

Conscious Sedation Update: A Review in Pharmacology and Emergency Procedures

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SEDATION DENTISTRY
Taking Anxiety Out Of Dentistry
Sedation dentistry reduces anxiety so you
can face dental appointments without fear



**Sedation is a continuum from
minimal, moderate, to deep as
described by the American
Society of Anesthesiologists**

Sedation Techniques

- ☉ Inhalation Sedation
- ☉ Oral Sedation
- ☉ Intranasal Sedation
- ☉ Intravenous Sedation
- ☉ Intramuscular Sedation



Inhalation Sedation

- ☉ Very Safe
- ☉ Well tolerated by patients
- ☉ Quick action and recovery
- ☉ Some amnesia / analgesia
- ☉ No needles









Oral Sedation

- ☞ Technique is non invasive
- ☞ Patients accept it very readily
- ☞ No ancillary techniques to master
- ☞ Titration of medications for each patient can be difficult
- ☞ Very effective and great track record



TYPES OF ORAL SEDATIVES

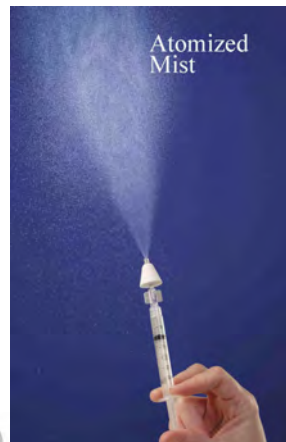
BRAND NAME	DESCRIPTION	DURATION <i>in hours</i>	GENERIC NAME
 Valium [®]	Valium [®] is the most widely recognized drug in the group. It has been around since the 1960's and is a well known sedative with time tested properties. Valium has a longer duration of action and half life than some of the other medications, so it is particularly useful for appointments where extensive dentistry is being performed.	6-8	Diazepam
 Halcion [®]	Halcion [®] is most well known for the treatment of insomnia. It is highly effective when used in oral sedation protocols, and can be used in conjunction with an antihistamine like Vistaril [®] . Like Valium [®] , it is a popular choice because of its amnesic properties and proven effectiveness. However, it has a shorter duration of action and half-life than Valium [®] and is used for appointments under two and a half hours.	2-3	Triazolam
 Ativan [®]	Ativan [®] is commonly prescribed for the treatment of anxiety. It possesses many of the desirable effects of other benzodiazepines but also has amnesic properties. It is an effective sedative with a medium length duration of action and half-life. It is useful for appointments that are longer than two hours.	6-8	Lorazepam
 Versed [®]	Versed [®] has the shortest duration of action and half-life of all of the benzodiazepines, lasting about an hour making it ideal for short appointments or simple procedures. It has many of the same anxiolytic and amnesic benefits of other benzodiazepines, but is less commonly used because of its short duration.	1	Midazolam
 Vistaril [®]	Vistaril [®] , while classified as an antihistamine, commonly used to treat allergies, it has also been shown to have anxiolytic (<i>anti-anxiety</i>) effects. It works well in conjunction with many of the benzodiazepines but has no amnesic properties.	3-6	Hydroxyzine
 Sonata [®]	Sonata [®] is similar to Halcion [®] in that it is also commonly used for the treatment of insomnia. It is important to remember, however, that you are not intended to sleep through your oral sedation appointment. The goal is simply to be relaxed and comfortable throughout the procedure. Appointments using a Sonata [®] protocol most commonly last one hour or less.	1-2	Zaleplon

Intranasal Sedation

Advantages

Drug can be transferred quickly across thin intranasal epithelial layer directly to the systemic circulation without first-pass hepatic and intestinal metabolism.

Receive maximum potency of the drug.



Intranasal Administration



Drugs that can be given by the IN route include:

- Analgesics: ketorolac, fentanyl.
- Anticonvulsants: midazolam, lorazepam.
- Antidotes: naloxone.
- Anti-hypoglycemic agents: glucagon.

IV Sedation

- Drugs administered directly into the cardiovascular system produce clinical actions significantly more rapidly than drugs administered in other routes
- Arm-brain circulation time ~20-25 seconds

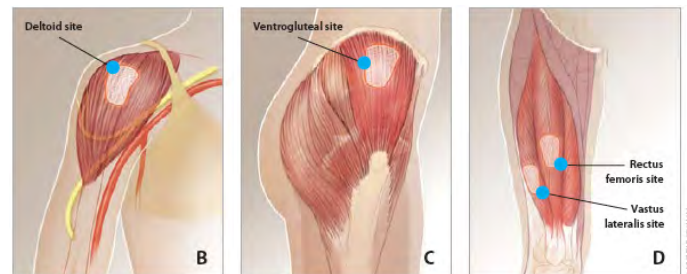


Intramuscular Injections /Sedation

Advantages

Many medications are formulated for this delivery method

Use if IV access is not available



Pharmacology Review

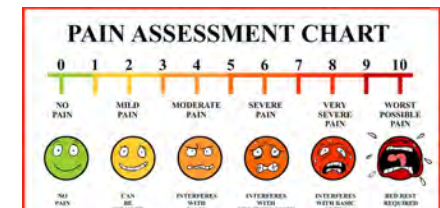
- ☉ Sedation Drugs
- ☉ Antidotal Drugs
- ☉ Additional Ancillary Medications



Benzodiazepines

Benzodiazepines may actually LOWER the threshold for pain according to some studies. This is an indication for using polypharmacy (Opiates).

Dellemijn P, Fields HL: Do benzodiazepines have a role in chronic pain management? Pain 1994; 57:137-152 King SA, Strain JJ: Benzodiazepine use by chronic pain patients. Clinical Journal of Pain 1990; 6:143-147



Versed (Midazolam)

Supplied- 1 mg/mL; 5 mg/mL

Dosage- Titrate to effect ~2mg

IV solution concentration typically 1 mg/mL

IM concentration 5 mg/mL

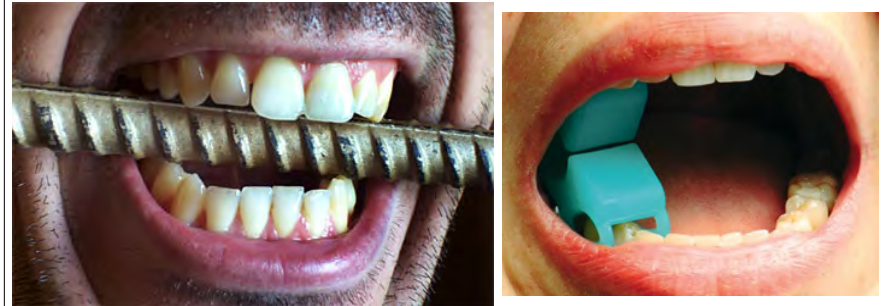
2-5 minute onset when given IV
3-11 hour half-life due to active metabolite



Versed (Midazolam)

Midazolam is found to increase the biting force exhibited in sedation patients.

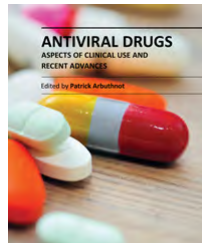
Importance of using a bite block during procedures.



Versed (Midazolam)

Contraindications

- Acute pulmonary insufficiency
- Acute narrow-angle glaucoma- increases intraocular pressure
- Use caution in patients taking anti-virals used in HIV patients



Versed (Midazolam)

Syrup concentration is 2mg/ml

Rapid peak action within 20 min.

