EMERGENCY MEDICINE

10-Minutes to Save a Life

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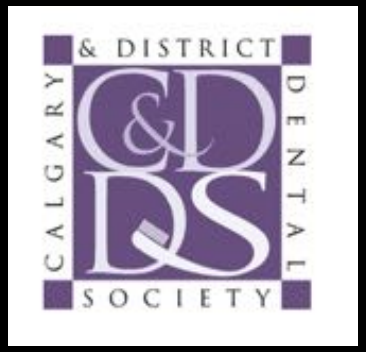

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Medical emergencies CAN and DO happen in the practice of dentistry

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Syncope	**15,407** (50.3%)	ALL patients (Adult, Pediatric, Geriatric)
Mild allergy	**2,583** (8.4%)	
Angina Pectoris	**2,552** (8.3%)	
Postural hypotension	**2,475** (8.1%)	
Seizure	**1,595** (5.2%)	
Asthmatic attack	**1,392** (4.5%)	
Hyperventilation	**1,326** (4.3%)	All ages N = 4,307
Epinephrine Rxn	**913** (3.0%)	
Hypoglycemia	**890** (2.9%)	
Cardiac Arrest	**331** (1.1%)	
Anaphylaxis	**304** (1.0%)	
Myocardial Infarction	**289** (0.9%)	
L.A. Overdose	**204** (0.7%)	

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Medical Emergencies
Stage of Treatment

Treatment Stage	Occurrence
Immediately before Tx	**1.5%**
During or after local	**54.9%**
During treatment	**22%**
After treatment	**15.2%**
After leaves office	**5.5%**

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Medical Emergencies
Treatment being performed

Treatment	Occurrence
Tooth extraction	**38.9%**
Pulp extirpation	**26.9%**
Unknown	**12.3%**
Other treatment	**9%**
Preparation	**7.3%**
Filling	**2.3%**
Incision	**1.7%**

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Legal (moral) Obligation of the Doctor to the "Victim"

Ultimate goal

"Keep the victim alive until they recovery or until another - more qualified - individual assumes responsibility for treatment"

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Preparation of the Office & Staff

1. **Basic Life Support training**
2. *Preparation of Dental Office Staff Members*
3. **Emergency Assistance**
4. **Emergency Drugs & Equipment**

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Preparation of the Office & Staff

Basic Life Support
Basic Life Support
Basic Life Support
Basic Life Support
Basic Life Support
Basic Life Support
Basic Life Support
Office Emergency TEAM
Emergency Assistance
Emergency Drugs & Equipment

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BASIC LIFE SUPPORT

(CPR, Resuscitation, Reanimation)

is THE single-most important step in the management of ALL medical emergencies

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BASIC LIFE SUPPORT

- ***ALL*** staff members
- Annually
- Course in-office
- Pocket mask for ***ALL*** staff members
  - Mouth-to-mask ventilation

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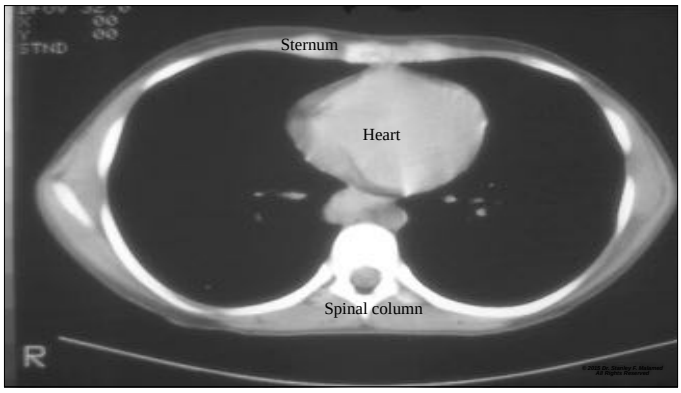

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EMERGENCY MANAGEMENT ALGORITHM

P - C - A - B - D

Algorithm for
ALL
emergency management

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Preparation of the Office & Staff

Have a
PREDETERMINED PLAN
for managing medical emergencies

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Member #1

- **1st person on scene of emergency**

- **Stay with victim; yell for 'HELP'**
- **Administer BLS, as needed**

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Member #2, on hearing call for *HELP* . . .

Obtains:

- **1. Emergency drug kit;**
- **2. Portable O_2 cylinder; and**
- **3. AED**

. . . bringing them to site of emergency

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Members #3, #4 and on . . . Assigned ancillary tasks such as:

- **Monitoring vital signs (BP, heart rate & rhythm)**
- **Assist with basic life support**
- **Activate EMS**
- **Hold elevator in lobby while awaiting arrival of EMS**
- **Prepare emergency drugs for administration.**
- **Keep written time line record during emergency**

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Preparation of the Office & Staff

1. **Basic Life Support training**
2. **Preparation of Dental Office Staff Members**
3. *Emergency Assistance*
4. **Emergency Drugs & Equipment**

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Emergency Medical Services

When the DOCTOR or other PERSON IN CHARGE feels it is necessary

NEVER HESITATE to seek help if you feel it is needed

When?

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Emergency Medical Services

9 1 1

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Preparation of the Office & Staff

1. **Basic Life Support training**
2. **Preparation of Dental Office Staff Members**
3. **Emergency Assistance**
4. *Emergency Drugs & Equipment*

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Emergency Drugs & Equipment
USA Canada

Numerous specialty organizations (AAP, AAOMS, AAPD, AGD) have developed Guidelines for their members and other dentists practicing that specialty

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Emergency Drugs & Equipment
USA Canada

IF the doctor utilizes:

GENERAL ANESTHESIA
PARENTERAL SEDATION (IM, IV, IN)
ORAL SEDATION

Individual States have Regulations requiring a predetermined list of EMERGENCY DRUGS & EQUIPMENT

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Emergency Drugs & Equipment USA

HOWEVER if the doctor utilizes:

LOCAL ANESTHESIA
INHALATION SEDATION (RA)

There are NO requirements for permits and thus no mandated list of emergency drugs, except Massachusetts.

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MASSACHUSETTS - 2010

(3) Drugs Required. The following drugs and/or categories of drugs shall be provided and maintained in accordance with the *AHA/ACLS Guidelines* (234 CMR 6.02) or as determined by the Board for emergency use. All drugs shall be current and not expired

(a) Acetylsalicylic acid (readily absorbable form);
(b) Ammonia inhalants;
(c) Antihistamine;
(d) Antihypoglycemic agent;
(e) Bronchodilator;
(f) Epinephrine preloaded syringes (pediatric and adult);
(g) Two epinephrine ampules;
(h) Oxygen;
(i) Vasodilator; and
(j) Any other drugs or categories of drugs as may be required by the Board.

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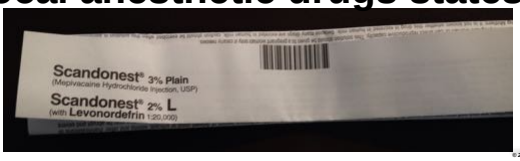
However, if you're NOT from Massachusetts the Drug Package Insert for all local anesthetic drugs states:



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Drug Package Insert for all local anesthetic drugs states:

Septocaine® with epinephrine 1:100,000
Septocaine® with epinephrine 1:200,000
(articaine hydrochloride 4% (40 mg/mL) with epinephrine 1:100,000 or 1:200,000 injection)

For Infiltration and Nerve Block Anesthesia

WARNINGS
Accidental intravascular injection may be associated with convulsions, followed by central nervous system or cardiorespiratory depression and coma, progressing ultimately to respiratory arrest. Dental practitioners and/or clinicians who employ local anesthetic agents should be well versed in diagnosis and management of emergencies that may arise from their use. Resuscitative equipment, oxygen, and other resuscitative drugs should be available for immediate use.

