Emergency Medicine

Back to basics

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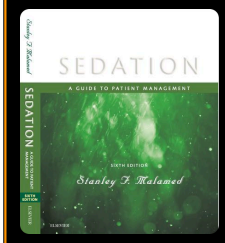

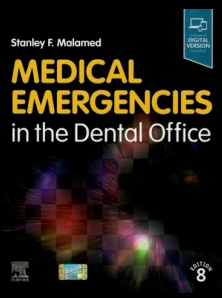

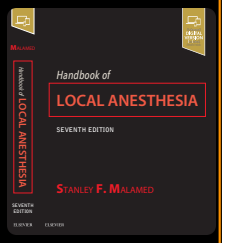

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Medical emergencies
CAN and **DO**
happen
in the practice of
dentistry

What *IS* a medical emergency in the dental surgery?

An unforeseen event requiring the doctor to stop treatment because the patients life appears to be in jeopardy

Do medical emergencies occur in the dental surgery?

4,307 doctors in North America

- 94.9% have experienced at least one medical emergency in their office
- Average length of career 14.7 years
- 30,608 emergencies reported
- 7.1 emergencies per doctor during career

Malamed SF. Managing medical emergencies
J Am Dent Assoc; 1993 Aug; 124(8):40-53.

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%)
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Hypoglycemia	890 (2.9%)
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Anaphylaxis	304 (1.0%)
Myocardial infarction	289 (0.9%)
L.A. Overdose	204 (0.7%)

ALL patients
(Adult, Pediatric, Geriatric)

All ages
N = 4,307

You can expect to encounter
1 medical emergency situation
every 2 to 4 years

Malamed SF. Managing medical emergencies J Am Dent Assoc; 1993 Aug; 124(8):40-53.

Jevon P. Updated guidance on medical emergencies and resuscitation in the dental practice. Brit Dent J 2012 Jan;212(1):41-43

Johnson TM, Kurt-Gabel C. Compliance with and attitudes towards the management of medical emergencies in general dental practice. Prim Dent J. 2014 Feb;3(1):41-45

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

"Try to
keep the victim alive until
they recover or until another
- more qualified - individual
assumes responsibility
for treatment"

Preparation of the Office & Staff

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

BASIC LIFE SUPPORT

(CPR, Resuscitation, Reanimation)

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

Preparation of the Office & Staff

1. ***Basic Life Support - CPR***
2. ***Basic Life Support - CPR***
3. ***Basic Life Support - CPR***
4. ***Basic Life Support - CPR***
5. ***Basic Life Support - CPR***
6. ***Basic Life Support - CPR***
7. ***Basic Life Support - CPR***
8. Office Emergency TEAM
9. Emergency Assistance
10. Emergency Drugs & Equipment

Preparation of the Office & Staff

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

The Office Emergency Response Team

Member #1
Member #2
Member #3

Member #1

1st person on scene of emergency

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

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

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

Preparation of the Office & Staff

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

Emergency Medical Services

When?

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

Emergency Medical Services

NEVER HESITATE
to seek help if you
feel it is needed

When?

Emergency Medical Services

9 1 1

9 1 1

Emergency Medical Services

Stabilize & Transport

Response time, urban v suburban v rural - United States - 2019

			Urban	Suburban	Rural
	Brooks 2019	New England USA ME, RI, Vt, NH, CT	9 min		15 min
	Mell 2017	USA	7 min	6 min	13 min

Brooks A.
Racing against the clock: Improving speed and effectiveness of emergency medical service response in rural areas.
J Publ Health Manag Pract 2015; 7 October

Mell HK, Mumma SN, Hiestand B, Carr BG, Holland T, Stopyra J.
Emergency Medical Services Response Times in Rural, Suburban, and Urban Areas. JAMA Surg. 2017 Oct 1;152(10):983-984.

Response time, urban v suburban v rural - United States - 2019

		Urban	Suburban	Rural
	Mell 2017	7 min	6 min	13 min

In 25% of cases of RURAL SCA
response time exceeded 19 minutes

Mell HK, Mumma SN, Hiestand B, Carr BG, Holland T, Stopyra J.
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Preparation of the Office & Staff

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

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

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** & **West Virginia.**

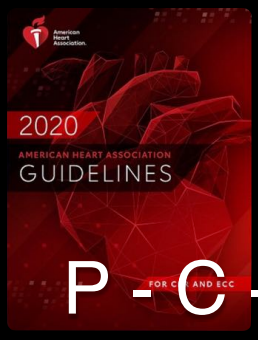
Critical Drugs & Equipment
THE BASIC EIGHT
(as per Malamed)

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

BASIC EQUIPMENT

Automated External Defibrillator (AED)

EMERGENCY MANAGEMENT ALGORITHM



P - C - A - B - D

EMERGENCY MANAGEMENT ALGORITHM

P - C - A - B - D

Algorithm for
ALL
emergency management

P - C - A - B - D

P = Position . . . . . **Conscious** = comfortable; **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 . . . **Diagnosis**, **Drugs**, **Defibrillation**