15-30mg for adults and .25-5mg/kg for children 6-12 yo.

\$89.00 for 1 bottle 118mL



Diazepam (Valium™)

Supplied-

5 mg/mL solution for IV/IM

2,5,10 mg PO for preoperative anxiety

Dosage- Titrate to effect

5-10 mg loading dose then 0.03-0.1

mg/kg every 30 mins - 6 hours PRN

2-5 minute onset with IV

20- 70 (120) hour half-life due to active metabolites that accumulate



Valium vs. Versed

Why do we prefer to use Versed™ over Valium™ IV?

Midazolam = 10x as potent as Diazepam

Active metabolites with diazepam metabolism are stored in gall bladder and released after eating causing rebound or second peak effect

Diazepam uses propylene glycol as vehicle for administration which may cause phlebitis in small veins

Has been shown that Midazolam controls seizures as effectively as diazepam in the prehospital setting.

Furthermore, midazolam potentially reduces respiratory depression and time to treatment.

J Paediatr Child Health. 2002 Dec;38(6):582-6. Controlling seizures in the prehospital setting: diazepam or midazolam? Rainbow J1, Browne GJ, Lam LT.

Alprazolam (Xanax™)

Peak plasma levels reached within 1-2 hours and its half-life is 12-15 hours with NO active metabolites.

Adult dosage .25-.5mg tid.



Lorazepam - Ativan

Oral Sedation and IV sedation

PO for pre-operative anxiety

Major side effect is excessive sleepiness and prolonged amnesic period

Has NO active metabolites



Triazolam - Halcion™

One of the most prescribed psychoactive drug in the U.S.

Very short half-life of 1.5–5.5 hours and has NO active metabolites. Peak plasma levels at 1.3 hours.



Triazolam - Halcion™

Hypnotic dose .25mg 1 hour before bedtime and before dental treatment. Cimetidine

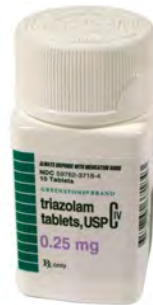
Co-administration of cimetidine (Tagamet) increased the maximum plasma concentration of triazolam by 51%, decreased clearance by 55%, and increased half-life by 68%



Triazolam - Halcion™

Grapefruit juice increased the maximum plasma concentration of triazolam by 25%, and increased half-life by 18%.

Halcion is contraindicated with ketoconazole, itraconazole, nefazodone, and several HIV protease inhibitors.



Flumazenil Reversal of Sublingual Triazolam: A Randomized Controlled Clinical Trial Original Research Article

The Journal of the American Dental Association, Volume 140, Issue 5, May 2009, Pages 559-566
Kazuo Hosaka, , Douglass Jackson, , Jacqueline E. Pickrell, , Masahiro Heima, , Peter Milgrom,

Methods

The authors conducted a randomized controlled clinical trial to investigate how intraoral submucosal flumazenil (0.2 milligram) attenuates central nervous system depression produced by incremental SL dosing of triazolam (three doses of 0.25 mg across 90 minutes) in 14 adults. The authors assessed outcomes by using the Observer's Assessment of Alertness/Sedation (OAA/S) scale, bispectral index (BIS) and physiological monitoring.

Results

The OAA/S and BIS scores increased after the flumazenil injection at the 30-minute observation point, but they were not sustained. Six hours after the initial dose of triazolam had been administered (four hours after the flumazenil or placebo challenge), all patients could be discharged from the dental clinic.

Conclusions

Deep sedation from incremental SL dosing of triazolam is incompletely reversed by a single intraoral injection of flumazenil. The reversal did not persist. The authors discharged the patients from the dental clinic at 360 minutes.

Hydroxyzine (Vistaril™)

- Is an anti-histamine (H₁) blocker
- Used to help decrease anxiety and nausea prior to surgery
- Used regularly in pediatric sedation.
- Maximum clinical effects reached in 1 hour and duration of action is usually 3-4 hours.



Hydroxyzine (Vistaril™)

- For children < 6 yo 2mg/kg divided dose every 6-8 hours daily.
- For children 6-12 yo 12.5-25mg every 6-8 hours.
- Adult dosages range from 25-100mg 3-4 times a day.
- A 50% decrease dosage is used in conjunction with opioids or barbituates in adult patients.



Narcotics for Sedation (Opioid Agonists)

Characteristics

- Anxiolytic, narcotic pain reliever
- Ideally IM or IV due to significant hepatic first-pass effect if taken orally
- Typically administered in conjunction with other CNS depressants to provide an increased sedative effect
- Dose-related respiratory depression by inhibition of the CO₂ response centers and rhythm and rate response centers

Since 1999, sales of prescription opioids in the U.S. have quadrupled.

4x

At least **HALF** of all opioid overdose deaths involve a prescription opioid.

Opiates vs **Opioids**

- Opiates:
 - Narcotic analgesic derived from a opium poppy (natural)
 - Not manufactured by chemical synthesis
 - Derived from the opium poppy plant
- Opioids:
 - A synthetic narcotic that mimics the natural poppy plant
 - Chemically manufactured narcotics
 - Narcotic analgesic that is not found in nature

The infographic features a central 'VS' symbol. To the left, under 'Opiates', are images of opium poppy plants. To the right, under 'Opioids', are images of various white pills. A CDC logo is visible in the upper left, and a prescription pad and pen are in the upper right.

Opioid Agonists

Smooth Muscle Effects

Increase smooth muscle tone (ureter, bladder, uterus)

Bronchioles affected and may lead to bronchospasm in patients with asthma

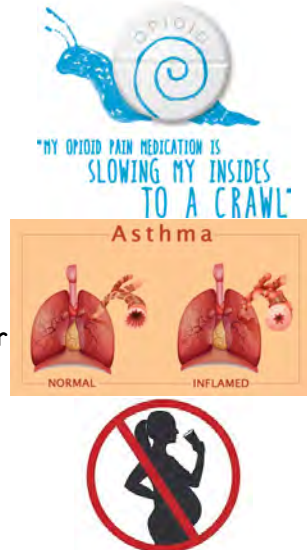
GI Tract Effects

Constipation

Pregnancy Risk Factor C

Studies in animals suggest a potential for harm, controlled studies have not been done. The potential benefit from use should exceed the potential for risk.

Schedule II DEA drug



Fentanyl (Sublimaze™)

-Supplied- 50 mcg/mL

-Titrate to effect administering 25 mcg each time.

-Onset is within 60 seconds with maximal effect 5-7 minutes after administration

-Duration is 30-60 minutes

-Peak respiratory depression 5-15 minutes after administration



Fentanyl (Sublimaze™)

-Potential reaction of "chest wall rigidity"

-Develops after high rate of IV administration

-Managed by assisted ventilation and if necessary administration of succinylcholine



Meperidine - Demerol

Characteristics

Clinical symptoms of effect at 2-4 minutes.

Duration of action 30-45 minutes.

Originally made as an anticholinergic, therefore, may increase heart rate and decrease saliva.