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You need 'STUFF'

Options

1. BUY a proprietary emergency drug kit
2. MAKE your own kit

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Proprietary Emergency Kits
Advantage: Convenience; Drug updates
Disadvantage: Complacency; Cost

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2. Make your own kit

Self-made Emergency Kits

Advantage: You made it; Lower cost

Disadvantage: You've got to make it; Upkeep

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Critical drugs & equipment

THE BASIC SEVEN

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Critical drugs & equipment

THE BASIC SEVEN
(as per Malamed, and Massachusetts)

1. Epinephrine
2. Histamine-blocker
3. Bronchodilator
4. Nitroglycerin
5. 'Sugar'
6. Aspirin
7. Oxygen

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Epinephrine (Adrenaline)

Single most important drug in emergency medicine

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Epinephrine

- **1:1,000 AND 1:2,000**
  - **Autoinjector**
  - **1:2,000 up to 30 kg weight**
  - **1:1,000 if more than 30 kg**

- **INDICATION: Anaphylaxis**
- **CONTRAINDICATIONS: None**

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Histamine-Blocker

- **Diphenhydramine HCl injectable**
  - **Benadryl**
- **50 mg/mL**

- **INDICATION: Anaphylaxis, Mild Allergy**
- **CONTRAINDICATIONS: None**

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Bronchodilator

Albuterol

- Proventil, Ventolin, ProAir
- Bronchospasm (asthma)
- NO CONTRAINDICATIONS
- Spacer recommended for younger patients

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Coronary artery VASODILATOR

Nitroglycerin

- Nitrolingual spray (USD$200+)
- Nitrostat sublingual tablets (USD$50/100tabs)
- 0.4 mg/dose

- INDICATION: Angina pectoris;
  Prehospital management of cardiac pain
- CONTRAINDICATION:
  - Hypotension (Systolic BP <90mmHg)

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Antihypoglycemic

- Non-diet soft drink
- Orange juice
- Tube of concentrated glucose
  - InstaGlucose — For oral administration

- INDICATION: Hypoglycemia
- CONTRAINDICATION: Unconsciousness

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Thrombolytic

Aspirin (ASA)

- 325 mg
- Chewed / swallowed or
- Chewable or
- Powdered

- INDICATION: Suspected myocardial infarction
- CONTRAINDICATION: Allergy

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Oxygen

The 2nd most important drug in emergency medicine

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Oxygen

- 'E' cylinder + delivery system
- INDICATION: Any medical emergency
- CONTRAINDICATION: None *

* Hyperventilation

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Equipment

Disposable face masks (pediatric & adult for ventilation with supplemental O_2)

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Automated External Defibrillator (AED)

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Equipment

- **Automated External Defibrillator (AED)**

Why *YOU* want *2* AED's

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Survival Rates from SCA

- **Survival - *to hospital discharge* - is dependent upon:**
  - **Bystander initiated CPR**
  - **Time from collapse to defibrillation**

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Survival Rates from SCA

TIME
is
MYOCARDIUM

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Sudden Cardiac Arrest

- **70% of out-of-hospital SCA occur in the HOME of the victim.**
- **As dentists we have TWO homes:**
  - **The one in which we live**
  - **The one in which we work**

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Chronology of Sudden Cardiac Arrest

- Every day into 6 hour segments:
  - 12:01 AM - 06:00 AM
  - 06:01 - Noon
  - 12:01 PM - 06:00 PM
  - 06:01 PM - Midnight

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- 44 of 50 states in the USA mandate successful BASIC LIFE SUPPORT training to maintain dental licensure

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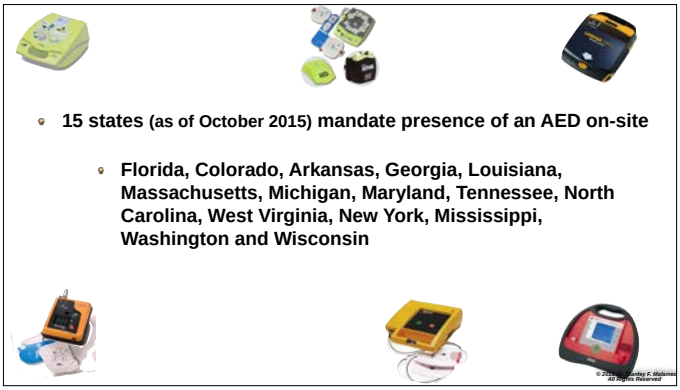

- 15 states (as of October 2015) mandate presence of an AED on-site
  - Florida, Colorado, Arkansas, Georgia, Louisiana, Massachusetts, Michigan, Maryland, Tennessee, North Carolina, West Virginia, New York, Mississippi, Washington and Wisconsin

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EMERGENCY MANAGEMENT ALGORITHM

P - C - A - B - D

Algorithm for
ALL
emergency management

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P - C - A - B - D

- ☆ P = Position . . . . . Conscious = anything; Unconscious = supine
- ☆ C = Circulation . . . . . Assess & chest compression if needed
- ☆ A = Airway . . . . . Assess & maintain airway (head tilt-chin lift) if needed
- ☆ B = Breathing . . . . . Assess & ventilate if needed
- ☆ D = Definitive Care

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Preparation of the Office & Staff

1. Basic Life Support training
2. Preparation of Dental Office Staff Members
3. Emergency Assistance
4. Emergency Drugs & Equipment

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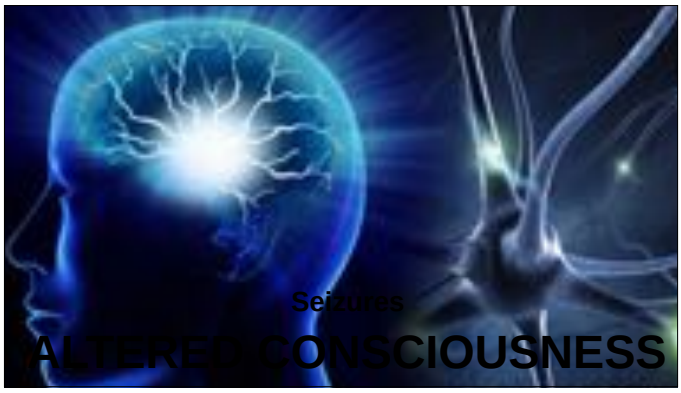

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Seizure

Convulsion, 'Fit', 'Spasm'

Definition:
A paroxysmal episode, caused by abnormal electrical conduction in the brain, resulting in the abrupt onset of transient neurologic symptoms such as involuntary muscle movements, sensory disturbances and altered consciousness. Also called convulsion.

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Injured cells

When cells are injured, hypoxic or anoxic, they become hyperexcitable

Brain (CNS) = SEIZURES

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Causes of seizures in the dental environment

Epileptic patients

- Stress induces seizures
- Cerebral hypoxia
  - Syncope + inadequate airway
- Hypoglycemia
- Local anesthetic overdose

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Seizures - Dialogue history

- What type of seizure(s) do you have?
- What anticonvulsant medications do you take?

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Seizures - Dialogue history

- What type of seizure do you have?
- What anticonvulsant medications do you take?
- How well controlled are your seizures?
- **What is your aura?**
  - Generalized tonic-clonic

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Epileptic AURA

- **An epileptic aura precedes an epileptic seizure and may involve visual disturbances, dizziness, numbness, or any of a number of sensations which the patient may find difficult to describe exactly.**

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Epileptic AURA

- **In epilepsy the aura serves a useful purpose in that it warns of an impending attack and gives the patient time to seek privacy and a safe place to lie down before the seizure actually begins.**

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Seizure Management

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Seizure Management

Remove any/all items of dental equipment from the patients mouth

Prepare the patient for the seizure:
Remain in dental chair
Loosen tight clothing

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Generalized tonic clonic seizure

GTCS, 'Grand Mal'

- **Are self-limiting**
- **(most) SEIZURES STOP**
- **Last not more than 2 to 5 minutes**
- **Do *NOT* require anticonvulsant therapy**
- **Do *NOT* result in injury**

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Generalized tonic clonic seizure

GTCS, 'Grand Mal'

- **In a generalized tonic clonic seizure . . .**
- **During the *ictal* phase:**

- **CNS stimulation** **Bad**
- **Respiratory stimulation** **OK**
- **Cardiovascular stimulation** **So-So**

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Generalized tonic clonic seizure

GTCS, 'Grand Mal'

P . . .