P = position

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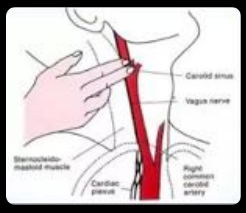

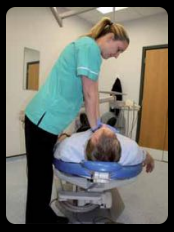

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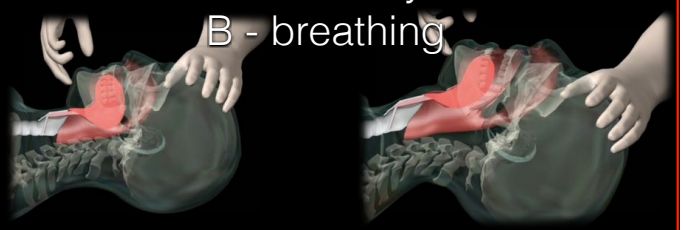
A = airway
B - breathing

The *TONGUE* is the most common cause of respiratory (airway) obstruction in the unconscious patient.

A = airway
B - breathing



- *BASIC airway maneuver:*
- **HEAD TILT - CHIN LIFT**

D = Definitive Care . . .

Diagnosis

Drugs

Defibrillation

Emergency Medications and Indications

Prepared by Stanley Malamed, DDS

The table below outlines Dr. Stanley Malamed's recommended list of emergency medications for dental practices. Dr. Malamed is a Diplomate of the American Dental Board of Anesthesiology as well a continuing education lecturer on anesthesia, sedation, and emergency medicine. He has authored more than 170 scientific papers and three textbooks that are used around the world.

Medication	Indication	Adult Dose & Route (>66 lb; >30 kg)	Pediatric Dose & Route (33 to 66 lb; 15 to 30 kg)
Albuterol metered dose inhaler	Bronchospasm (acute asthma attack)	1 – 2 puffs Spacer recommended Repeat every 5 minutes, PRN	1 – 2 puffs Spacer recommended Repeat every 5 minutes, PRN
Aspirin	Suspected myocardial infarction ('heart attack')	325 mg, chewable or powdered preferred	N/A
Diphenhydramine	Allergy (non-life threating)	50 mg IM (vastus lateralis)	25 mg IM (vastus lateralis)
Epinephrine autoinjector	Anaphylaxis (life threating allergy)	0.3 mg IM vastus lateralis Repeat every 5 minutes, PRN	0.15 mg IM vastus lateralis Repeat every 5 minutes, PRN
Glucose gel (oral)	Hypoglycemia (conscious and able to cooperate)	Squeeze entire content of tube (15 grams glucose gel) into mouth and swallow	Squeeze entire content of tube (15 grams glucose gel) into mouth and swallow
Naloxone nasal spray	Suspected opioid overdose	1 spray (4 mg) naloxone, IN Repeat every 2 – 3 minutes in alternating nostrils	1 spray (4 mg) naloxone, IN Repeat every 2 – 3 minutes in alternating nostrils
Nitroglycerin translingual spray	Angina or suspected myocardial infarction	2 metered sprays (0.4 mg x2) on surface of tongue	N/A
Nitroglycerin sublingual tablets	Angina or suspected myocardial infarction	2 sublingual tablets (0.4 mg x2)	N/A
Oxygen	Any emergency (except hyperventilation)	15 liters/minute via face mask	15 liters/minute via face mask
Device: Automated External Defibrillator (AED)	Unconscious and no palpable pulse	As directed by AED	As directed by AED

PRN = as needed IM = intramuscularly IN = intranasally

HealthFirst

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Request:
Emergency medicine 'stuff'

The EMERGENCIES

Emergency Medicine

Recognition & Management

1. Seizures
2. Respiratory Distress
3. Cardiovascular

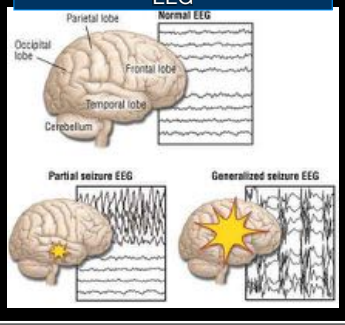
Seizure

Convulsion, 'Fit', 'Spasm'

Seizures represent a **HYPERSTIMULATION** of the neurons in the brain

Electroencephalogram

EEG

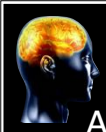


EPILEPSY World Health Organization EPILEPSY

- One seizure does NOT signify epilepsy
- Epilepsy is defined as having two or more unprovoked (idiopathic) seizures

Seizures - Dialogue history

- How well controlled are your seizures?
  - Typical = ~5 per year
  - Well-controlled
  - Poorly controlled



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.

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.

Epileptic AURA

Aura

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

Prepare the patient for the seizure:
Remain in dental chair

P . . .
C . . .
A . . .
B . . .
D . . .