Meperidine - (Demerol)

Precautions

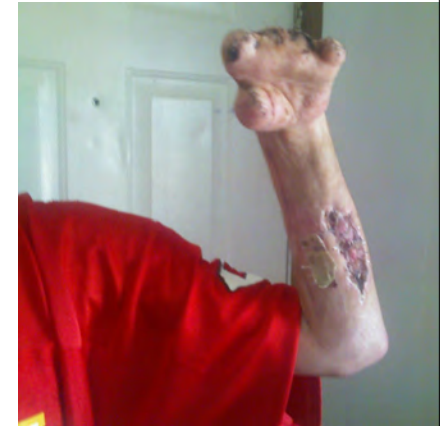
Due to localized histamine release may produce "tracking" at site of introduction to body and will resolve within 15 minutes
Long lasting, longer than reversal
Higher incidence of allergic reactions



Meperidine - (Demerol)

Supplied- 50 or 100 mg/mL
Place 1 mL of 50 mg/mL solution in 4 mL of IV fluid and use as 10 mg/mL solution

Dosage- Titrate to effect ~ 50-100 mg



Opioid Agonists/Antagonists

Characteristics

Some of therapeutic effects of opioids but with less of the undesirable effects such as respiratory depression and abuse potential.

Not routinely used in dentistry.
Contraindications, warnings, precautions, and side effects are similar to opioid agonists.



Nalbuphine - (Nubain)

-Pregnancy Risk Factor B
-Not controlled by DEA
-Metabolized in the liver
-Supplied- 10 or 20 mg/mL
-Dosage:
Titrate to effect ~7-8 mg
\$45.00/10mL vial



Opioid Agonists -reversal Agents

Naloxone (Narcan™)

- 0.4-2mg IV as single dose
- May repeat at 2-3 min intervals
- Max total dose up to 10mg
- Will also reverse analgesic effect



Opioid Agonists -reversal Agents

- Relistor
- Movantik



Reversal Agent for Benzodiazepines

Flumazenil (Romazicon™)

- Initial dose of 0.2 mg over 15 seconds, wait 45 seconds. If desired affect not reached, additional 0.2 mg (2 mL) can be injected at 60-second intervals where necessary (up to 4 more times) to a maximum total dose of 1 mg (10 mL).
- Child dose 0.01mg/kg over 15 seconds followed by 0.01 mg/kg (max single dose of 0.2 mg) repeated at 1-minute intervals to a max cumulative dose of 1 mg.



Propofol - (Diprivan)

- Milky white compound
- May be painful on injection
- Uncertain mechanism of action
- Respiratory depressant
- Onset within minutes
- Short clinical half-life
- Hypnotic/amnesiac agent
- Not an analgesic



Etomidate - (Amidate)

- In emergency settings, etomidate is one of the most frequently used sedative hypnotic agents. It is used for conscious sedation
- Rapid onset of action and a safe cardiovascular risk profile
- Limited suppression of ventilation, lack of histamine liberation and protection from myocardial and cerebral ischemia



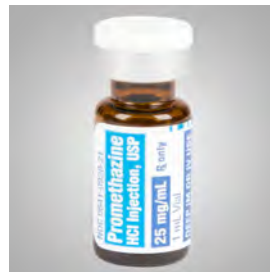
Etomidate - (Amidate)

Adverse effects

- Transient Injection site pain up to 80 % patients
- Skeletal Muscle movements mainly myoclonic (peripheral limb movements) up to 30 % patients
- Opsoclonus (uncontrolled eye movements)
- Adrenal Suppression up to 10 % patients
- Hiccups
- Apnea up to 90 seconds
- Less frequently laryngospasm, nausea/vomiting, snoring, arrhythmia & increase in PaCO₂

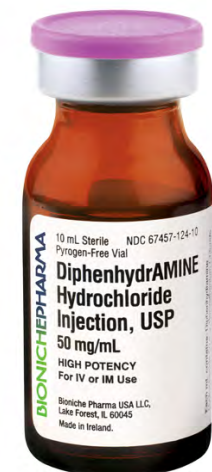
Anti-Histamines

- Relief of anaphylactic reaction to antibiotics
- Inhibition of salivary and bronchial secretions
- Reduction of post-operative nausea and vomiting
- Mild sedative-hypnotic effects
- No reversal



Diphenhydramine (Benadryl™)

- Pregnancy Risk Factor B
- Not controlled by DEA
- Metabolized in the liver
- Competes with histamine for H₁ receptor sites on effector cells in the GI tract, blood vessels, and respiratory tract
- Also has anticholinergic and sedative effect



Promethazine (Phenergan™)

Precautions:

- If used with epinephrine may cause decrease in BP.
- Additive effects with other CNS depressants.
- Very caustic and may cause phlebitis if injected in small vein.



Steroids

Characteristics:

- Antiemetic
- Reduce swelling post-operatively
- Pregnancy Risk Factor C
- Not controlled by the DEA
- Metabolized in the liver



Hydrocortisone (Solu-Cortef™)

- Supplied- 100, 250, 500 mg, 1 g
- Dosage-100-500 mg IV q6-8h and 240mg for 1-2 days placed in N.S. or other IV medium.



Methylprednisolone (Solu-Medrol™)

Medrol Dose Pack- 4 mg tab #21



Dexamethasone (Decadron™)

Dosage- 4 mg/mL
usually 2 mL
(8mg)
Should be diluted
May cause
peritoneal itching



Anticholinergics

Mechanism of Action

Inhibits acetylcholine at receptor sites in
smooth muscle, secretory glands, and CNS
Increases cardiac output
Dries secretions

Contraindications

Narrow-angle glaucoma
Myasthenia gravis
GI obstruction
Tachycardia



Atropine

Duration of action is about 3
hours
Supplied- 0.4 mg/mL
Dosage- 0.5-1.0 mg IV for
bradycardia
Intoxication is easily diagnosed
and usually not fatal
Overdose reversal is
physostigmine 0.2 mg/mL



Glycopyrrolate -(Robinul)

Does not cross blood-brain barrier
Least likely to produce CNS or
delirium effects
Onset of action within 60 seconds
Effects may last up to 7 hours
Supplied- 0.2 mg/mL
Dosage- 0.1 mg. Repeat every 2-3
minutes prn



Local Anesthetic Systemic Toxicity (LAST)

Local anesthetic systemic toxicity (LAST) is dose-related and although rare, occurs more frequently in small children and when the patient is administered concomitant central nervous system (CNS) depressants, such as opioid/sedative medications.

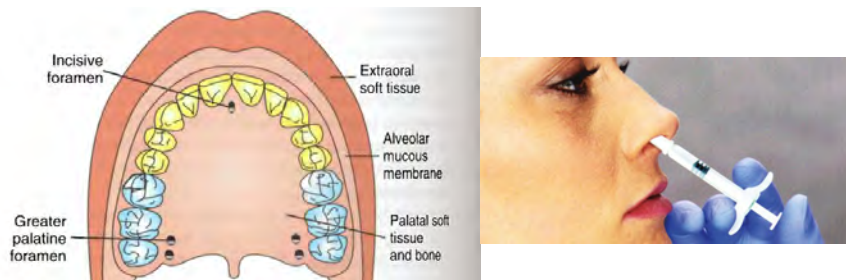
Mana Saraghi, DMD n Paul A. Moore, DMD, PhD, MPH n Elliot V. Hersh, DMD, MS, PhD.
Local anesthetic calculations: avoiding trouble with pediatric patients. *General Dentistry* 63(1):48-52. January 2015