C . . .

A . . .

B . . .

D . . .

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Seizure management - TONIC

- Chair is narrow
- Victim may fall from chair
- Keep victim in the dental chair

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Seizure management - CLONIC

Protect victim from injury:
Rescuer 1: arms . . .gently!
Rescuer 2: legs . . . gently!
Rescuer 3: airway
remove "pillow" or "donut" from headrest of chair
↓
Summon EMS ?????

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Remove "pillow" or "donut" from headrest of chair

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DO NOT PUT ANYTHING INTO THE MOUTH OF A CONVULSING PERSON

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Seizure Management

- In a generalized tonic clonic seizure . . .
- During the *post-ictal* phase:

- CNS depression **Bad**
- Respiratory depression **Bad**
- Cardiovascular depression **Bad**

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Post-Ictal Phase

Reassess: **P . . .**

C . . .

A . . .

B . . .

D . . .

Post-Ictal Phase

- CAB as needed
  - Airway, if snoring
  - Breathing, circulation - usually not necessary
- Patient is disoriented, sleeping
- Position: turn on side, if at all possible
  - Minimizes risk of aspiration of vomitus
  - Aids in airway maintenance,
- Dental chair: turn on side, if at all possible
  - If not: Supine & maintain airway prn

Post-Ictal Phase

- CAB as needed
  - Airway, if snoring
  - Breathing, circulation - usually not necessary
- Patient is disoriented, sleeping

Post-Ictal Phase

- Position: turn on side, if at all possible
  - Minimizes risk of aspiration of vomitus
  - Aids in airway maintenance,
- Dental chair: turn on side, if at all possible
  - If not: Supine & maintain airway, prn

Why consider EMS?

Determine disposition of patient following seizure:

- **Hospitalization, if not oriented to space & time:**
  - **Where are you?**
  - **What day is it?**
- **Discharge home in company of companion if oriented to space and time**

Management of status epilepticus

Status Epilepticus

STATUS EPILEPTICUS is defined as:

A medical emergency characterized by continuous seizures lasting more than *5 minutes* **without interruption or . . .**
A repeated seizure that begins before the individual recovers from the initial episode.

American Academy of Orthopedic Surgeons
Emergency care and transportation of the sick and injured. ed4, 1987

Management of Grand Mal Status

- Terminate dental procedure
- Position patient - supine, feet elevated
- Activate EMS
- Protect patient from injury
- BLS, prn
- Administer oxygen
- Monitor vital signs

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Management of Grand Mal Status

EMS

- Venipuncture (adult or larger child [> 30 kg])
- Anticonvulsant drug - titrated to effect IV
- Administer 50% dextrose

- Definitive management:
  - Stabilize & transport to hospital ED

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Management of Grand Mal Status

EMS

- Smaller pediatric patient (< 30 kg)
- Anticonvulsant drug - 0.2 mg/kg IN
- Administer 25% dextrose

- Definitive management:
  - Stabilize & transport to hospital ED

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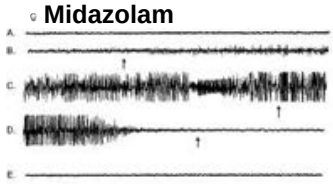
GTCS (Grand mal) status

Administer anticonvulsants:

- Administered IV or IN
- IV benzodiazepines:
  - Midazolam



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DRUG RELATED EMERGENCIES

Allergy

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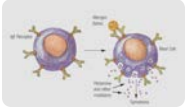
Allergy

Allergy represents an OVERREACTION by the bodies immune system to a foreign substance (allergen)



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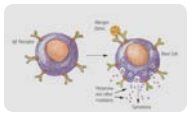
Allergen

An allergen is anything that can provoke an allergic reaction



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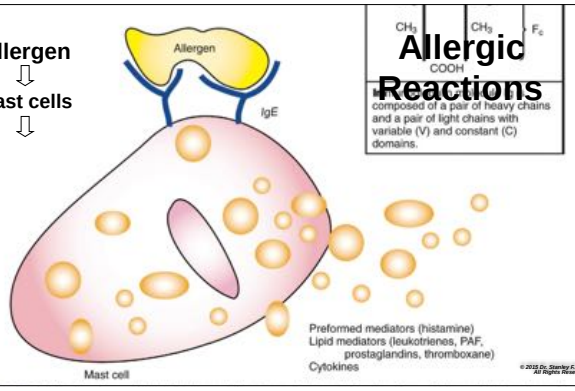
Allergic Reactions

Allergen
⇩
Mast cells
⇩



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Histamine

The Primary Mediator of the Allergic Reaction

DISTRIBUTION:

- **Everywhere, but higher amounts in lungs, skin and GI**
  - **Rapidly stored in mast cells and basophils**

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Histamine

The Primary Mediator of the Allergic Reaction

RELEASE CONDITIONS:

- **Type 1 hypersensitivity (allergy)**
- **Tissue injury**
- **Drugs & other foreign compounds,** e.g. meperidine (Demerol)

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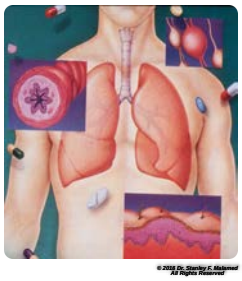
Histamine

The Primary Mediator of the Allergic Reaction

- **Heart rate = increases**
- **Blood pressure = decreases**
- **Small blood vessels = dilate**
- **Flushing**
- **Increased capillary permeability**



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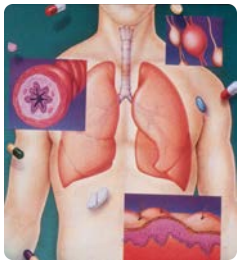
Histamine

Pharmacology - Summary



Itching . . . Pruritis

Hives . . . Urticaria

Rash . . . Erythema

Bronchospasm

Vasodilation

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Allergic Reactions

Diagnosis
&
Management

Allergic Reactions

Possible predictors of severity of the reaction

Rapidity of *ONSET*
of signs and symptoms

PROGRESSION
of signs and symptoms

Onset of S&S

Delayed:

- **S & S develop slowly [>60 min]**
- **Reaction involves skin**

Immediate:

- **S & S develop within minutes of exposure**
- **Reaction involves respiratory a/o cardiovascular systems**

Progression of S&S

Usual: Starts as SKIN - does not progress

Stimulation of EXOCRINE GLANDS e.g. tearing, nasal discharge (runny nose)

Spasm of intestinal smooth muscle (e.g. cramping)

Bronchospasm

Vasodilation of blood vessels

Allergic Reactions

Most allergic reactions (~85% - 90%) are Non-Life Threatening

- **P . . .**
- **C . . .**
- **A . . .**
- **B . . .**
- **D . . .**

Delayed onset skin reaction

S&S
> 1 hour after antigenic exposure

Delayed Onset Skin Reaction

Management:

D . . .

Parenteral histamine blockers:

- **Diphenhydramine . . . IM (vastus lateralis)**
  - **50 mg adults**

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Delayed Onset Skin Reaction

Management:

D . . .

Oral histamine blockers:

- **Diphenhydramine**
  - **50 mg qid adults**
  - **25 mg qid < 30 kg**
  - **For 3 days**

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Anaphylaxis

Definition: An acute and potentially life-threatening multi-system allergic reaction

- **Respiratory compromise and cardiovascular collapse cause most deaths**
  - **Time to CV collapse: Food (25-35 min); Insect sting (10-15 min)**

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Anaphylaxis

Common etiologies

Stinging insects

Penicillin

Latex

Peanuts

Aspirin, NSAIDs

Shellfish

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Bee Sting Fatal to Player

A South Carolina-Spartanburg basketball player died Monday shortly after a bee stung him during a pickup game at the school's gym.

