Avoiding Emergencies Under Sedation

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Murphy’s Law

Anything that can go wrong, will go wrong

Murphy was an optimist

O’Toole’s Corollary

Things Happen!
Things Happen!

...and when they do, you don’t want to be caught without a paddle

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Life-Threatening Reactions
Factors Increasing Their Likelihood
- Increase in geriatric patient population
- Medical advances prolonging life expectancy
- Increased availability of drugs
- Lengthened patient appointments

Avoiding Medical Emergencies
- Recognition of contributing factors
- Obtaining a thorough medical history
- Educating staff and conducting drills
- Maintaining an appropriate emergency kit
- Planning an appropriate anesthetic course

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Characterization of Emergencies

Non-cardiovascular
- stress related
- non-stress related

Cardiovascular
- stress related
- non-stress related

Anesthesia related
- respiratory
- cardiovascular
- other
Non-Cardiovascular Emergencies

- Stress related:
  - vasodepressor syncope
  - hyperventilation syndrome
  - epilepsy
  - acute adrenal insufficiency
  - thyroid crises
  - asthmatic

- Non-stress related:
  - orthostatic hypotension
  - anaphylactic reactions
  - hypoglycemia
  - asthma

Cardiovascular Emergencies

- Stress related:
  - angina pectoris
  - acute myocardial infarction
  - heart failure
  - cerebral ischemia
  - cerebral infarction

- Non-stress related:
  - acute myocardial infarction

Anesthesia Related

- Respiratory
  - airway obstruction
  - laryngospasm
  - bronchospasm
  - emesis/aspiration
  - hyperventilation
  - respiratory depression/cessation

- Cardiovascular
  - syncope
  - hypertension
  - hypotension
  - angina pectoris
  - cardiac dysrhythmias
  - myocardial infarction
  - cardiac arrest

- Other
  - local anesthetic toxicity
  - allergic reactions
  - seizures
  - hypoglycemia
  - malignant hyperthermia
  - venipuncture complications
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“...the most important aspect of nearly all medical emergencies in the dental office is to prevent, or correct, insufficient oxygenation of the brain and heart. Therefore the management of all medical emergencies should include ensuring that oxygenated blood is being delivered to these critical organs. This is consistent with basic cardiopulmonary resuscitation, with which the dentist must be competent.”

Overall Goals in the Treatment of Emergencies

- Deliver O2 to heart and brain
- Deliver glucose to brain
- Overall management of medical emergencies
Hypoxia

- A deficiency of oxygen in the body's tissues
- Which can result in:
  - Dysrhythmias
  - Cardiac arrest
  - Brain damage
  - Death

Therefore, the airway must always be maintained and breathing uncompromised for life to be sustained.

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Emergencies Involving the Tracheobronchial Tree and Alveoli

- Tongue Obstruction
- Foreign Body Obstruction
- Acidic stomach contents
- Emesis and Aspiration
- Laryngospasm
- Bronchospasm
- Respiratory Depression*

Airway Assessment Algorithm

Assess Airway

- Breathing
  - Unobstructed
  - Obstructed
  - Foreign Body
  - Laryngospasm
  - Bronchospasm
  - Respiratory Depression*

Assess Breathing

- Drug Induced:
  - Narcotic
  - Benzodiazepine
  - Alkylphenol
24-Year-Old Man Dies While Getting Wisdom Teeth Pulled

A scenario likely common in the nightmares of dental patients became the devastating reality for a 24-year-old San Diego man earlier this month. He died during his wisdom teeth extraction.

The complications began mid-surgery when Marek began to cough. In response, medical staff administered propofol, causing the patient to go into cardiac arrest. Marek was rushed to the hospital, where he died three days later on March 24. A piece of gauze was found in his airway.

Marek, who had no medical issues that the family was aware of, was given at least six different sedatives by the surgeon. …[A] nurse at the hospital… said Marek "was given way too much anesthesia." The pulmonary doctor at the hospital [said] Marek’s death "looked like an overdose to him.”