Anticonvulsant Activity with Local Anesthetics

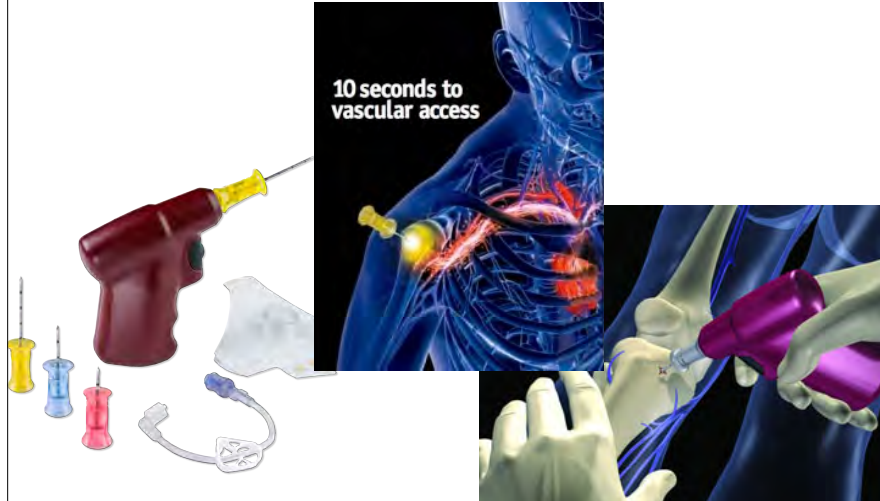
- It has been shown in some studies that the seizure threshold of lidocaine-induced tonic clonic seizure activity was 8.5 mg/kg
- When IM diazepam was administered 60 minutes before treatment in a dose of 0.25 to 0.5 mg/kg, the seizure threshold was elevated to 16.8 mg/kg of lidocaine



De Tong RH: Clinical Physiology of Local Anesthetic Action. In Cousins MJ, Bridenbaugh PO, eds: *Neural Blockade*, ed 2. Philadelphia, 1988. Lippincott



Intra-osseous Drug Administration



Most of the literature revealed a consensus that light sedation on low-risk American Society of Anesthesiologists (ASA) groups, that is ASA I, and possibly II, is the safest method for sedation in a dental outpatient setting.

“Why only dream of having a beautiful smile, when you can dream while getting a beautiful smile! ☺”

Sedation Dentistry

Techniques to administer oral, inhalational, and IV sedation in dentistry

Diana Krystyna Harbuz and Michael O'Halloran
School of Dentistry, University of Western Australia, Perth, WA, Australia



Conclusion

Formal training is essential to achieve the safe practice of sedation in dentistry or medicine. The appropriate setting for sedation should be determined as there is an increased risk outside the hospital setting. Patients should be adequately assessed and medication titrated appropriately, based on individual requirements.

Techniques to administer oral, inhalational, and IV sedation in dentistry

Diana Krystyna Harbuz and Michael O'Halloran
School of Dentistry, University of Western Australia, Perth, WA, Australia

We've all had an Emergency in our office.....

- ⦿ Prevalence
- ⦿ Most Common
- ⦿ Expectations
- ⦿ Preparation
- ⦿ Management



What Do We Know? (Statistically Speaking)

It is estimated that the average dentist will have to deal with one or two life-threatening medical emergencies in their office during their career.



Theisen, F.C., Feil, P.H., and Schultz, R. Self perceptions of skill in office medical emergencies. Journal of Dental Educ. 54:10 (1990):623-5



Over a Ten Year Period 4,309 U.S. Dentists Responded to Surveys Regarding Office Emergencies, With 96% Reporting They Had Experienced In Office Emergencies.

(30,608)

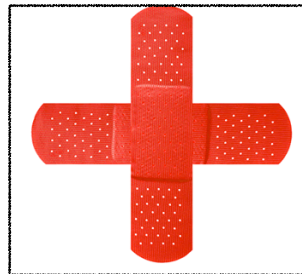


Fast:1986, Malamed:1993



Emergencies in Private Dental Practice

Syncope	15,407
Mild allergic reaction	2,583
Angina pectoris	2,552
Postural hypotension	2,475
Seizures	1,595
Asthmatic attack (bronchospasm)	1,392
Hyperventilation	1,326
"Epinephrine reaction"	913
Insulin shock (hypoglycemia)	890
Cardiac arrest	331
Anaphylactic reaction	304
Myocardial infarction	289
Local anesthetic overdose	204
Acute pulmonary edema (heart failure)	141
Diabetic coma	109
Cerebrovascular accident	68
Adrenal insufficiency	25
Thyroid storm	4
Total	30,608



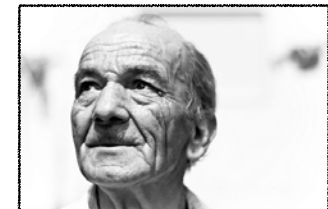
Factors that attribute to life threatening emergencies in the dental office

Increased number of older persons seeking dental care.

Therapeutic advances in the medical profession.

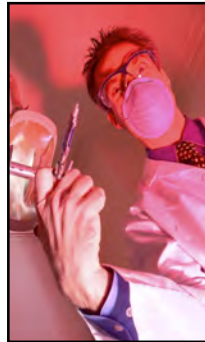
Growing trend toward longer dental appointments.

The increasing use and administration of drugs in dentistry.



When Do Emergencies Most Often Occur?

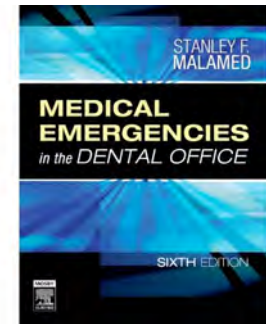
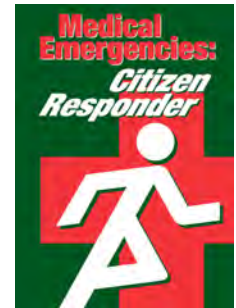
Medical emergencies were most likely to occur during and after local anesthesia, primarily during tooth extraction and endodontics.



Expectations

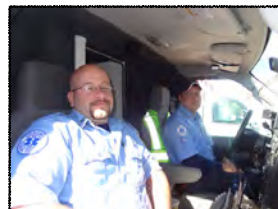


The dentist in a dentist-patient relationship has certain expectations imposed by society with respect to managing, preparing for, and preventing emergencies.



Standard of Care During Emergencies

A practitioner must act as a corresponding qualified health professional would in the same circumstances.



Standard of Care During Emergencies

Each year 7% - 8% of Dentists sued >15,000.

Minority arise as result of medical emergency.



Legal Considerations - What if any obligation does a dentist have to provide care in the presence of a medical emergency?

Keep the victim alive by treating the victim until recovery or until someone more qualified to treat them assumes responsibility of the emergency care.



Medical-Legal Aspects

\$2.5 Million Where Hospital Sedated Patient Then Allowed Him to Drive Home

\$2.5 Million suit against a hospital that gave patient conscious sedation during an out patient procedure and then allowed him to drive home. The patient fell asleep on the drive home and rolled his car.



Medical-Legal Aspects of Sedation



Sarah Coleman sued Dr. Guilan Norouzi and the dental office where her husband went in March 2007 to have some teeth extracted and get dental implants. She claims the dentist's careless or negligent care caused her husband's death. She didn't sue DOCS.

Medical-Legal Aspects of Sedation

Dental Sedation Responsible For At Least 31 Child Deaths Over 15 Years

The Huffington Post | By Tracy Rodriguez | Posted: 07/15/2012 3:43 pm | Updated: 07/15/2012 3:43 pm

New Jersey Dentist, Investigated After Second Child Dies In Care

Highlands Ranch, Denver dentist may have contaminated patients for 12 years.