Charles Maurice D'Antignac Tysus, 20, apparently had a history of allergic reactions to insect stings, said Chris Sawyer of the Spartanburg County Coroner's office.

Teammates said they saw a bee sting Tysus, who collapsed and went into convulsions. (AP)

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ANAPHYLAXIS

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Anaphylaxis . . . Management

P . . . Based upon primary complaint:

- **"Can't breathe" . . . upright**
- **"Feel faint" . . . supine, feet elevated**

C . . . assess . . . prn

A . . . assess . . . prn

B . . . assess . . . prn

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The diagnosis and management of anaphylaxis practice parameter: 2010 Update

Lieberman P, Nicklas RA, Oppenheimer J, et al

Allerg Clin Immunol 126:477-480, 2010

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The more rapidly anaphylaxis develops, the more likely the reaction is to be severe and potentially life-threatening

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Prompt recognition of signs and symptoms of anaphylaxis is crucial.

If there is any doubt, it is generally better to administer epinephrine

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S&S of Anaphylaxis

- **Skin: Flushing, hives, itching, angioedema**
- **Face/Neck: Conjunctival injection, nasal congestion, swelling, throat clearing, throat closing, hoarseness, difficulty swallowing**
- **Respiratory: Wheezing, SOB, coughing**
- **Cardiac: Chest pain, hypotension, tachycardia, (bradycardia), LOC**
- **GI: Nausea, vomiting, cramping, diarrhea**

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- **Epinephrine and oxygen are the most important therapeutic agents administered in anaphylaxis.**
- **Epinephrine is the drug of choice, and the appropriate dose should be administered promptly at the onset of apparent anaphylaxis**

108

The diagnosis and management of anaphylaxis practice parameter: 2010 Update.
Lieberman P, Nicklas RA, Oppenheimer J, et al
Allerg Clin Immunol 126:477-480, 2010

There is no absolute contraindication to epinephrine administration in anaphylaxis

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Anaphylaxis . . . Management

D . . . Definitive care

- **Epinephrine**
  - **As soon as possible**
  - **Every 5 minutes until**
    - **Victim recovers**
    - **Help (9.1.1) arrives**

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Anaphylaxis . . . Management

D . . . Definitive care

- **Epinephrine**
- **Basic life support, as needed**
- **Oxygen**
- **EMS (9.1.1)**

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Anaphylaxis . . . Management

0.3 mg/dose = adult
0.15 mg/dose = child (15 - 30 kg)

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OXYGEN

"E" cylinder

portable delivery system

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Anaphylaxis: How do patients die?

Vasodilation

- **Increased vascular permeability may shift 35% - 50% of intravascular volume to the extravascular space within 10 minutes** Results in precipitous drop in BP

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Anaphylaxis . . . Management (1)

- Assess C, A, B's
- Epinephrine 0.3 mg of 1:1,000 IM *thigh* (adult); 0.15 mg of 1:1,000 IM *thigh* (child). Give quickly and repeat every 5 minutes as needed
- Give as soon as possible

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Anaphylaxis . . . Management (2)

- **Position supine, feet elevated.** This position is equivalent to infusion 1 - 2 liters in the central vascular compartment

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Anaphylaxis . . . Management (3)

- Diphenhydramine: 25-50 mg IV (adults); 1 mg/kg children (up to 50 mg)
- Prednisone 0.5 mg/kg/day orally - will have NO ACUTE EFFECT

117

Anaphylaxis . . . Management (4)

- **Oxygen** - for patients with prolonged reactions, are short of breath, experiencing chest pain
- **Activate EMS** (e.g. 9.1.1)

118

- According to the 2010 practice parameter update on anaphylaxis, measures to take in order of importance:
  - Epinephrine
  - Patient position
  - Oxygen
  - IV fluids
  - Nebulized therapy
  - Vasopressors
  - Antihistamines, steroids & other agents

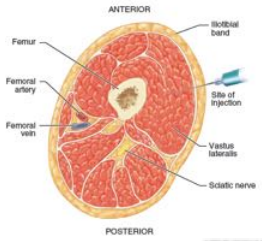
119

Epinephrine in Anaphylaxis

- There are NO absolute contraindictions to using epinephrine in anaphylaxis
- Approximately 25% - 33% of patients with anaphylaxis who receive epinephrine are reported to receive a 2nd dose because of ongoing S&S or a biphasic reaction

120

Vastus Lateralis = Thigh



121

Why epinephrine?

Reverses 2 components of anaphylaxis which lead to death:

- Bronchospasm . . . Epi is bronchodilator
- Hypotension . . . Epi is vasopressor

- Epi, through its vasoconstrictive actions can reverse edema, but only if administered PROMPTLY

Works fast

- IM vastus lateralis w/l ± 2 minutes

122

Anaphylaxis . . . Management

Goal: short-term survival

- Keep the victim alive until
  - They recover
  - Help arrives on scene

123

Anaphylaxis . . . Management

Goal: short-term survival

- Epi . . . Epi . . . Epi
- BLS, prn
- Oxygen
- EMS

124

Anaphylaxis . . . Management

Recovery:

- Relief of bronchospasm
- Elevation of blood pressure

125

Anaphylaxis . . . Management

Recovery:

- Epinephrine:
  - Rapid onset - GOOD
  - Short duration - BAD

126

Anaphylaxis . . . Management

Once life is out of danger . . .

Histamine blocker IM (1 mL)

- **Diphenhydramine HCl 50 mg**
  - **25 mg - up to 30 kg**

127

Anaphylaxis . . . Management

Histamine blockers IV

Corticosteroids IV

- **Decadron, Solu-Cortef, Solu-Medrol**
- **Slow onset, long duration**
- **Stabilize cell membranes**
  - **Prevent edema, vasodilation**

128

Anaphylaxis . . . Management

Hospitalization

- **ED . . . several hours - observation**
- **Hospitalized . . . overnight - observation**
- **Hospitalized . . . several days**

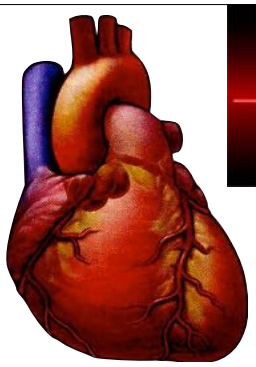
129

Anaphylaxis

- **Represents the only emergency situation which requires the immediate administration of a drug, epinephrine, in order for the victim to have a chance of survival.**
- **The more rapidly epinephrine is administered at onset of anaphylaxis the greater the chance of survival**
- **Absent epinephrine, survival from anaphylaxis is less likely**

130

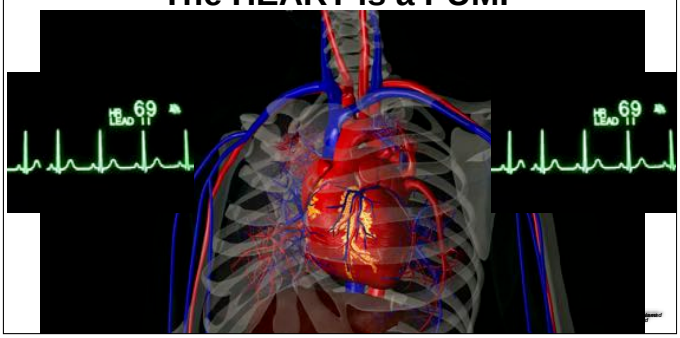
Chest 'Pain'



Chest 'Pain'

131

The HEART is a PUMP

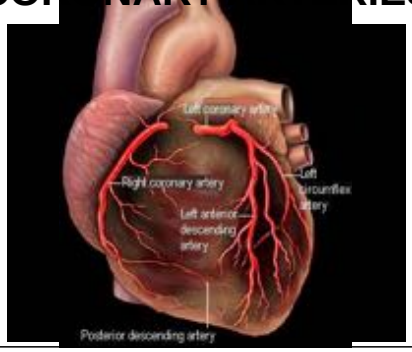


132

- Heart muscle - MYOCARDIUM contracts, squeezing blood out of the heart into the pulmonary artery (right side of heart) or aorta (left side of heart)
- To continue to function the myocardium requires its own blood supply
- Myocardial blood supply is from *CORONARY ARTERIES*