Medical records also show that Marek "may have been without oxygen for 10 minutes,” said Natalie. Per FOX5

In addition to the apparent overabundance of sedatives, medical records also show that Marek "may have been without oxygen for 10 minutes," said Natalie. Per FOX5
24-Year-Old Man Dies While Getting Wisdom Teeth Pulled

- At 25 minutes, there was no registrar. At the last entry registered at 43 percent. The official cause of Marek’s death is pending autopsy, and his family plans to take legal action.

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http://laist.com/2013/04/02/25-year-old_man_dies_while_getting_wisdom_teeth_pulled.php

Airway Obstruction

Complete or partial blockage of the airway resulting in insufficient gas exchange

- Foreign Body
  - teeth
  - tooth fragments
  - bone
  - soft tissue
  - graft material
  - implant
  - fixture
  - components
  - instruments
  - tumor, fur fragments
  - endodontic files

- Implant
  - fixtures
  - components

- Instruments
  - burs/bur fragments
  - endodontic files

- Management
  - lighten anesthetic
  - reposition airway
  - airway adjunct
    - nasopharyngeal airway
    - oropharyngeal airway
    - LMA
  - remove foreign body
    - direct vision
    - Magill forceps
    - persistent obstruction
    - intubation
    - tracheostomy

- Prevention
  - appropriate head position
  - throat pack
  - rubber dam
  - independent vision
  - local anesthesia

- Signs & Symptoms
  - stridor & wheezing
  - use of accessory muscles of breathing
  - loss of breath sounds
  - absence of CO₂ tracing
  - O₂ saturation
  - cyanosis

- Airway Obstruction

- Appropriate head position
- Throat pack
- Rubber dam
- Independent vision
- Local anesthesia
Avoidance of Airway Obstruction

- Soft, highly absorbent sponge
- Placed medial to the teeth
- Acts as an oral/pharyngeal barrier or curtain
- Individually sterilizable
- Doesn't hang up on orthodontic appliances
- Won't wrap around a bur
- Can be drained of collected fluid while suction is in place

Xemax C-Sponge®
Isolite System

Isolite...delivers continuous illumination, aspiration and retraction all in one easy-to-use, time-saving device that makes isolation easy and provides uninterrupted access to the patient. Isolite helps you work faster, brighter, and drier.

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Laryngospasm

A protective reflex of the vocal cords that attempts to prevent passage of foreign matter, such as blood or saliva, into the larynx, trachea, and lungs.

- **Signs and symptoms**
  - Little or no air movement with respiratory effort
  - Cyanosis
  - Respiration: labored
  - "Chasing"
  - Labored respiratory efforts

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Laryngospasm Pathophysiology
Laryngospasm

Management
- 100% oxygen
- positive pressure
- pack off surgical site
- suxamethonium
- yankauer suction tip
- suxamethonium
- 100% O2
- support respiration

Prevention
- properly placed pharyngeal packing
- effective suctioning
- proper head position
- careful titration of intravenous agents

Adjuncts

Bronchospasm

Generalized contraction of smooth muscles of bronchi and bronchioles in lungs resulting in restriction of air flow to and from the lungs

Pathophysiology secondary to
- asthma
- allergic reaction
- chemical irritation

Signs and symptoms
- poor air exchange
- CO2 retention
- wheezing
Bronchospasm

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Management (awake patient)
- control operative site
- oxygen
- nebulized nebulizers
- beta2 bronchodilators
- albuterol
- isoproterenol
- metaproterenol
- iv fluids

Labored breathing, difficulty with expiration
Cyanosis of skin and mucous membranes
Wheezing

Resistant to ventilation

O₂
CO₂

Management (under IV anesthesia)
- pack site & suction
- positive pressure O₂
- full mouth mask
- suction catheter, bronchialator
**Bronchospasm**

**Management (under IV anesthesia)**
- If no response
  - Epinephrine IV 0.5 mg
- If drug allergy
  - Diphenhydramine
  - Corticosteroid
- Intubate as needed

**Prevention**
- Maintain a dry field
- Pre-operative inhaler puffs
- Avoid histamine releasing drugs
- Exercise caution with meperidine

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**Emesis/Aspiration**

Vomiting when the patient has depressed or absent laryngeal reflexes which may allow stomach contents to enter the lungs