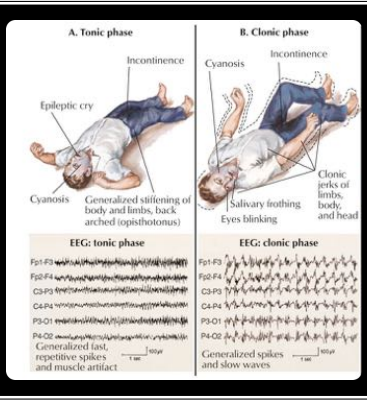
Seizure management

P . . .
C . . .
A . . .
B . . .
D . . .

Generalized tonic clonic seizure

GTCS, 'Grand Mal'

- Are self-limiting
- (most) SEIZURES STOP
- Last not more than 2 to 5 minutes



PREVENT INJURY

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 ?????

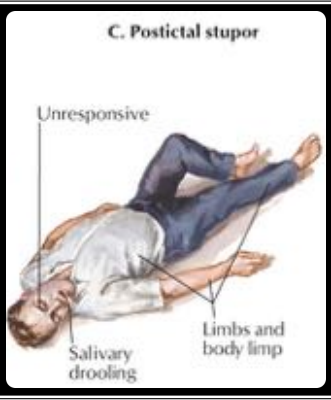
DO NOT PUT ANYTHING INTO THE MOUTH OF A CONVULSING PERSON

Generalized tonic clonic seizure
GTCS, ‘Grand Mal’

Last not more than 2 to 5 minutes

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

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



Post-Ictal Phase

Most morbidity & mortality occur in the post-ictal phase

Post-Ictal Phase

Keep them alive

Post-Ictal Phase

Reassess:

P . . .

C . . .

A . . .

B . . .

D . . .

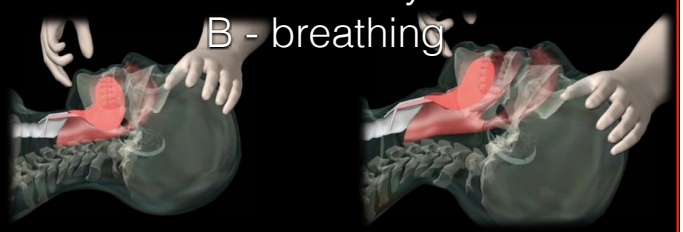
Post-Ictal Phase

CAB as needed

- Airway, if snoring
- Breathing, circulation - usually not necessary

Patient is disoriented, sleeping

A = airway
B - breathing



- *BASIC airway maneuver:*
- **HEAD TILT - CHIN LIFT**

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?

The doctor is uncomfortable with the situation

Why consider EMS?

Sometimes seizures DON'T stop

Status Epilepticus

A medical emergency characterized by continuous seizures lasting more than *5 minutes* without interruption

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

D . . . protect from injury during seizure, Activate EMS

D . . . if IV access is available . . .
Titrate midazolam to effect
(seizure terminated)

Management of Grand Mal Status

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

- Definitive management:
  - Stabilize & transport to hospital ED

Respiratory Distress

Bronchospasm

Asthma
Hyperactive Airway Disease

Dialogue history

What kind of asthma do you have?

Allergic (extrinsic) - 50% of all asthmatics

Common in children and young adults

Non-allergic (intrinsic) - 50% of all asthmatics

More common in adults older than 35 years

Dialogue history

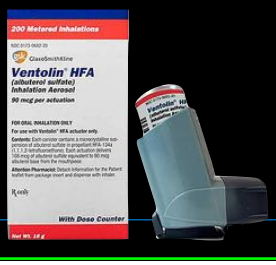
What drug[s] do you use for an acute episode?

- Your 'Rescue Drug'

- Beta agonists, such as:
  - Albuterol (Salbutamol)
  - Metaproterenol [Alupent]

Bronchospasm

Asthmatics will usually have their 'RESCUE DRUG' with them at all times



Signs & symptoms of bronchospasm

Feeling of chest congestion
Cough: c/s sputum production
Wheezing
Dyspnea
Patient sits up
Use of accessory muscles of respiration
Increased anxiety
Tachypnea

Bronchospasm

P . . .

C . . .

A . . .

B . . .

D . . .

Bronchospasm Management

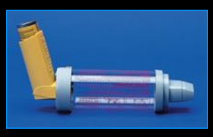
Administer bronchodilator . . .
episode terminates

Subsequent dental care

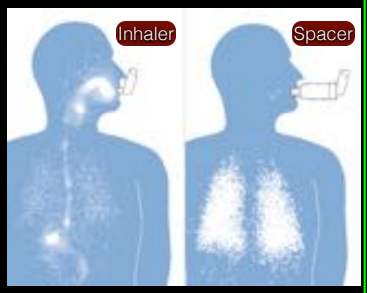
Discharge of patient

Asthma

On termination of the acute episode,
the planned dental treatment
MAY proceed if BOTH
the patient and the dentist
are comfortable doing so



It is recommended that ALL asthmatics
use a spacer (chamber) when using an MDI



Bronchospasm Management

When should EMS be activated during an acute episode of bronchospasm?