133

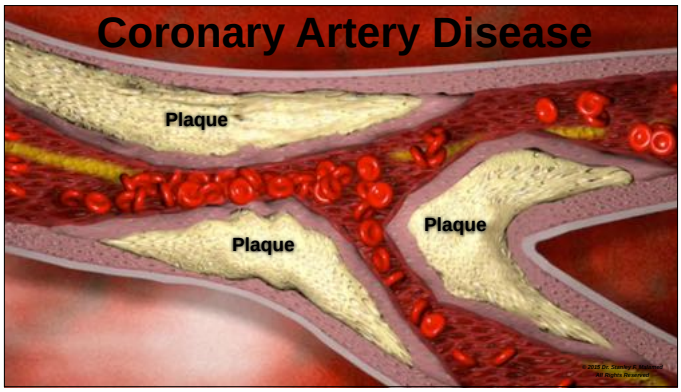
COR NARY RIES



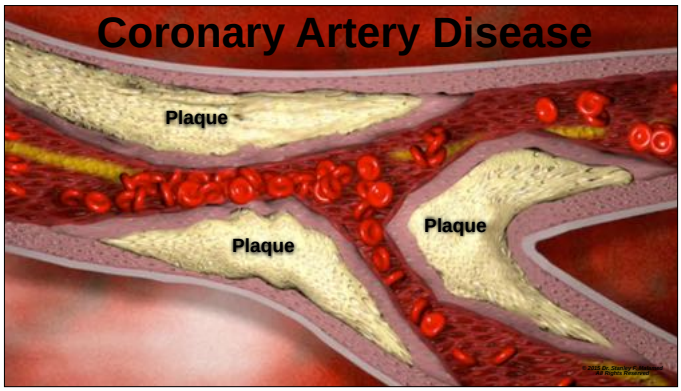
134

Syncope	15,407 (50.3%)	ALL patients (Adult, Pediatric, Geriatric)
Mild allergy	2,583 (8.4%)	
Angina Pectoris	2,552 (8.3%)	
Postural hypotension	2,475 (8.1%)	
Seizure	1,595 (5.2%)	
Asthmatic attack	1,392 (4.5%)	
Hyperventilation	1,326 (4.3%)	All ages N = 4,307
Epinephrine Rxn	913 (3.0%)	
Hypoglycemia	890 (2.9%)	
Cardiac Arrest	331 (1.1%)	
Anaphylaxis	304 (1.0%)	
Myocardial Infarction	289 (0.9%)	
L.A. Overdose	204 (0.7%)	

135

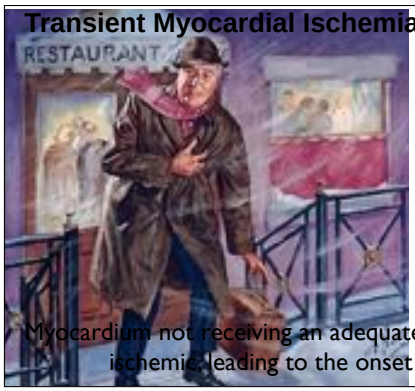


136



137

Transient Myocardial Ischemia = Angina Pectoris



Myocardium not receiving an adequate blood supply becomes ischemic, leading to the onset of anginal 'pain'

138

Angina Pectoris . . . Management

P . . . Conscious = Comfortable (usually upright preferred)

C . . . Assess . . . prn

A . . . Assess . . . prn

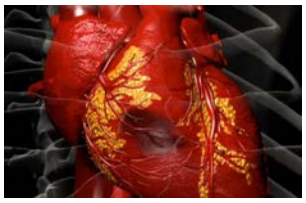
B . . . Assess . . . prn

D . . . Nitroglycerin, O_2

D . . . Determine cause, modify future treatment

139

Angina Pectoris



With rest or administration of nitroglycerin the myocardial workload decreases and the chest 'pain' dissipates

140

Nitroglycerin

Nitroglycerin produces a 28% increase in coronary artery lumenal diameter

141

Angina pectoris and dentistry

The only time ANGINA should be considered as a diagnosis in acute chest pain is where the patient (victim) has a PREEXISTING HISTORY of ANGINA

142

142

Consider Myocardial Infarction when:

In anginal patient when:

- **'Pain' worse than usual**
- **3 doses of nitroglycerin fail to relieve discomfort**
  - **doses every 5 minutes**
- **Nitroglycerin relieves 'pain', but 'pain' returns.**

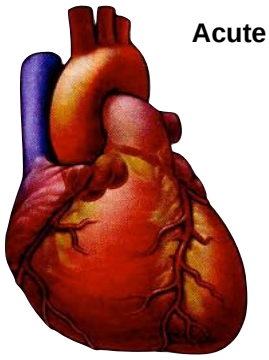
143

Consider Myocardial Infarction:

ALWAYS
when there is no prior history
of
cardiovascular disease

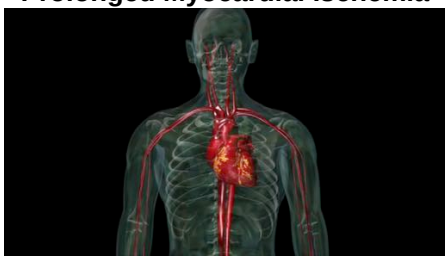
144

Acute Myocardial Infarction



145

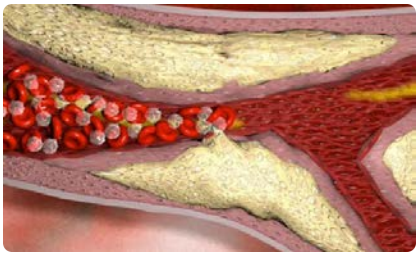
Prolonged Myocardial Ischemia



RUPTURE of the PLAQUE into the lumen of the coronary artery terminates blood flow to an area of myocardium

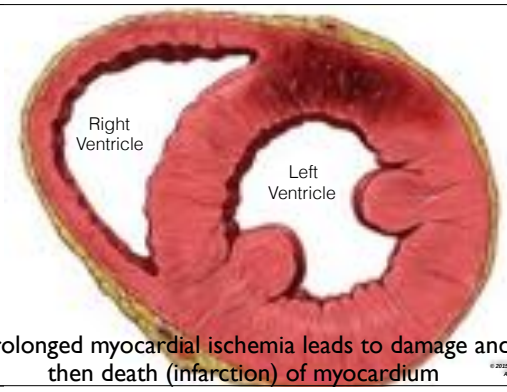
146

Prolonged Myocardial Ischemia



RUPTURE of the PLAQUE into the lumen of the coronary artery terminates blood flow to an area of myocardium

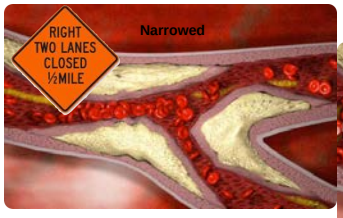
147



Prolonged myocardial ischemia leads to damage and then death (infarction) of myocardium

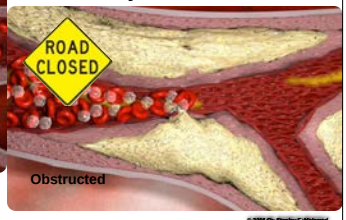
148

Acute Coronary Syndrome



Angina Pectoris

Acute Myocardial Infarction



149

First Time Chest 'Pain"

P . . .

C . . .