Dental sedation calms patients, courts controversy
Some experts worry about risks of powerful drugs, but many patients say it's the only way they can face procedures
August 09, 2012 | By Jessica M. Morrison, Chicago Tribune reporter

Family: Man who died during dental surgery had 6 sedatives, went 10 mins. without air

SEPTEMBER 19, 2014

NC dentist's license suspended following patient's sedation death

Prevention / Preparation

Medical/Dialogue History
 Physical Examination
 Modifications in Dental
 Care to Minimize
 Medical Risk



How can we categorize a patients physical status for our dental appointment?



The ASA physical status classification system is a system for assessing the fitness of patients before surgery. In 1963 the American Society of Anesthesiologists (ASA) adopted the five-category physical status classification system; a sixth category was later added.

While anesthesia providers use this scale to indicate the patient's overall physical health or "sickness" preoperatively, it is regarded by hospitals, law firms, accrediting boards and other health care groups as a scale to predict risk, and thus decide if a patient should have - or should not have had - an operation.

William D. Owens, M.D. American Society of Anesthesiologists Physical Status Classification System Is Not a Risk Classification System. *Anesthesiology*. 94(2):378, February 2001.

Lema, Mark J (September 2002). "Using the ASA Physical Status Classification May Be Risky Business". *ASA Newsletter (American Society of Anesthesiologists)* 66 (9). Archived from the original on 10 July 2007. Retrieved 2007-07-09.

American Society of Anesthesiologists: ASA Status

ASA Classification		Examples:
ASA I	A normal healthy patient	Healthy; no smoking, no or very minimal drinking.
ASA II	A patient with mild systemic disease	Smoker; more than minimal drinking; pregnancy; obesity; well controlled diabetes; well controlled hypertension; mild lung disease.
ASA III	A patient with severe systemic disease, not incapacitating	Diabetes, poorly controlled hypertension; distant history of MI, CVA, TIA, cardiac stent; COPD, ESRD; dialysis; active hepatitis; implanted pacemaker; ejection fraction below 40%; congenital metabolic abnormalities.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Recent history of MI, CVA, TIA, cardiac stent; Ongoing cardiac ischemia or severe valve dysfunction; implanted ICD; ejection fraction below 20%.
ASA V	A moribund patient who is not expected to survive without the operation	Ruptured abdominal or thoracic aneurysm; intracranial bleed with mass effect; ischemic bowel in the face of significant cardiac pathology.
ASA VI	A patient who has already been declared brain-dead and whose organs are being removed for transplant.	

The addition of an 'E' indicates emergency status.

American Society of Anesthesiologists: ASA Status

- Established in ALL patients undergoing surgery with either L.A. or general anesthesia
- It determines the patient's capacity to WALK up a flight of stairs OR WALK 2 blocks
- ASA I: No difficulty experienced - Normal or well controlled patient
- ASA II: The patient is short of breath on reaching the top and has to stop

ASA Class in our Office

What ASA Class do you want to treat in your office?

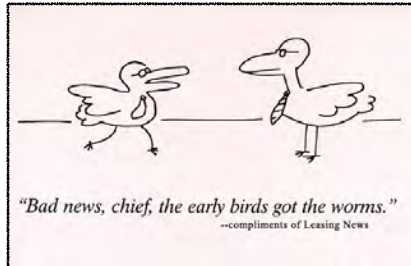


I & II

Bad News

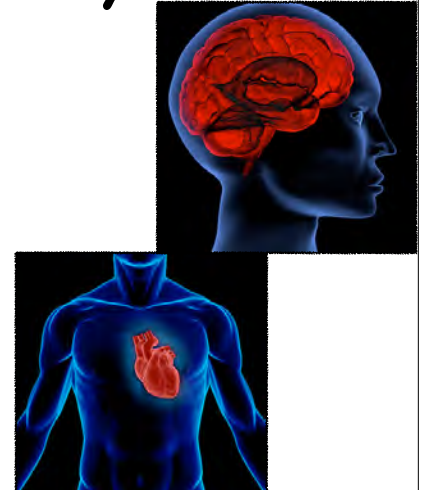
A complete system of physical evaluation for all prospective dental patients can prevent approximately 90% of life-threatening situations. The remaining 10% occur in spite of all preventive efforts.

McCarthy



Primary Goal During an Emergency

Most important aspect of nearly all medical emergencies in the dental office is to prevent, or correct, insufficient oxygenation of the brain and heart!



Keys to successful office outcomes.....

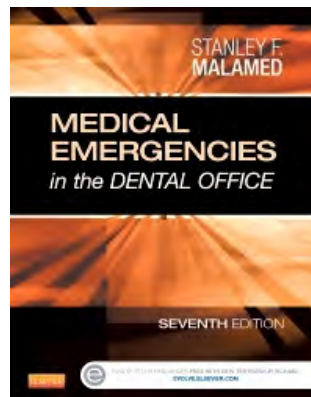
Office and Staff Preparation

BLS Whole Staff

Emergency Team

Know when to activate 911

Drugs & Equipment



Office and Staff Preparation



Office preparation should include the posting of emergency assistance numbers and stocking of emergency drugs and equipment.



Basic Life Support & Defibrillation

Staff training should include BLS instruction and training in defibrillation for all members of the dental office staff, recognition and management of specific emergency situations, and emergency "fire" drills.



The importance of an AED in the office cannot be stressed enough; between 350,000 and 400,000 people will die in the United States this year from sudden cardiac arrests.



Team Management

Each staff member in your office should be able to maintain a life on their own, but more importantly be proficient in managing any emergency as part of a team!



Duties of Team Member 1

- ◀ Usually the dentist, but all should know the role
- ◀ Provide BLS as indicated
- ◀ Stay with the victim
- ◀ Alert office staff members
- ◀ CROSS TRAIN EVERYONE!!!



Dr. McDreamy
(AKA Emergency Man)

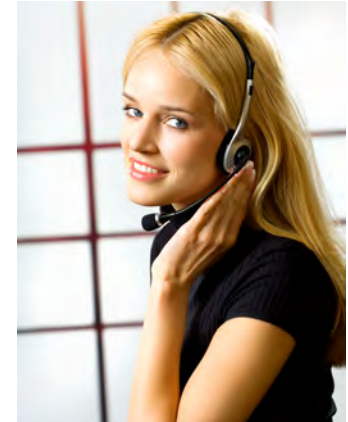
Team Member 2

- ⦿ Bring emergency drug kit, oxygen (O2) and AED to emergency site
- ⦿ Check O2 daily
- ⦿ Check emergency kits weekly
- ⦿ Check AED weekly



Duties of Team Member 3

- ⦿ Assist with BLS
- ⦿ Monitor vital signs
- ⦿ Assist as needed
- ⦿ Prepare emergency drugs for administration
- ⦿ Activate EMS system
- ⦿ Maintain records
- ⦿ Meet rescue team at building entrance and escort to the office



Information to be given to

**MEDICAL
EMERGENCY**

EMS (9-1-1) Operator



- ⦿ Location of the emergency (with names of the cross streets, roads, office, or room number, if possible.)
- ⦿ Telephone number from which the call is being made.
- ⦿ What happened – heart attack, motor vehicle crash, etc.
- ⦿ How many persons need help
- ⦿ Condition of the victims
- ⦿ What aid is being given to the victim(s) (e.g "CPR is being performed" or "We're using an AED")
- ⦿ Any other information requested.
- ⦿ Only hang up with EMS personnel when instructed to, insuring all questions are answered

It is always better to seek medical assistance "too soon" than "too late"



Geographic Requirements

Some practitioners will need to be better equipped and trained, simply due to the specific geographic area they practice in. (Urban v.s. Rural)



Emergency Practice Drills

Use a weekly / monthly staff meeting to discuss one potential medical emergency and your staff will be ready to handle the real thing when it happens, and it will!!