Bronchospasm Management

Summon EMS . . . if

patient requests
or
episode is refractory to
2 doses of bronchodilator

911 Police · Fire · Medical EMERGENCY

911 Police · Fire · Medical EMERGENCY

- If bronchospasm is not relieved, or
- If doctor is uncomfortable, or
- If parent or child wishes,
- ACTIVATE EMS STAT

911 Police · Fire · Medical EMERGENCY

Status Asthmaticus

Status asthmaticus is an acute exacerbation of asthma that remains unresponsive to initial treatment with bronchodilators.

Status Asthmaticus

- If EMS delayed, or
- If situation deteriorates . . .

- IM epinephrine q5m
- Vastus lateralis
- 0.3 mg or 0.15 mg of 1:1000

15 - 30 kg = 0.15 mg
>30 kg = 0.3 mg

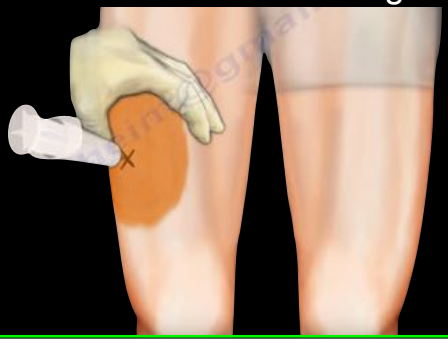
EpiPen package insert
May 2016

The EpiPen or EpiPen Jr should only be injected into the middle of your outer thigh (upper leg).

Hold firmly in place for 3 seconds (count slowly 1,2,3).

The injection is now complete.

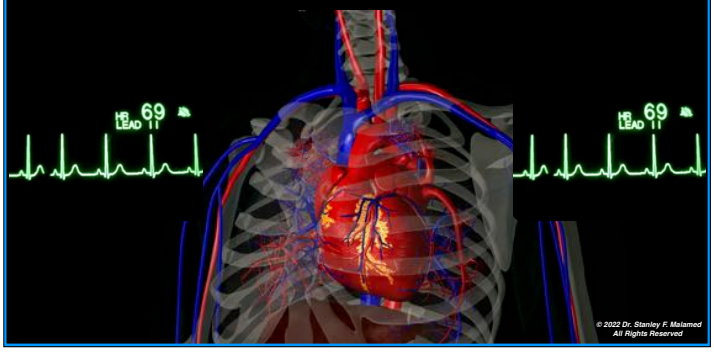
Vastus Lateralis = Thigh



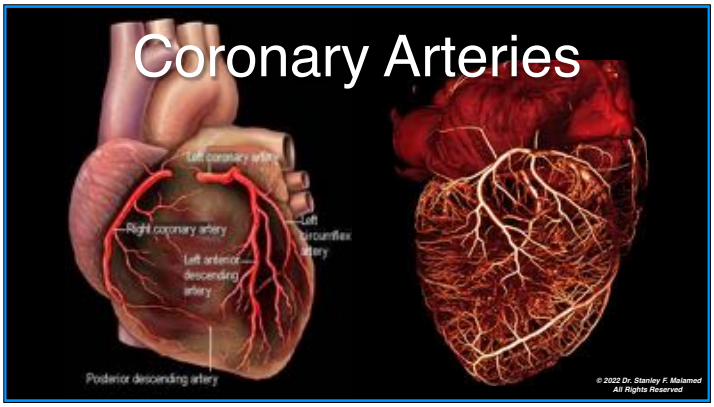
Emergency Medicine

CARDIOVASCULAR

The HEART is a PUMP



Coronary Arteries



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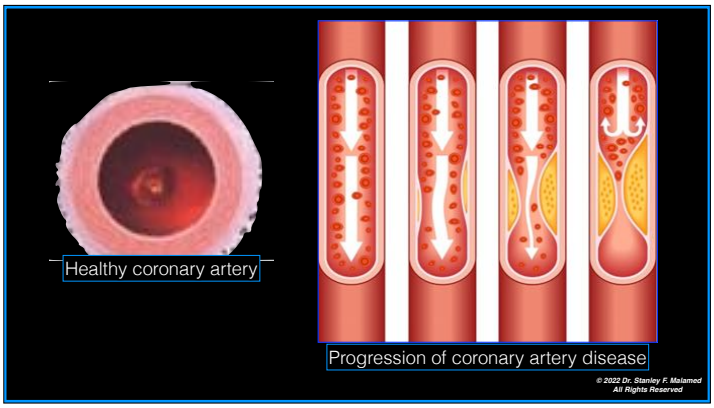
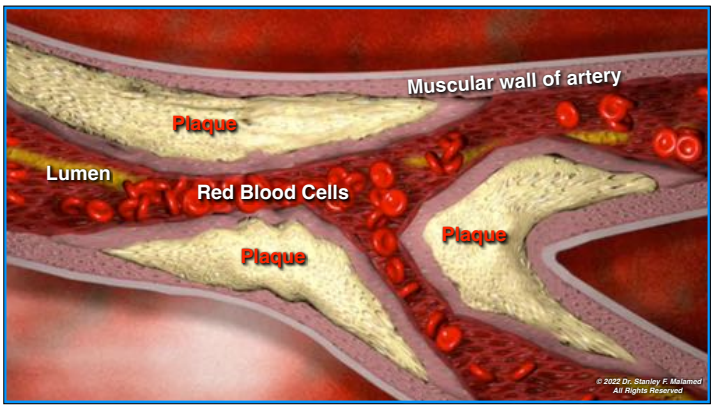




Angina Pectoris

Angina pectoris	2,552 (8.3%)

Angina Pectoris

Angina pectoris, commonly known as angina, is the sensation of chest pain, pressure, or squeezing, often due to ischemia of the heart muscle from obstruction or spasm of the coronary arteries.