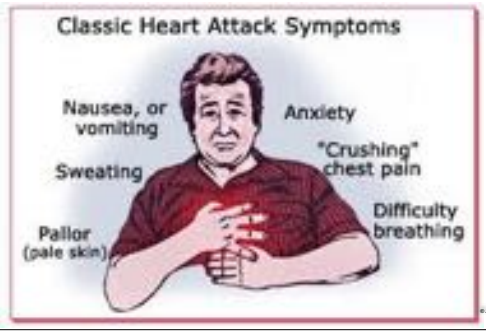
A . . .

B . . .

D . . .

150

Acute Myocardial Infarction



151

Acute Myocardial Infarction

SILENT MI

- **Women (up to 50%)**
- **Elderly**
- **Diabetics**

- **Do not present with classic signs & symptoms**

152

Suspected MI . . . Management

P . . . Conscious = Comfortable
(usually upright preferred)

C . . . Assess . . . prn

A . . . Assess . . . prn

B . . . Assess . . . prn

D . . . MONA - Nitroglycerin, O_2

D . . . Activate EMS

153

MONA

Acronym for the *PRE-HOSPITAL MANAGEMENT OF A SUSPECTED MYOCARDIAL INFARCTION*

154

MONA

Morphine

Oxygen

Nitroglycerin

Aspirin

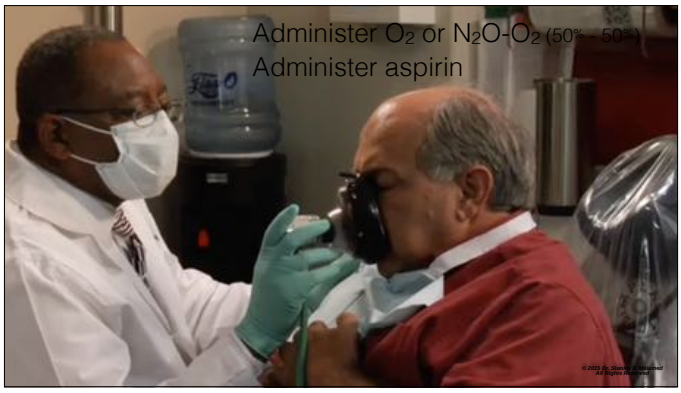
Prehospital management of suspected MI

155

MONA	=	NONA
Morphine	=	N_2O-O_2
		Oxygen
		Nitroglycerin
		Aspirin

Prehospital management of suspected MI

156



157

Nitrous Oxide - Oxygen

50% - 50%

As analgesic as IV morphine

- **Separates pain from suffering**

Sedative

- **Relaxes scared patient**

50% O_2

- **2.5 times ambient air**

Entonox
Dolonox

Prehospital management of suspected MI

158

Aspirin
in Myocardial Infarction

- **325 mg. chewed, swallowed - POWDERED, if available**
  - **20 minute onset**
- **Prevents blood clot (thrombosis) from increasing in size**
- **Increases chances of primary balloon angioplasty being successful**

Prehospital management of suspected MI 159

159

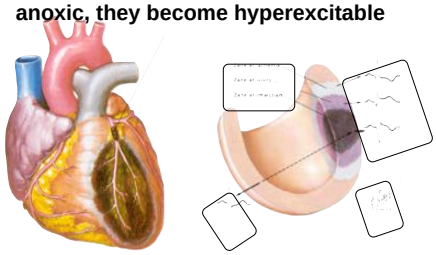
160

161

162

Acute Myocardial Infarction

When cells are damaged, hypoxic or anoxic, they become hyperexcitable



Myocardium = DYSRHYTHMIAS

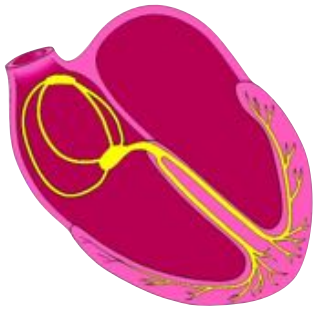
163

Arrhythmia or Dysrhythmia

- **Arrhythmia: A = 'not' or "without' Therefore, an arrhythmia implies NO beat or a 'flat line'.**
- **The only true arrhythmia is asystole (no contraction)**
- **Dysrhythmia: Dys = abnormal 'An abnormal cardiac rhythm'**

164

The Conduction System of the Heart



165

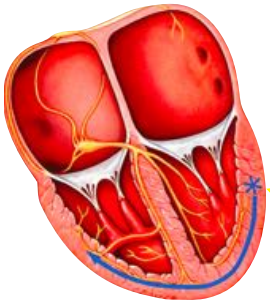
Normal Sinus Rhythm - NSR

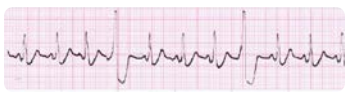
'P' wave
Atria contract

166

Premature Ventricular Complexes

Monomorphic (Unifocal)





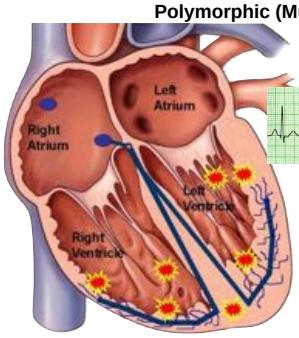
ALL PVC's look alike

Area of ischemic myocardium

167

Premature Ventricular Complexes

Polymorphic (Multifocal)



PVC's vary in size & shape

MORE CLINICALLY SIGNIFICANT!

168

Premature Ventricular Contractions
PVC's

- PVC - ischemic (not enough blood [O_2] supplied to muscle). Muscle becomes irritable (hyperexcitable)
- Ischemic muscle depolarizes prematurely initiating premature contraction of the ventricle. Ventricle has not completely filled with blood therefore little/no blood ejected from heart
- Result: NO PALPABLE PULSE

169

Premature Ventricular Contractions
PVC's

Patient is CONSCIOUS
8 of 11 contractions (systoles) are normal, ejecting blood into the systemic circulation.

Output of blood is 73% of normal

170

Premature Ventricular Contractions
PVC's

Patient is CONSCIOUS
yet demonstrating S&S of decreased blood flow to periphery:
- Cyanotic mucous membranes
- Ashen gray skin color
- Diaphoresis
- Generalized feeling of fatigue

171

Premature Ventricular Contractions
Bigeminy

Cardiac

172

The doctor's goal in a medical emergency situation

Keep the victim alive until:
(1) Recovery occurs or
(2) Help arrives to take over management

173

So, what exactly has been done prior to EMS arrival to PREVENT the occurrence of cardiac arrest?

Morphine (N_2O-O_2)
Oxygen
Nitroglycerin
Aspirin

174

Acute Myocardial Infarction

Cardiac Arrest

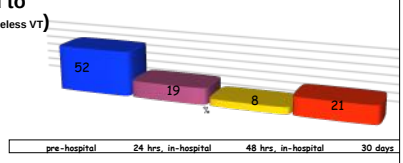
Most OOH-SCA are related to acute dysrhythmias (VF/ pulseless VT)

Most occur during the

1st hour

after symptom onset

52% of MI mortality



Deaths from MI

175

Acute Myocardial Infarction

Cardiac Arrest

Getting into the 'system' (9.1.1) is *THE* most important thing that can be done for the victim of a 'suspected heart attack' (AMI)

176

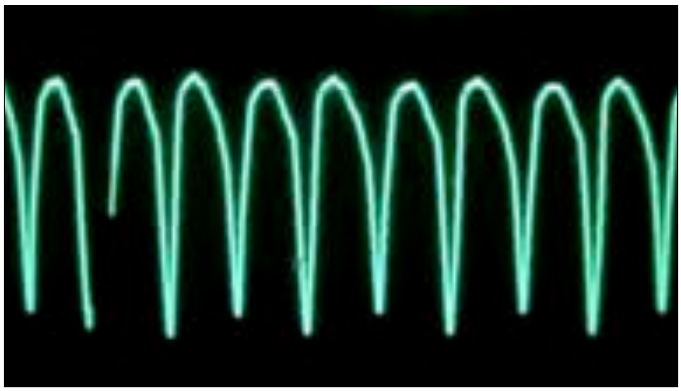
Ventricular fibrillation is 15 times more likely to occur in the first hour after the onset of signs and symptoms than in the next 12 hours.

