth with cuff “up”
  - Push into airway until LMA “seats” – inflate cuff a little more for seal
  - Attach airway tube to oxygen delivery system (i.e., ambu bag)
  - Deliver oxygen slowly and watch chest rise
Epinephrine

• #2 drug of choice

• Has 3 major actions
  – Bronchodilator (beta 2)
    • Used for bronchospasm
  – Vasoconstrictor (alpha)
    • Increases peripheral resistance
    • Increases blood pressure
  – Increases heart rate/myocardial contractibility/myocardial $O_2$ needs (beta 1)
Epinephrine

- Dose 0.01 mg/kg
  - Epipen > 25 kg
  - Epipen Jr. <25 kg
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 In Respiratory Emergency:
  ✓ Adult: 0.4mg IV/IM; Repeat to 2mg Total Dose
  ✓ Children: 0.1 mg/kg IV/IM
    • Repeat At Higher Doses As Needed To 2 mg Total Dose

● No Harm In Additional Doses

● Possibility for Re-narcotization Exists
Flumazenil - Romazicon®

- Can Consider IM, But.......
  - It’s Not FDA Approved
  - We Don’t Know the Proper Dose

- If **Starting** Dose is 0.01 mg/kg given IV
  - 20 kg Child = 0.2 mg
  - Probably better to start at 0.5 mg or more given IM route
Reverse Benzo *or* Opioid First?

The Opioid!!!

But, If You Need To Reverse, Reverse Everything You Can
Reversal Agents

● Must Monitor the Patient LONGER In Recovery Due To Possibility For Re-Sedation

● How Long???
  ✓ Most Hospital Protocols Recommend 2 Hours Observation
Can We Agree On The Premise That

Pediatric Dentists Don’t Often Start IVs.

Therefore............
IM Injection Technique
But Who Is Managing The Airway?!?!??!

Know Your Limitations & Plan Emergency Care Accordingly
To Defibrillate or Not to Defibrillate, That is the Question...

- Defibrillators
  - Manual or AED

- Hypoxia $\rightarrow$ bradycardia $\rightarrow$ asystole
  - Not primary cardiac problem
  - Shocking the hypoxic heart doesn't help much

- If purchasing check for
  - Progressive power
  - Biphasic: converts 90%
    - monophasic: 40%
  - Kid sized pads
  - User friendly
Airway Obstruction
Anatomy of possible obstruction sites

• Upper airway
  – Most likely, the tongue and/or tonsils & adenoids

• Tracheal airway
  – Most likely, a foreign body
  – Allergic reaction (laryngeal edema)
  – Laryngospasm

• Lower airway
  – Bronchospasm
  – Stiff chest syndrome
Aids To Opening Airway

• Routine manipulations
  – Chin lift, head tilt
  – Shoulder rolls
  – Suction

• Definitive procedures
  – Oral & nasal airways
  – Laryngeal Mask Airway (LMA)
  – Endotracheal intubation
Allergy

• Mild
  – Diphenhydramine (25 – 50 mg)

• Moderate/Severe (anaphylaxis)
  – Bag value mask with 100% oxygen
  – Epinephrine (0.01 mg/kg)
Laryngospasm

• Causes during sedation
  – Secretions
  – Aerosol debris
  – Foreign body
  – Unconscious

• Signs
  – Rocking chest/abdominal wall
  – No sound or high pitched “ee”
Laryngospasm Treatment

- Bag valve mask & 100% oxygen
  - Continuous gentle pressure

- Laryngospasm notch stimulation

- Succinylcholine
Bronchospasm – not expected in our selection of patients to sedate

• Causes
  – Anaphylactic/anaphylactoid reaction
  – Laryngeal edema
  – Hyperactive airway (asthma)

• Treatment
  – Bag-value-mask & 100% O₂
  – Albuterol via metered inhaler
Asthmatic Attack
Asthmatic Episode

- Associated With Nasal Polyps/ASA Sensitivity
- Difficulty Breathing, Wheezing
- Short Inspiration, Long Expiration
- Can Be Mild or Life Threatening
- Usually Patients Are Aware of Asthma History When Coming to Dental Office
- Patient Should Bring Albuterol Inhaler to All Appointments
Acute Asthmatic Episode - Treatment

• β2 Inhaler – Albuterol
  – Less CV Stimulation Than Epinephrine

• Supplemental O₂

• Vital Signs

• If Severe, Activate EMS

• Epinephrine 0.01 mg/kg (Max 0.3mg) IM If Potentially Life Threatening
  – > 20 - 30 kg = EpiPen
  – < 20 - 30 kg = EpiPen Jr.
ALLERGY and ANAPHYLAXIS
Allergy and Anaphylaxis

• Mild Allergic Reaction
  ✓ An immunoglobulin mediated attack on an antigen (allergen) incl. latex, tape, drugs
    • IgE mediated
  ✓ Usual response is histamine mediated including rash, itching, sneezing, conjunctivitis, possibly localized hives
  ✓ Immediate v. delayed (onset is >60 min)
  ✓ Usually involves skin and mucosa
Allergies and Anaphylaxis

- **Anaphylaxis**
  - Acute multisystem allergic response to various antigens
  - Usually prior exposure, then allergic response
  - IgE and IgG4 antibodies with histamine and vasoactive mediators released
  - Urticaria, tachycardia, swelling, hypotension, nausea, bronchospasm, shock, laryngeal edema, DEATH
  - Requires immediate response and activation of EMS for transport
Mild Allergic Reaction Treatment