(stable) Angina Pectoris

Anything increasing the workload of the heart can induce an anginal episode

The 4 E's of angina

Exertion
Emotion
Eating
Extremely cold or hot weather

Angina Pectoris . . . Management

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

C . . . Assess . . . prn

A . . . Assess . . . prn

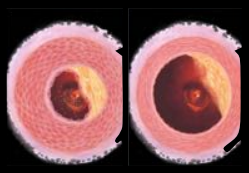
B . . . Assess . . . prn

D . . . **Nitroglycerin**, O_2

D . . . Determine cause, modify future treatment

Nitroglycerin

Nitroglycerin produces a 28% increase in coronary artery lumenal diameter



Angina

On termination of the acute episode, the planned dental treatment MAY proceed if BOTH the patient and the dentist are comfortable doing so

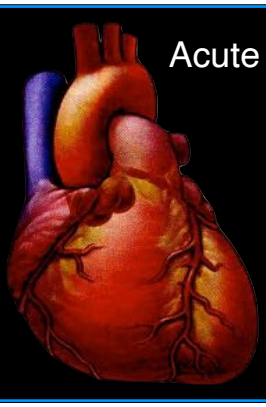
Angina pectoris and dentistry

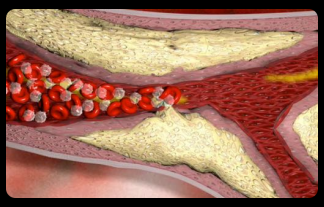
The only time **ANGINA** should be considered as a diagnosis in acute chest "pain" is where the patient (victim) has a **PREEXISTING HISTORY of ANGINA**

Consider Myocardial Infarction:

ALWAYS
when there is no prior history
of
cardiovascular disease

Acute Myocardial Infarction



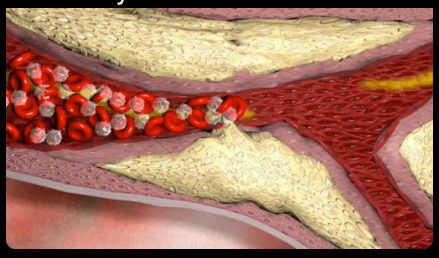


Myocardial Infarction

Myocardial infarction	289 (0.9%)

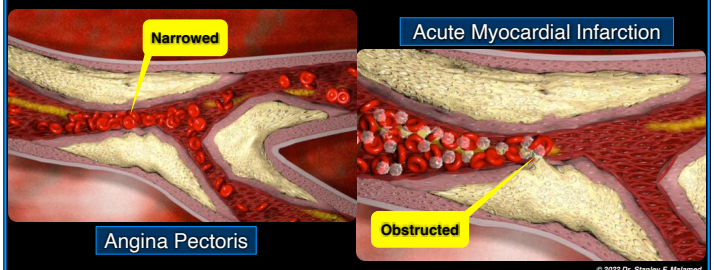
Obstruction of the blood supply to an organ or region of tissue, typically by a thrombus or embolism, causing local death of the tissue

Prolonged Myocardial Ischemia = Myocardial Infarction



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

Acute Coronary Syndrome



First Time Chest 'Pain"

911

P . . .

C . . .

A . . .

B . . .

D . . .

Suspected MI . . . Management

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

C . . . Assess . . . prn

A . . . Assess . . . prn

B . . . Assess . . . prn

D . . . **MONA** - Nitroglycerin, O_2, Aspirin

D . . . Activate EMS

MONA

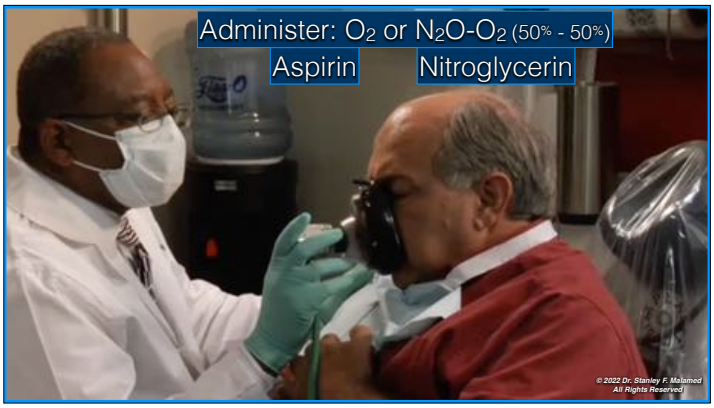
Acronym for the *PRE-HOSPITAL MANAGEMENT OF A SUSPECTED MYOCARDIAL INFARCTION*