It develops in the first hour in approximately 36% of persons with acute MI.

177

The significant mortality rate associated with MI is in part based on the average delay (4.9 hours) between the onset of signs and symptoms and intervention by the emergency medical system.

178



179

CARDIAC ARREST
occurs when the heart ceases to PUMP BLOOD

In CARDIAC ARREST
the heart, usually, is still BEATING
It is no longer PUMPING

180

CARDIAC ARREST
occurs when the heart ceases to
PUMP BLOOD

There are four rhythms that constitute cardiac arrest

(1) (pulseless) Ventricular Tachycardia
(2) Ventricular Fibrillation (coarse & fine)
(3) Asystole
(4) Pulseless Electrical Activity (PEA)

181

Cardiac Arrest

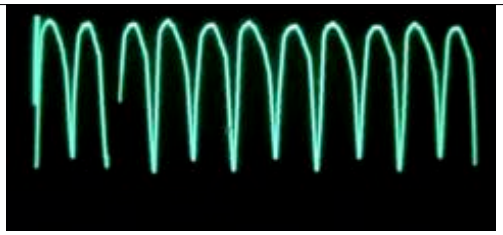
- **Pulseless Ventricular Tachycardia**

- **Ventricular Fibrillation**

- **Asystole**

- **Pulseless Electrical Activity**

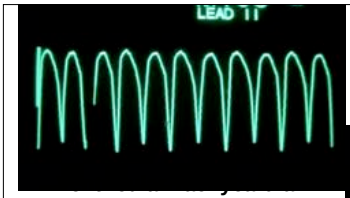
182



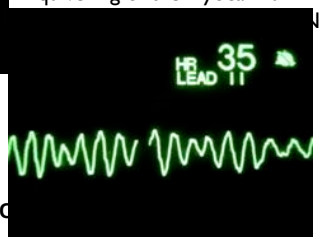
VT with a pulse or pulseless VT

The ischemic area of myocardium has taken control.
ALL beats are PVCs

183

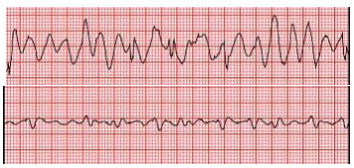


VT degenerates into a
CHAOTIC, unorganized
quivering of the myocardium -



184

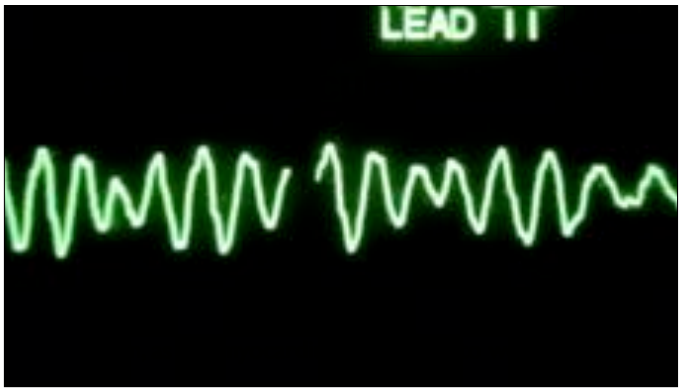
Ventricular Fibrillation



Common clinical findings

- **Disappearance of pulse with VF**
- **Collapse, unconsciousness**
- **Agonal breaths** **apnea in < 5 minutes**
- **Onset of reversible death**

185



186

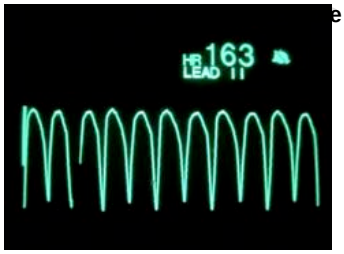
187

CARDIAC ARREST
occurs when the heart ceases to PUMP BLOOD

In CARDIAC ARREST
the heart, usually,
is still BEATING
It is no longer PUMPING

188

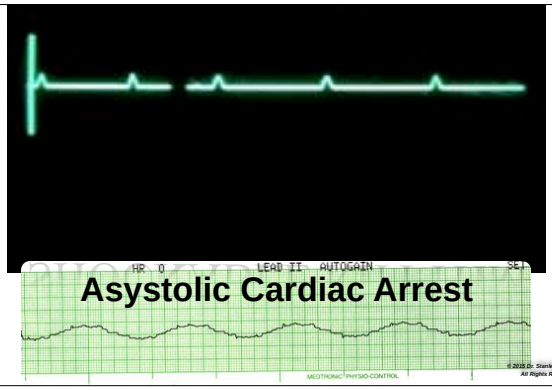
Cardiac Arrest



Ventricular Tachycardia

Ventricular Fibrillation
coarse & fine

189



190

What happens when the heart stops *PUMPING* blood?

191

Blood pressure falls to zero,

Pulse is not palpable,

Consciousness is lost, and

Respirations cease.

And the victim is . . .

192

DEAD

UNCONSCIOUS

NOT BREATHING

NO PULSE

DEAD

193

Cardiac Arrest

UNCONSCIOUS

NOT BREATHING

NO PULSE

Clinical Death

194

Our goal in resuscitation is to prevent the *PERMANENT* death of the victim.

- Cells in the victims body will die when they use up all of the O_2 available to them
- CELLULAR or BIOLOGICAL death occurs
- Biological death is *irreversible*

195

The time between the occurrence of CLINICAL and BIOLOGICAL DEATH represents the period in which RESUSCITATION may be successful

196

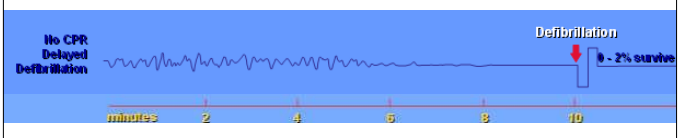
Surviving Sudden Cardiac Arrest

Brain cells (neurons) have a high metabolic rate.

A degree of permanent neurologic deficit can be expected when neurons are deprived of O_2 for 3 or more minutes.

197

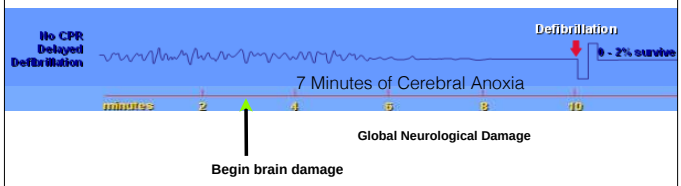
No BLS
Delayed EMS, Delayed BLS & Defibrillation:



Death . . . or . . .

198

No BLS
Delayed EMS, Delayed BLS & Defibrillation:



Severe brain damage

199

A very important fact about CPR (Basic Life Support):

- **Basic life support . . .**
  Circulates oxygenated blood . . .
- **Does NOT convert cardiac arrest into a functional rhythm (e.g. NSR)**
- **BLS simply increases the time during which the myocardium is still alive**

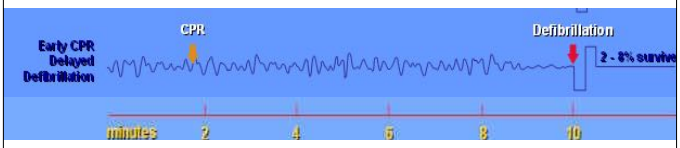
200

ANY rhythm

is better than

NO rhythm

201



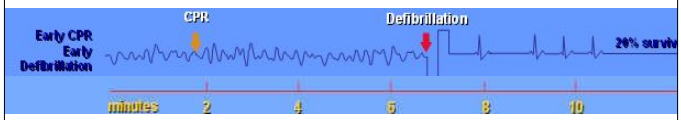
Early BLS increases the duration of VF (fine VF)

+ delayed defibrillation

2% - 8% survival

202

Early BLS + early defibrillation (coarse VF)