- Diphenhydramine 25-50mg IM (PO)
  - Consider IM corticosteroid
    - e.g., methylprednisilone 1 – 2 mg/kg
- Monitor patient for symptom progression
  - Activate EMS if necessary
- Discharge with PO antihistamine/corticosteroid
Anaphylaxis Treatment

- Activate EMS!!! This is the real deal
- Airway
  - ✓ 100% O₂ & support as needed
- Circulation
  - ✓ Early has tachycardia
  - ✓ Late has tachycardia and hypotension
  - ✓ Monitor and support as needed
- Definitive
  - ✓ Epinephrine 1:1000, 0.01 mg/kg IM (max 0.3mg/dose)
  - ✓ Repeat q5m; Yes, this often
  - ✓ Diphenhydramine 25-50mg IM/Corticosteroid IM OK
  - ✓ Start IV if possible
Allergies and Anaphylaxis

Anaphylaxis is one of the few emergencies when you **HAVE TO** give a drug and you have to give it **NOW**!

General rule

- **NO** airway involvement
  - Diphenhydramine

- Airway involvement and/or systemic swelling
  - Epinephrine

- Transport
Allergy & Sedation

- Remember that every time you administer Diphenhydramine, you are prolonging and deepening sedation.

- Watch your airway!
Seizure
Seizure Disorders

- Convulsions Associated With Abnormal Neuronal Discharge – Epilepsy

- May Be Associated With Skeletal Muscle Contractions

- Usually Altered or Lost Consciousness

- May Occur In Association With:
  - Local Anesthetic Overdose
  - Hypoglycemia
  - Syncope
  - Hyperventilation
Seizures - Treatment

• BLS - Airway, Airway, Airway

• Supplemental $O_2$

• Place Supine - Protect Patient From Injury

• No Feet Elevation - $\uparrow$ BP

• Status Epilepticus
  – IM/IN Midazolam 0.2 mg/kg (Max 10 – 15mg)
  – IV Diazepam 0.1mg/kg; Titrate

Local Anesthetic Overdose Can Cause Seizures
LOCAL ANESTHETIC OVERDOSE
Local Anesthesia Overdose

Prevention

- Avoid polypharmacy

- Use lowest doses needed

- Do not exceed max. recommended doses
  - Narcotics & other sedatives decrease respirations
  - Seizure threshold lowered in acidosis
  - Cerebral blood flow increased

- Infiltration instead of blocks to avoid intravascular injection

- Use epinephrine
<table>
<thead>
<tr>
<th>Drug (with vc)</th>
<th>Max dose (mg/kg)</th>
</tr>
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<tbody>
<tr>
<td>Articaine</td>
<td>7</td>
</tr>
<tr>
<td>Bupivacaine</td>
<td>3</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>7</td>
</tr>
<tr>
<td>Mepivacaine</td>
<td>6.6</td>
</tr>
<tr>
<td>Mepivacaine (no vc)</td>
<td>5</td>
</tr>
<tr>
<td>Prilocaine</td>
<td>8</td>
</tr>
</tbody>
</table>

Lower Doses for Oral Sedation??  Additive CNS Depressant
Signs of CNS Toxicity

- **Low**
  - Sedation
  - Analgesia
  - Antiarrhythmic

- **Intermediate**
  - Lightheadedness
  - Slurred speech
  - Drowsiness
  - Euphoria/dysphoria
  - Diplopia
  - Sensory disturbances
  - Muscle twitching
Signs of CNS Toxicity

**High**
- Disorientation
- Tremors
- Respiratory depression
- Tonic/clonic seizures

**Lethal**
- Coma
- Respiratory arrest
- CVS collapse
Local Anesthesia Overdose - Treatment -

● **Position**
  - ✓ Supine in the unresponsive, sedated patient
  - ✓ Neck/shoulder roll

● **Airway**
  - ✓ Usually adequately maintained
  - ✓ Follow precautions for hypoxia

● **Breathing**
  - ✓ Usually maintained
  - ✓ May be depressed or absent
    - • Bag/mask/valve
  - ✓ 100% O$_2$ to prevent hypoxia, hypercapnia and acidosis
Local Anesthesia Overdose

● Circulation
  ✓ Usually adequately maintained
  ✓ Hypotension and tachycardia require BLS intervention

● Definitive
  ✓ EMS activation with transport and observation
  ✓ Intralipid?
Hypoglycemic Shock

Insulin Dependent Diabetic vs. Non-Insulin Dependent Diabetic vs. Non-Diabetic
Hypoglycemic Shock

- Patient Will Be Cold, Sweaty, Shaky and Will Appear Disoriented, Confused, or Not Respond Appropriately to Questioning

- Immediate Sugar Intake Critical - Regular Soda, 4 Sugar Packets, 10 Lifesavers (10 – 15gms Glucose)
  - Complex Carbs Not As Good, e.g., Candy Bar

- If Patient Becomes Unconscious → BLS → EMS
  - Vital Signs Likely Acceptable
  - Glucose Paste?

- If Serious Emergency Situation
  - If IV Access Available: IV Dextrose (D50W) or
  - If No IV Access Available: IM Glucagon 1mg or
  - IM Epinephrine 0.3mg (Careful: CV Consequences)
Syncope
Syncope

- Vasovagal Syndrome

- Rare in young children especially if supine
  - Suspect cardiac disease

- More likely in teenagers

- Exacerbated by fasting: lower fluid volume

- Place patient in Trendelenberg position

- Open the airway and assess breathing

- Administer O₂ if necessary

- Dismiss when comfortable, alert, awake and VSS

- The patient just asked you for sedation!
Questions???