**Signs and symptoms**
- Retching
- Large amounts of fluid in throat
- Gurgling sounds
- Signs of anxiety, obstruction

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Emesis/Aspiration

**Treatment**
- Tonsillar suction
- Trendelenburg position to right side
- 100% O2
- Visualize with laryngoscope
- Remove large particles with Magill forceps
- Intubate if necessary
- Steroids
- Transport to hospital

**Prevention**
- Observe ASA fasting guidelines
  - Solid foods – 6 hours before
  - Clear liquids – 2 hours before

NPO Considerations

**Gastric emptying**
- Clear fluids: 10 – 20 minutes (half-time)
- Solids clear: 3 – 6 hours
- Can be prolonged by:
  - Anxiety
  - Pain
  - Opiate analgesics
  - Sedatives

**NPO After midnight**
- pH < 2.5
- Gastric vol > 0.4 ml/kg
- Solid foods/milk prolonging gastric emptying
- Electrical emptying of clear liquids
- Half-time = 10 – 20 minutes
**NPO Considerations**
- Prolonged fast may cause irritability especially in children.
- Healthy elective patients should refrain from solids and liquids that produce suspensions.

**Respiratory Depression**
- **Respiratory Arrest**
  - A decrease in or absence of normal breathing rates and/or volumes

  **Etiology**
  - Narcotics
  - Sedative agents
  - Muscle relaxants
  - Hyperventilation
  - Seizures

  **Resulting in**
  - Tachycardia
  - Hypoxia
  - Cyanosis

  **Management**
  - Determine cause
    - Obstruction
    - Oversedation
  - 100% O2
  - Open airway
  - Ventilate
  - Consider reversal agents
    - Naloxone
    - Flumazenil

  **Prevention**
  - Avoid oversedation
  - Review past medical history

**Respiratory Depression**
- **Management**
  - Abnormal cause
  - Awake
  - Nasal oxygen
  - 100% O2
  - Open airway
  - Ventilate
  - Consider reversal agents
    - Naloxone
    - Flumazenil
Local Anesthetic Toxicity

Harmful effects caused by overdose of agents used for local anesthesia given in an amount or manner that produces an excessive serum concentration

**Signs and symptoms (CNS)**
- restlessness
- excitement of CNS
- tremors
- confusion/apprehension
- peri-oral numbness
- rapid pulse
- tinnitus
- slurred speech
- coma

**Signs and symptoms (CVS)**
- hypotension
- dysrhythmias
- cardiac arrest

**Treatment**
- discontinue local anesthetic
- 100% oxygen
- supine position
- monitor vital signs
- establish IV
- treat symptomatically
- IV diazepam
  - 5-10 mg IV over 1-2 minutes

**Prevention**
- know safe dose!
- aspirate before injection
- use only what is necessary

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Venipuncture Complications

- Hematoma
- Extravasation of fluids
- Phlebitis
- Infection
- Intravascular injection

Signs and symptoms:
- Swelling
- Redness
- Slowing or stopping of IV flow
- Pain on injection
- Loss of effectiveness of IV medications
- Firm, tender vein post-operatively

Treatment:
- Pressure to prevent hematoma
- Ice or heat
- Aspirin or other anti-inflammatory medications
- Severe cases: may need steroids and/or antibiotics

Office Emergencies and Emergency Kits

ADA Council on Scientific Affairs
J Am Dent Assoc 133:364-365;2002
Emergency Drug Kits

“All dental offices should maintain at least the basic recommended emergency equipment and drugs. The content and design of these kits should be based upon each practitioner’s training and individual requirements. Proprietary emergency drug kits are available, but none of these kits is compatible with the needs of all practitioners. The Council on Scientific Affairs does not recommend any specific proprietary emergency drug kit…”

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ADA Council on Scientific Affairs
J Am Dent Assoc 133:364-365;2002

…”it does recommend that dentists, after considering their specific training and special needs, design their own individualized emergency kits if proprietary kits do not meet their needs.”

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Stanley F. Malamed D.D.S.

“…mere possession of an emergency kit does not make one adept in the prevention, recognition and management of [potentially life-threatening] situations…

…unless both doctor and staff are fully trained in these areas and in the use of emergency drugs and equipment, such kits as may be present, may prove a liability, not an asset.”

Stanley F. Malamed, D.D.S.