~20% survival

203

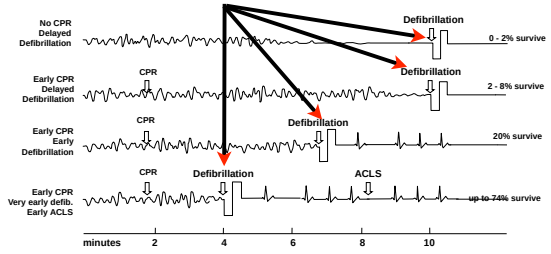
Early BLS + very early defibrillation (coarse VF)

Up to 74% in some situations

Neurological deficit unlikely

204

EMS arrival Survival Rates



BYSTANDER-INITIATED BLS

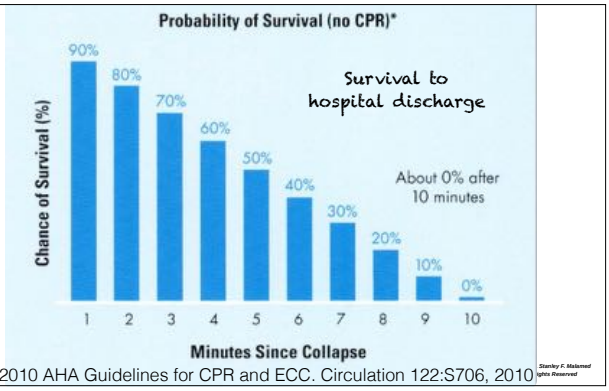
205

How critical is response time to survival?

In the absence of CPR, for every minute a victim is in cardiac arrest the chance of survival decreases by between 7% and 10%.

Survival to hospital discharge

206



2010 AHA Guidelines for CPR and ECC. Circulation 122:S706, 2010

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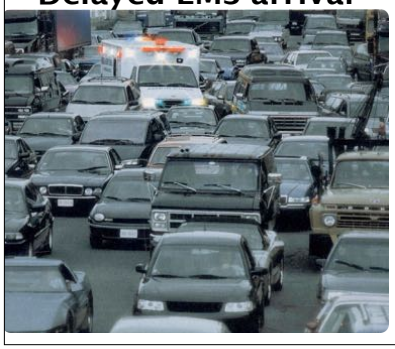
Delayed EMS arrival



Absence of BYSTANDER-INITIATED BLS

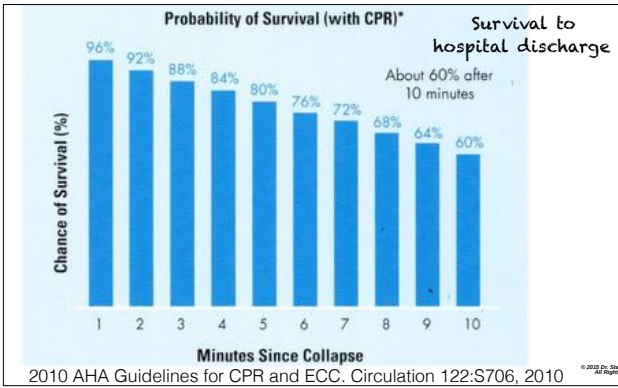
208

How critical is response time to survival?

With CPR initiated prior to EMS arrival, for every minute a victim is in cardiac arrest the chance of survival decreases by between 3% to 4%.

Survival to hospital discharge

209



2010 AHA Guidelines for CPR and ECC. Circulation 122:S706, 2010

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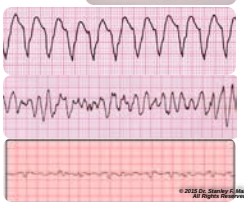
Automated External Defibrillators

(AED's)

211

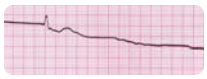
How to use an AED

- Simplistically, an AED is a battery operated computer which is capable of determining whether or not VF/VT is present.
  - VF/VT present:
    - 'SHOCK ADVISED"



212

How to use an AED



- Any rhythm other than VF/VT
  - PEA, asystole, NSR
    - 'NO SHOCK ADVISED'
    - 'Check airway'
    - 'Check breathing'
    - 'Check pulse'
    - 'If no pulse, continue CPR'

213

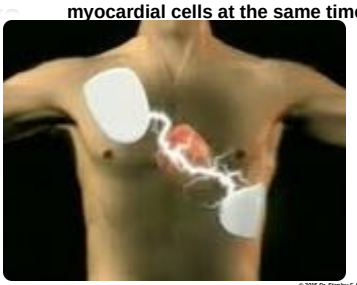
How an AED works

- VF . . . chaotic, uncordinated 'quivering' of myocardium

214

How an AED works

AED delivers a biphasic (2 shocks) shock across the chest - through the myocardium - depolarizing all myocardial cells at the same time.

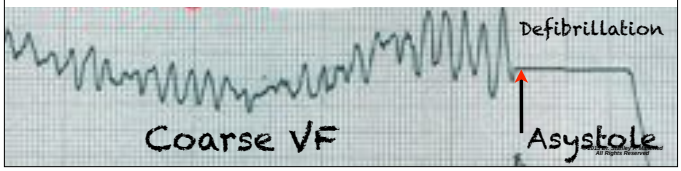


215

How an AED works

- AED delivers a biphasic (2 shocks) shock across the chest - through the myocardium - depolarizing all myocardial cells at the same time, producing . . .

ASYSTOLE



216

How an AED works

- The more 'alive' the myocardium when depolarized the more likely it is that the SA node will spontaneously depolarize inducing a normal sinus rhythm.

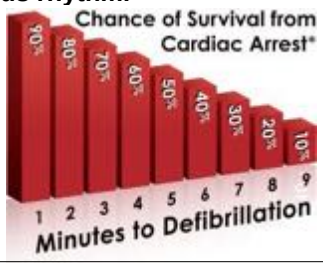
217

How an AED works

REBOOT
the
HEART

218

- The more 'alive' the myocardium when depolarized the more likely it is that the SA node will spontaneously depolarize inducing a normal sinus rhythm.



219

Can the chest be compressed adequately with the victim in the dental chair?

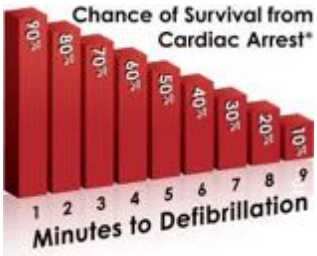
YES

Lepere AJ, Finn J, Jacobs I
Efficacy of cardiopulmonary resuscitation performed in a dental chair
J Australian Dental Association 48(4) 244-247, 2003 (December)

220

221

- Average response time in the USA: call to shock is 10-minutes
- Can this be improved upon?



222

Rules to Remember

The very first step in management of all medical emergencies is

BASIC LIFE SUPPORT,

as needed

223

And remember . . . "Stuff Happens"

Syncope	15,407 (50.3%)
Mild allergy	2,583 (8.4%)
Angina Pectoris	2,552 (8.3%)
Postural hypotension	2,475 (8.1%)
Seizure	1,595 (5.2%)
Asthmatic attack	1,392 (4.5%)
Hyperventilation	1,326 (4.3%)
Epinephrine Rxn	913 (3.0%)
Hypoglycemia	890 (2.9%)

Cardiac Arrest	331 (1.1%)
Anaphylaxis	304 (1.0%)
Myocardial Infarction	289 (0.9%)
L.A. Overdose	204 (0.7%)

224

Emergency Management

non-Cardiac arrest		Cardiac arrest
P . . . position		**P** . . . position
C . . . circulation	Drug therapy is **ALWAYS** secondary to basic life support	**C** . . . circulation
A . . . airway		**A** . . . airway
B . . . breathing		**B** . . . breathing
D . . . definitive care		**D** . . . defibrillation

225

P - C - A - B

Keep the victim alive

226

EMERGENCY MEDICINE

10-Minutes to Save a Life

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THANK YOU
for LISTENING!

THANK YOU
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