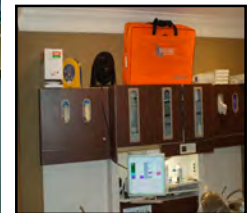


Essential Emergency Drugs

- ⦿ Oxygen
- ⦿ Epinephrine
- ⦿ Nitroglycerin
- ⦿ Injectable Antihistamine
- ⦿ Albuterol (Salbutamol)
- ⦿ Aspirin
- ⦿ Oral Carbohydrate
- ⦿ Ammonia Inhalant



Emergency Drugs & Equipment



Emergency Drugs & Equipment

"Drug administration is always of secondary importance in emergency management."



"PABCD"

"PABCD"

P-Position

A-Airway

B-Breathing

C-Circulation

D-Definitive Care (Diagnosis, Drugs, Defibrillation)



Oxygen

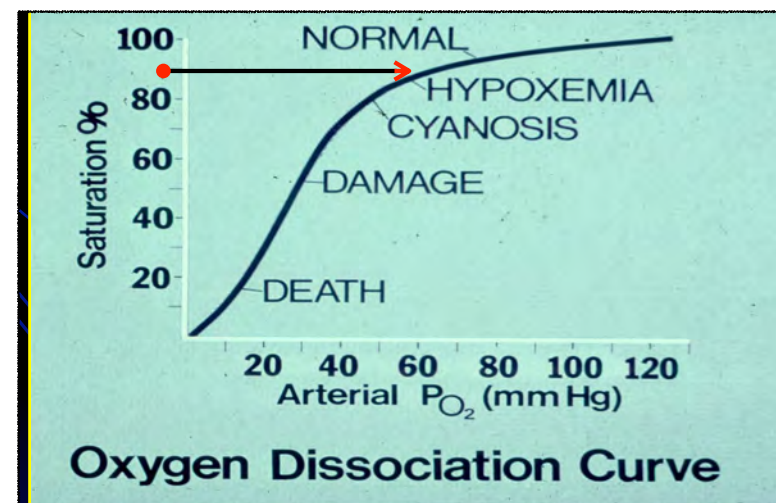
• Oxygen is indicated for every emergency except hyper-ventilation

• COPD?

For the management of a medical emergency it should not be withheld for the patient with chronic obstructive lung disease, even though they may be dependent on low oxygen levels to breathe if they are chronic carbon dioxide retainers. Short term administration of oxygen to get them through the emergency should not depress their drive to breathe.



When 90 % isn't enough..



Oxygen Dissociation Curve

Epinephrine



Why have multiple doses of Epi?

Protracted reaction

—where symptoms may persist even after a first dose of epinephrine is administered.



Biphasic reaction—

Another situation that may require a second dose of epinephrine is when symptoms may appear to go away but then come back, typically within 8 hours (sometimes up to 72 hours) after the initial allergic reaction.



Nitroglycerin

- Indicated for acute angina or myocardial infarction
- For emergency purposes it is available as sublingual tablets or a sublingual spray
- With signs of angina pectoris, one tablet or spray (0.4 mg) should be administered sublingually
- Relief of pain should occur within minutes. If necessary, this dose can be repeated twice more in 5-minute intervals



Injectable / Oral Antihistamine

- Antihistamine is indicated for the management of allergic reactions
- Mild non-life threatening allergic reactions may be managed by oral administration, life-threatening reactions necessitate parenteral administration
- Two injectable agents may be considered, either diphenhydramine or chlorpheniramine
- Recommended doses for adults are 25 to 50 mg of diphenhydramine or 10 to 20 mg of chlorpheniramine



Albuterol (Salbutamol)

- ☉ A selective beta-2 agonist such as albuterol (salbutamol) is the first choice for management of bronchospasm
- ☉ It has a peak effect in 30 to 60 minutes, with a duration of effect of 4 to 6 hours. Adult dose is 2 sprays, to be repeated as necessary. Pediatric dose is 1 spray, repeated as necessary



Aspirin

- ☉ Aspirin (acetylsalicylic acid) is one of the more newly recognized life-saving drugs, as it has been shown to reduce overall mortality from acute myocardial infarction
- ☉ Contraindicated if known hypersensitivity to aspirin, severe asthma or history of significant gastric bleeding ***



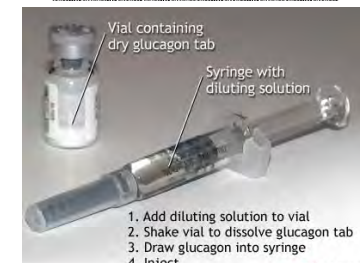
Oral Carbohydrate

- ☉ An oral carbohydrate source, such as fruit juice or non-diet soft-drink, should be readily available
- ☉ Its use is indicated in the management of hypoglycemia in conscious patients



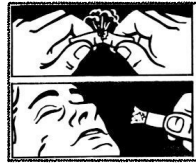
*Glucagon

Glucagon works by telling your body to release sugar into the bloodstream to bring the blood sugar level back up.



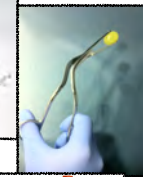
Ammonia Inhalants

- Ammonium carbonate, the active ingredient in ammonia inhalants (also known as smelling salts), is the treatment of choice for fainting prevention and treatment
- It produces near-instantaneous relief for lightheadedness



Essential Equipment

- Oxygen delivery system
- AED
- Syringes for drug administration
- Suction and suction tips
- Tourniquets
- Magill intubation forceps
- Drug Kit

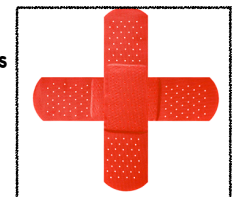


Commercial Versus Homemade Emergency Drug Kits



Management of Most Common Emergencies

- | | |
|---|---|
| <ul style="list-style-type: none"> Respiratory Depression and Arrest Laryngospasm Syncope Hypoglycemia Hyperventilation Airway Obstruction Dyspnea | <ul style="list-style-type: none"> Acute Asthmatic Attack / Bronchospasm Angina Acute Myocardial Infarction Cardiac Arrest Allergy / Anaphylaxis Drug Overdose Seizure |
|---|---|



Respiratory Distress

Can present in a variety of forms:

- Asthma
- Allergic reaction
- Hyperventilation
- Pulmonary embolus
- Acute congestive heart failure
- Diabetic Ketoacidosis
- unconsciousness



Respiratory Depression and Arrest

- Can develop secondary to CNS depressant drugs (most of our agents)
- Remember that Pulse Ox has a 10-20 second lag time
- When managed properly rarely represents a major problem.



