Emergency Medicine

CARDIOVASCULAR

6 March 2020

1

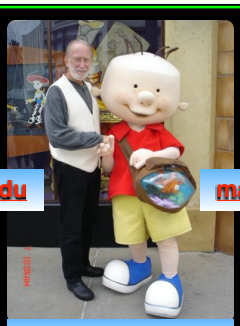
USC University of Southern California
Ostrow School of Dentistry of USC

Stanley F. Malamed, DDS

Dentist Anesthesiologist
Emeritus Professor of Dentistry
Herman Ostrow School of Dentistry of U.S.C.
Los Angeles, CA, USA

USC University of Southern California
Ostrow School of Dentistry of USC

2

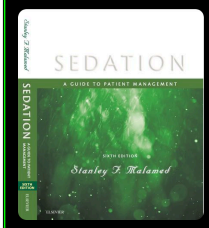


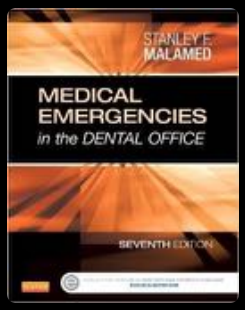
malamed@usc.edu

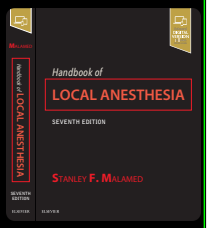
malamed@usc.edu

malamed@usc.edu

3







4

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

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%)

ALL patients
(Adult, Pediatric, Geriatric)

All ages
N = 4,307

5

WHEN do they occur?

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%

6

During or after local anesthesia
54.9%

IGNORING a patients FEAR

7

Treatment being performed

Treatment	Occurrence
Tooth extraction	38.9%
Pulp extirpation	26.9%
Unknown	12.3%
Other treatment	9.0%
Preparation	7.3%
Filling	2.3%
Incision	1.7%

8

9

65.8%

Tooth extraction - 38.9%
Pulpal extirpation - 26.9%

Inadequate PAIN CONTROL

10

Stress - Related Emergencies

Emergency	N =
Syncope (fainting)	15407
Mild allergy	2583
Angina pectoris	2552
Postural hypotension	2475
Seizures	1595
Acute asthma	1392
Hyperventilation	1326
Epinephrine reaction	913
Hypoglycemia	890

11

75%

of medical emergencies
(in dental offices)
are related to
stress and anxiety

12

And sometimes

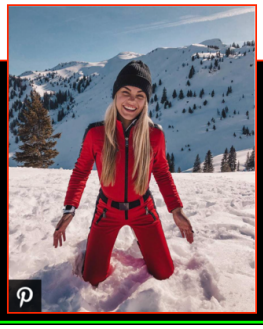
"stuff"

just happens

13

Miss Teenager Universe Lotte Van Der Zee Dead at 19 After Suffering Heart Attack

by ALYSSA MORIN | Fri., Mar. 8, 2019 1:09 PM



14

15

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

16

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

17

Preparation of the Office & Staff

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

18

Preparation of the Office & Staff

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

19

BASIC LIFE SUPPORT

(CPR, Resuscitation, Reanimation)

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

20

Preparation of the Office & Staff

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

21

The Office Emergency Response Team

Member #1
Member #2
Member #3

22

Member #1

1st person on scene of emergency

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

23

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

24

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

25

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

26

Emergency Medical Services

When?

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

27

Emergency Medical Services

NEVER HESITATE
to seek help if you
feel it is needed

When?

28

Emergency Medical Services

9 1 1

9 1 1

29

EMS

Stabilize & Transport

30

Preparation of the Office & Staff

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

31

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.