NONA

N_2O-O_2
Oxygen
Nitroglycerin
Aspirin

NONA

Prehospital management of suspected MI


Administer: O_2 or N_2O-O_2 (50% - 50%)
Aspirin
Nitroglycerin
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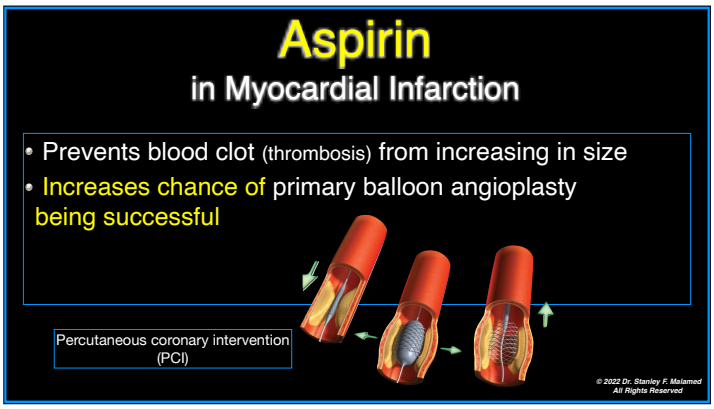
Aspirin
in Myocardial Infarction
• Prevents blood clot (thrombosis) from increasing in size
• Increases chance of primary balloon angioplasty being successful
Percutaneous coronary intervention (PCI)
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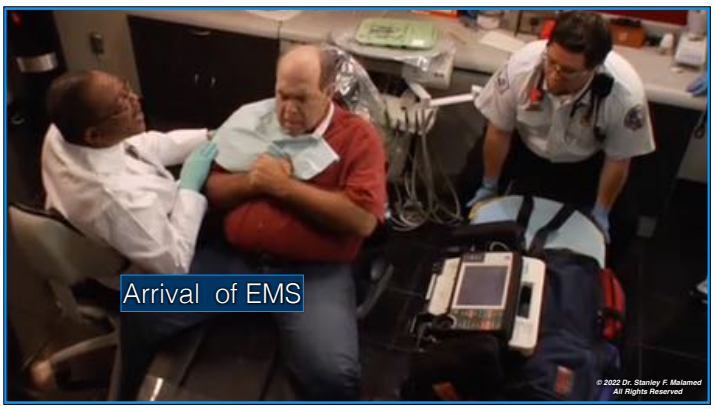
Arrival of EMS
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ECG monitoring
Transport to hospital ED
EMERGENCY
911
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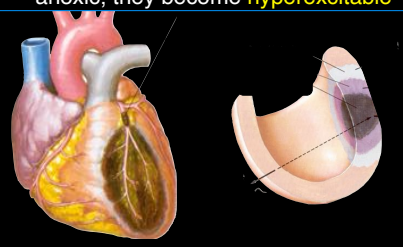
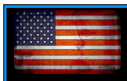
Acute Myocardial Infarction

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



Myocardium = DYSRHYTHMIAS

PVC's vary in size & shape



"Try to keep the victim alive until they recover or until another - more qualified - individual assumes responsibility for treatment"

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

NOTHING

Ischemic myocardium still exists;
Victim is symptomatic;
Dysrhythmias still occurring;
But the pump - though damaged - is still pumping

2015

70% of out-of-hospital cardiac arrests (OHCA) occur in the victims home

19.8% in public settings

10.6% in nursing homes

Heart Disease and Stroke Statistics 2017 At-a-Glance

When does MI become cardiac arrest?

Acute Myocardial Infarction

↓

Cardiac Arrest

Acute Myocardial Infarction

↓

Cardiac Arrest

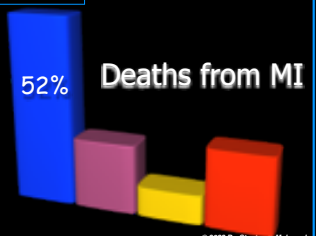
Most OOH-CA are related to acute dysrhythmias (VF/pulseless VT)

Most occur during the

1st hour

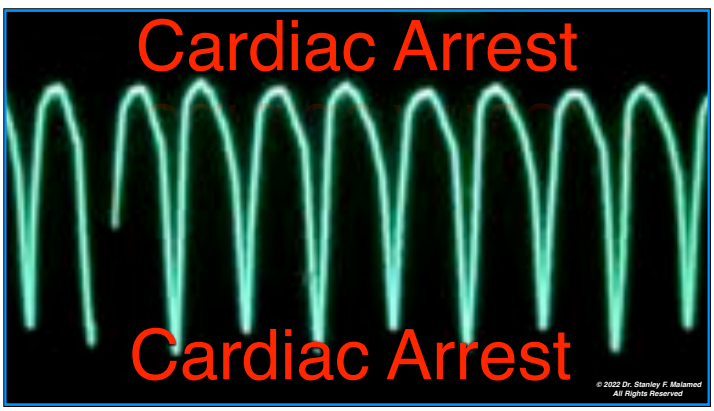
after symptom onset

52% of MI mortality



Why
is the mortality rate from
out-of hospital cardiac arrest
so high?