Steve Jobs Died of Respiratory Arrest at Home

Oct 10, 2011 8:02 PM CDT



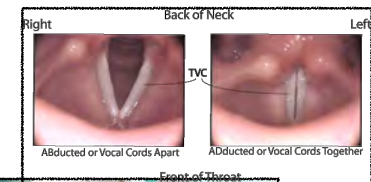
Respiratory Depression and Arrest

- Recognize and Terminate Procedure
- Position Patient in Supine Position
- Positive Pressure Oxygen when Indicated
- BP and HR Monitored every 5 minutes
- Start IV infusion
- Consider Reversal Agents (Naloxone 0.1mg/min, Flumazenil 0.2 mg/min)
- Allow Patient to Recover Following Ventilatory Adequacy
- Consider Administration of IM dose of Antidotal Drug



Laryngospasm

- Protective Reflex to Maintain Airway Integrity
- Occurs most often in Deep Sedation and G.A.
- Partial Laryngospasm can cause Stridor (A High Pitched Crowing Sound)
- Complete Laryngospasm is associated with Absence of Sound and Exaggerated Respiratory Efforts!!



Laryngospasm

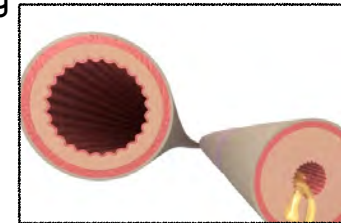
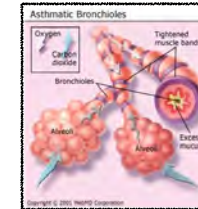
- Place Patient in Supine Position
- Administer 100% Oxygen at 5-7 L/Min
- Displace Tongue and Evaluate Airway
- Suction Any Liquid or Debris From Airway
- Reevaluate Airway With Sternal Rub
- Suction then Positive Pressure Oxygen

- Administer Succinylcholine (10mg IV for Partial and 20-40mg IV for Complete, may result in Apnea for up to 4 min.
- Supplemental Airways and controlled ventilations
- Monitor Throughout Recovery



Bronchospasm / Asthmatic Attack

- Upright Position
- Manage Airway
- 100% Oxygen
- Bronchodilating Medications



Emesis and Aspiration of Foreign Material Under Sedation

- When Reflexes are Intact Aspiration is Unlikely
- Aspiration of Solid Material Can Cause Airway Obstruction
- Liquid Aspiration may Result in Bronchospasm
- Manage by Positioning Patient in Trendelenburg Position in order to keep Vomit in Pharynx instead of the Lungs.

- Activate EMS, when Known Aspiration
- Suction, and Secure the Airway
- Oxygen
- Definitive Care Including Tracheal Lavage, IV steroids
- Hospitalization



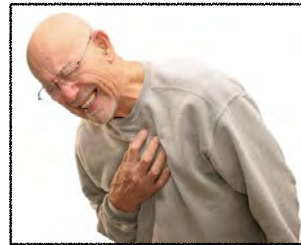
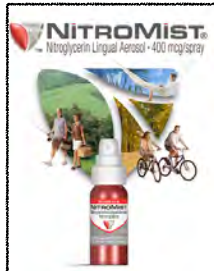
Aspiration

Patient aspirated crown during extraction with Local Anesthesia, thought he swallowed it.....



Angina Pectoris

- ⦿ Terminate Procedure
- ⦿ Oxygen
- ⦿ Nitroglycerin Sublingually
- ⦿ If New Onset Contact EMS
- ⦿ Monitor EKG



Myocardial Infarction

- ⦿ Upright / Semi-reclined Position
- ⦿ Activate EMS
- ⦿ Establish & Maintain Airway
- ⦿ Chew 325 mg Aspirin if not Allergic
- ⦿ Nitroglycerin Sublingually
- ⦿ Prepare for Defibrillation with AED



Blood Pressure

Blood Pressure Chart

Systolic pressure (mm Hg)	Diastolic pressure (mm Hg)	Stages of High Blood Pressure
210	120	Stage 4
180	110	Stage 3
160	100	Stage 2
140	90	Stage 1

Normal Blood Pressure Range

Systolic pressure (mm Hg)	Diastolic pressure (mm Hg)	Pressure Range
130	85	High Normal Blood Pressure
120	80	Normal Blood Pressure
110	75	Low Normal Blood Pressure

Low Blood Pressure Range

Systolic pressure (mm Hg)	Diastolic pressure (mm Hg)	Pressure Range
90	60	Borderline Low blood Pressure
60	40	Too Low Blood Pressure
50	35	Dangerously Low Blood Pressure

Hypotension

- ⦿ Determine Etiology (Stress, Overdose, Postural, Coexisting Disease, Hypovolemia, Anesthetic Overdose)
- ⦿ Stop Treatment
- ⦿ Administer Oxygen and place in supine position, Monitor Vitals
- ⦿ Determine the Level Of Consciousness
- ⦿ Administer IV Fluids
- ⦿ IF persistent Hypotension, administer 10-25 mg Ephedrine IV for first dose then 30sec-1min admin second dose
- ⦿ Activate BLS /ACLS if condition deteriorates and Transport per EMS



Hypertension

⦿ Hypertensive Crisis (>250/>130 Malamed, >180/>110 AHA Website)

⦿ If True Crisis use Labetolol 20mg over 2 min, then 40mg, then 80 mg as needed every 10 mins, Be sure Patient is truly Hypertensive in order to avoid Hypotensive event.



Table 1
Drugs Commonly Linked to Hypertension

Class	Drugs	Mechanism
Tryptaminergic agents	Amphetamines (methamphetamine, methylphenidate), methylphenidate, phenylpropanolamine, ephedrine, pseudoephedrine	Cause dose-related increases in blood pressure; CNS stimulant
NSAIDs and COX-2 inhibitors	Ibuprofen, diclofenac, celecoxib	Block COX-1 and COX-2 enzymes which leads to a reduction in prostaglandin formation; cause dose-related increases in sodium and water retention
Corticosteroids	Prednisone, hydrocortisone, hydrocortisone	Cause sodium retention, resulting in dose-related fluid retention
CAE stimulants	Caffeine	Stimulant effect
Estrogens and progestins	Oral contraceptives, ERT/HRT	Estrogen stimulates the hepatic production of the renin substrate angiotensinogen; both appear to contribute to a dose-dependent tachycardia
Dietary supplements	Ginseng, natural licorice, yohimbine	Mild stimulant effect; increase arterial pressure
DRUGS	Verapamil, diltiazem	Increase levels of norepinephrine and the subsequent potentiation of sympathetic neurotransmission
Immunosuppressants	Cyclosporin, tacrolimus	Increase prostaglandin synthesis and decrease water, sodium and potassium excretion

COX, central nervous system; NSAID, nonsteroidal anti-inflammatory drug; ERT, estrogen; HRT, hormone replacement therapy; DRUGS, drugs; CAE, cardiovascular; CNS, central nervous system; ERT, estrogen replacement therapy; HRT, hormone replacement therapy; NSAID, nonsteroidal anti-inflammatory drug; Verapamil, diltiazem, cyclosporin, tacrolimus.

Possible Causes of Unconsciousness in the Dental Office

Vasodepressor syncope (faint)	Most common
Drug administration or ingestion	Common
Orthostatic hypotension	Less common
Epilepsy	Less common
Hypoglycemic reaction	Less common
Acute adrenal insufficiency	Rare
Acute allergic reaction	Rare
Acute myocardial infarction	Rare
Cerebrovascular accident	Rare
Hyperglycemic reaction	Rare
Hyperventilation	Rare

Syncope

- ⦿ Report of Lightheadedness or Dizziness
- ⦿ Loss of Consciousness or Difficulty Standing
- ⦿ Report or Observation of Sweating
- ⦿ Pale or Ashen appearance
- ⦿ Decreased Pulse
- ⦿ Decreased Blood Pressure



Syncope

- ⦿ Position patient in supine position
- ⦿ Establish Airway
- ⦿ 100% Oxygen
- ⦿ Ammonia Capsule
- ⦿ Apply Cold Compress
- ⦿ Monitor vital signs
- ⦿ Reassure and relax patient
- ⦿ Full recovery : < 20 min



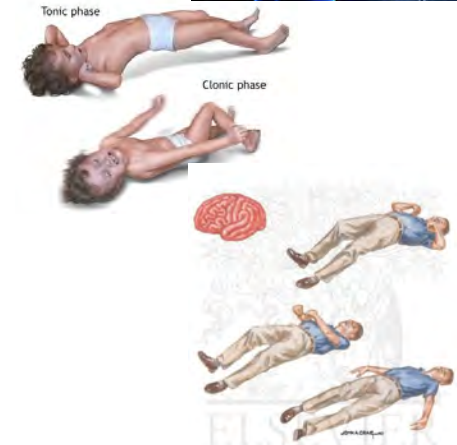
Anaphylaxis

- Basic Life Support
- Oxygen
- Monitor Vital Signs
- Activate EMS
- Epinephrine
- ACLS if Able



Seizures

- Terminate the Procedure
- Supine Position
- Ensure Patient Safety
- Establish Airway
- Monitor Vital Signs
- 100% Oxygen

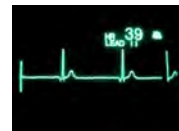


Hypoglycemia

- Stop Treatment
- Supine Position
- Maintain Airway
- Monitor Vital Signs
- Check Blood Glucose Levels
- Oral Glucose



Bradycardia



- Heart Rate Lower Than 60 bpm
- Physiologic, eg- conditioned athlete
- Increased Vagal Tone as in Sinus Bradycardia
- Block in Conduction System
- Signs include: Hypotension, Orthostatic Hypotension, Diaphoresis, Congestive Heart Failure
- Symptoms: Chest Discomfort, Shortness of Breath, Decreased Consciousness, Weakness, Fatigue, Light Headedness, Dizziness, Syncope
- Asymptomatic- No Treatment
- Treat: Symptomatic - Comfort Pt, ABC's, Oxygen, Monitor
- Poor Perfusion: Atropine 0.5mg IV q3-5min up to 3mg

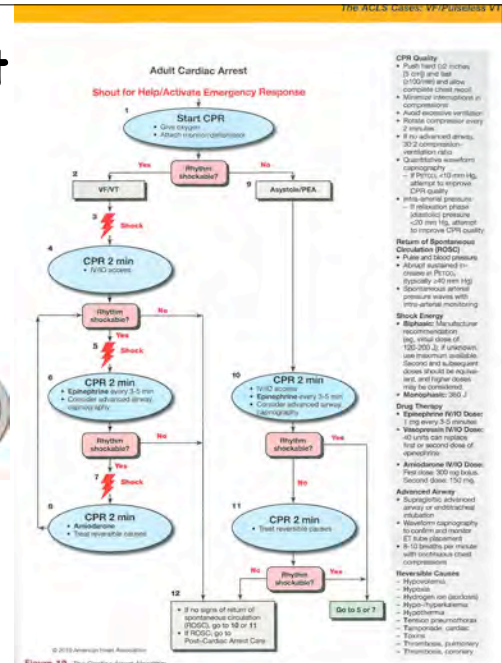
Cardiac Arrest

- Determine Rhythm
- Secure Airway
- Initiate Basic CPR
- Connect to AED / Shock if Advised
- Establish I.V.



Cardiac Arrest

ACLS Algorithms



Hyperventilation

- Upright Position
- Verbally Calm the Patient
- Rebreathing bag / Hands, to Reduce Carbon Dioxide Elimination

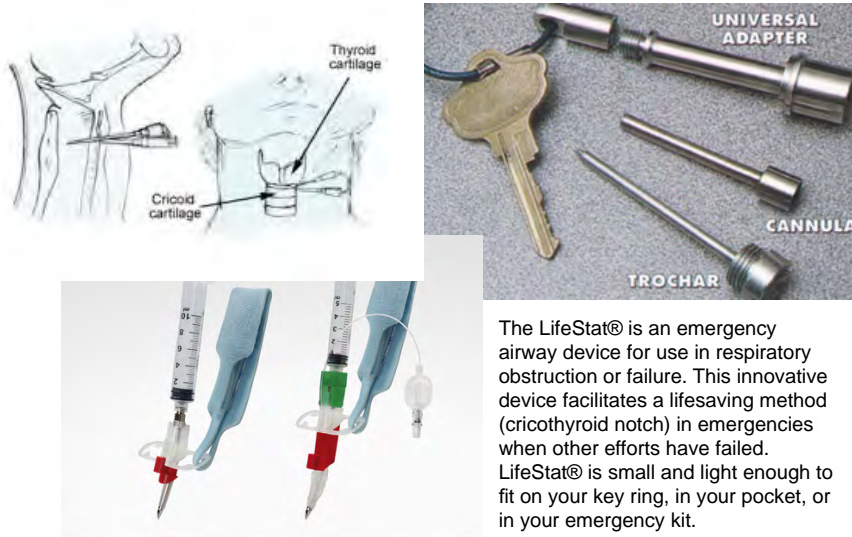


Airway Obstruction

- Upright Position
- Pack off Surgical Site
- Suction Oropharynx
- Determine if Airway is Obstructed
- Heimlich Maneuver, if Indicated
- McGyver.....



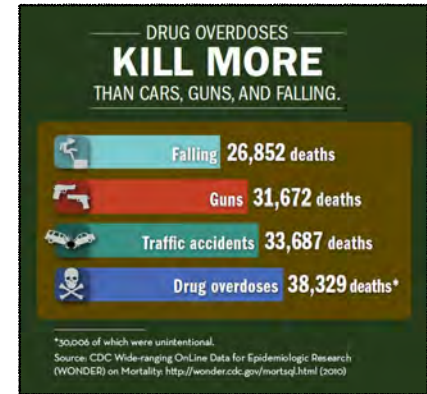
Airway Obstruction



The LifeStat® is an emergency airway device for use in respiratory obstruction or failure. This innovative device facilitates a lifesaving method (cricothyroid notch) in emergencies when other efforts have failed. LifeStat® is small and light enough to fit on your key ring, in your pocket, or in your emergency kit.

Drug Overdose

- ◀ Oxygen
- ◀ Monitor Vital Signs
- ◀ Administer Naloxone *
- ◀ Activate EMS
- ◀ Supine Position
- ◀ Maintain Airway
- ◀ Manage Seizures



So, What Do We Know?

Knowing how to handle medical emergencies will make the doctor and dental assistant more confident in his or her ability to handle all aspects of the job. The best way to handle an emergency is to be prepared in advance. Whether the medical emergency occurs years in the future or this afternoon, preparation is the key.



Fast, T.B., Martin, M.D., and Ellis, T.M. Emergency preparedness: A survey of dental practitioners. J. of the Amer. Dental Ass'n 112 (1986):499-500

What to do on Monday:

- Current BLS certification for all office staff
- Didactic and clinical courses in emergency medicine (Get office Copy of Malamed Emergencies DVD)
- Periodic office emergency drills
- Telephone numbers of emergency medical services (EMS) or other appropriately trained healthcare providers (touch base with service)
- Emergency drug kit and the equipment and knowledge to properly use all items."
- *Assign someone in office to put together an emergency action plan, approve it!, Adopt it!, then Practice it!!



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