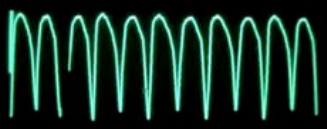
The significant mortality rate
associated with MI is in part
based on the average delay
(**4.9 hours**)
between the onset of signs and
symptoms and intervention by
the emergency medical system.



CARDIAC ARREST
occurs when the heart ceases to
PUMP BLOOD

In CARDIAC ARREST
the heart, usually, is still
BEATING

It is no longer
PUMPING



Ventricular Tachycardia

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

Coarse Ventricular Fibrillation

What happens when the heart stops *PUMPING* blood?

Blood stops circulating,

Pulse is not palpable,

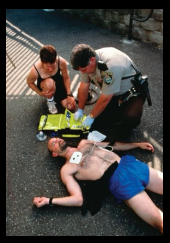
Blood pressure falls to ??? (<60mmHg)

Consciousness is lost, and

Respirations cease.

DEAD

UNCONSCIOUS



NO PULSE

NOT BREATHING

clinically, DEAD

Clinical death

You LOOK like you're dead

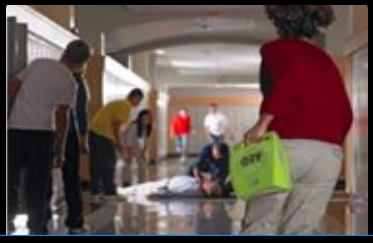
Biological / Cellular death

You ARE dead

Sudden Cardiac Arrest

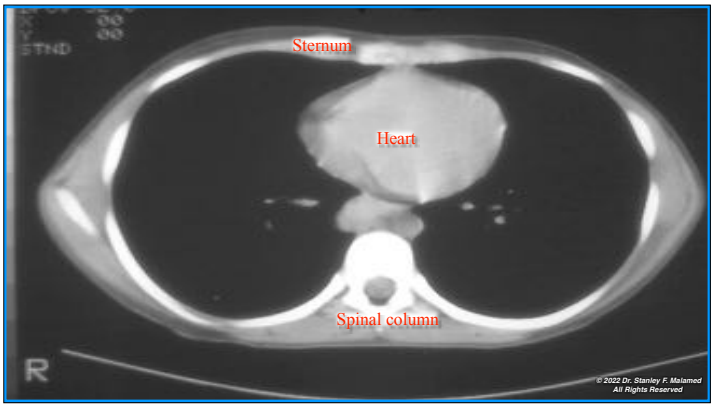
In the absence of any treatment death is a certainty

Sudden Cardiac Arrest



Doing 'something' gives the victim a chance at survival

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



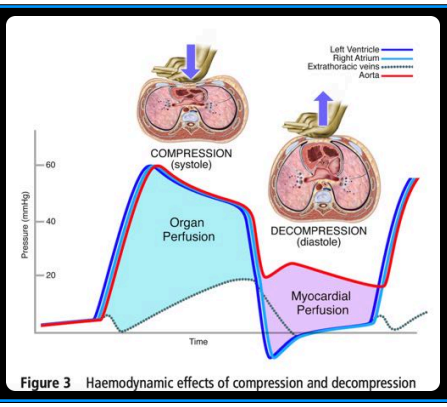
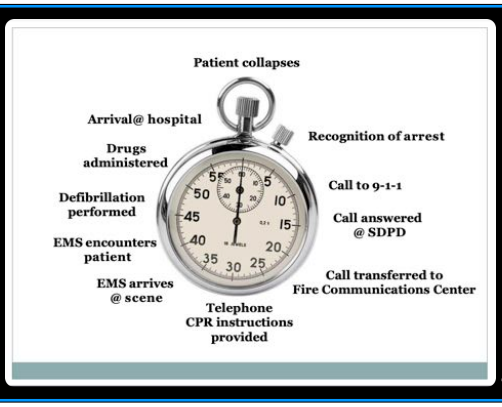
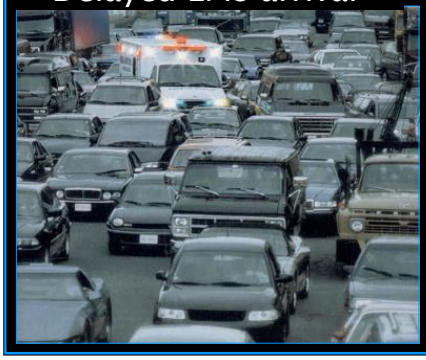


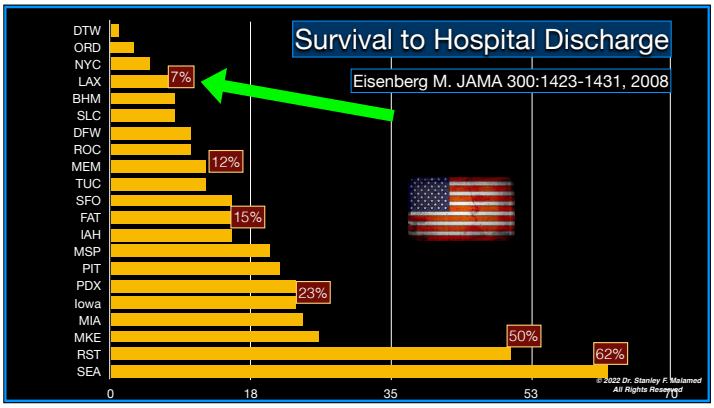
Figure 3 Haemodynamic effects of compression and decompression



Delayed EMS arrival



Absence of BYSTANDER-INITIATED BLS



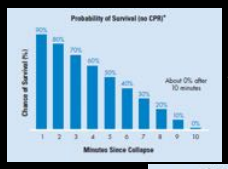
Survival Rates from SCA

Survival - *to hospital discharge* - is dependent upon:

- ✓ Bystander initiated CPR
- ✓ Time from collapse to defibrillation

How critical is response time to survival?

Survival to hospital discharge



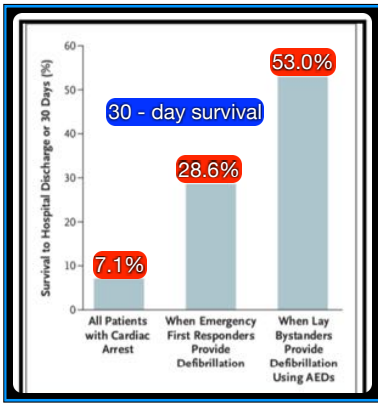
With NO CPR the chances of survival diminish 10% for every minute that passes from collapse

With "High Quality CPR" the victims chance of survival diminishes by only 3 to 4% every minute

Pre-arrival care
often means the difference
between life and death

'IT HAS BEEN SHOWN THAT DEFIBRILLATION WITHIN 3-5 MINUTES OF COLLAPSE CAN PRODUCE SURVIVAL RATES AS HIGH AS 50-70%'

Jevon P. Resuscitation in the dental practice. Br Dent J. 2016 Mar 11;220(5):261-263



Brady WJ, Mattu A, Slovis CM. Lay responder care for an adult with out-of-hospital cardiac arrest. N Engl J Med 2019 Dec 5;381(23):2242-2251

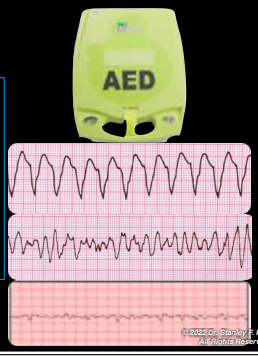
Automated External Defibrillators
(AED's)

How to use an AED

An AED is a battery operated computer capable of determining whether or not VF/VT is present.

VF/VT present:

'SHOCK ADVISED"



How to use an AED

Any rhythm other than VF/VT

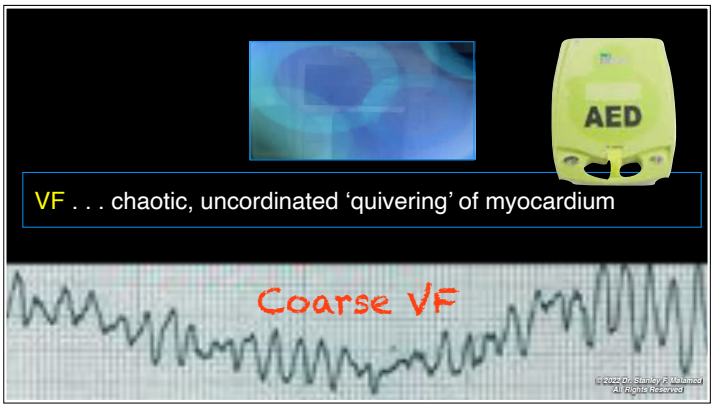
- PEA, asystole, NSR
  - 'NO SHOCK ADVISED'
  - 'Check airway'
  - 'Check breathing'
  - 'Check pulse'
  - 'If no pulse, continue CPR'

AED accuracy in rhythm analysis

Atkins DL, Scott WA, Blaufox AD, Law IH, Dick M 2nd, Gehen F, Sobh J, Brewer JE **Sensitivity and specificity of an automated external defibrillator algorithm designed for pediatric patients**. Resuscitation 76(2):168-174, 2008

Overall accuracy for shockable & non-shockable rhythms =

99% (702/709)



Can manual chest compression
be performed adequately
with the victim in the dental chair?

YES

Can manual chest compression be performed adequately with the victim in the dental chair?

Lepere AJ, Finn J, Jacobs I. Efficacy of cardiopulmonary resuscitation performed in a dental chair. Aust Dent J. 2003 Dec;48(4):244-247

Fujino H, Yokohama T, Yoshida K, Suwa K. Using a stool for stabilization of a dental chair when CPR is required. Resuscitation. 2010 Apr;81(4):502

How important is
BLS & defibrillation
to patient survival
in cardiac arrest?

So . . .

In Conclusion

Rules to Remember

The very first step in management of all medical emergencies is

BASIC LIFE SUPPORT,

as needed

Emergency Management

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

P - C - A - B - D

Try to keep the victim alive

malamed@usc.edu

malamed@usc.edu

malamed@usc.edu

THANK YOU for LISTENING!

THANK YOU for LISTENING!