32

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

33

Coronary artery VASODILATOR

Nitroglycerin

- Nitrolingual spray
- Nitrostat sublingual tablets
- 0.4 mg/dose

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

34

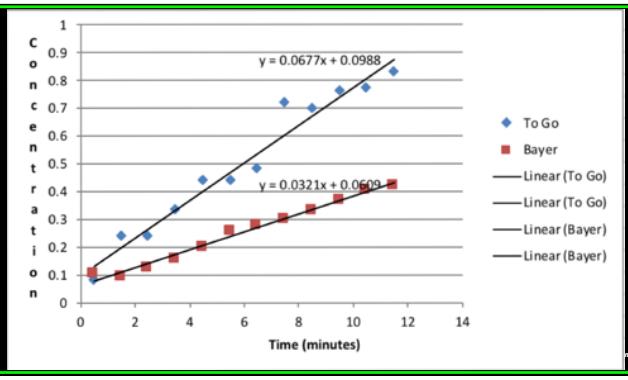
Thrombolytic

Aspirin (ASA)

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

- INDICATION: Suspected myocardial infarction
- CONTRAINDICATION: Allergy

35



36

Oxygen

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

37

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

38

BASIC EQUIPMENT

39

40

41

Equipment

Automated External Defibrillator (AED)

Why *YOU* want *2* AED's

42

Survival Rates from SCA

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

Bystander initiated CPR

Time from collapse to defibrillation

43

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

44

Chronobiology 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

45

EMERGENCY MANAGEMENT ALGORITHM

P - C - A - B - D

Algorithm for
ALL
emergency management

46

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 . . . **Diagnosis, Drugs, Defibrillation**

47

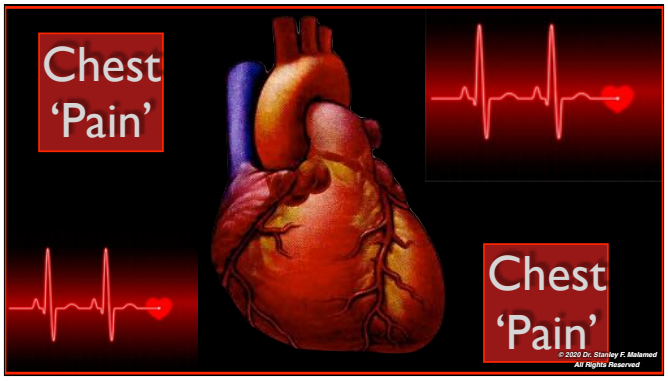
Emergency Medicine

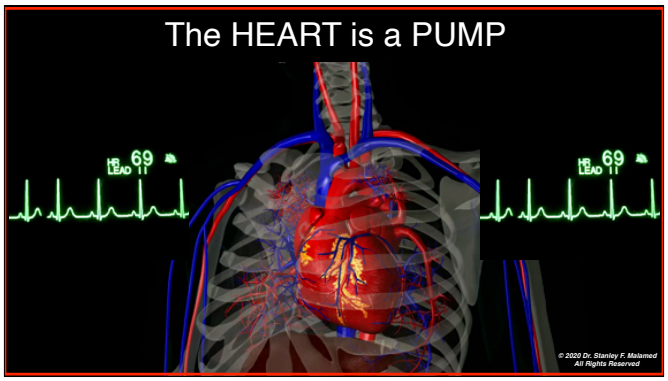
Recognition & Management

Cardiovascular Disorders

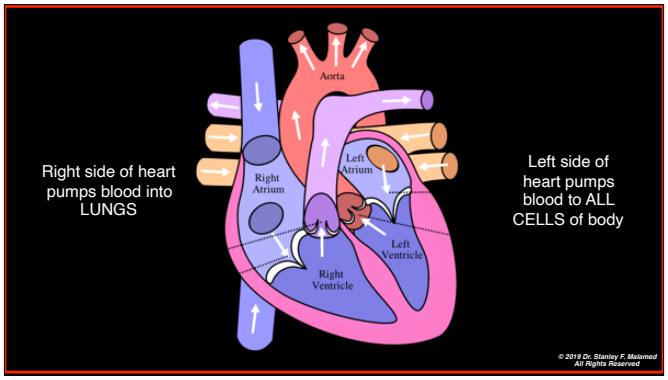
- Angina Pectoris
- Myocardial Infarction
- Cardiac Arrest
  - Defibrillation

48

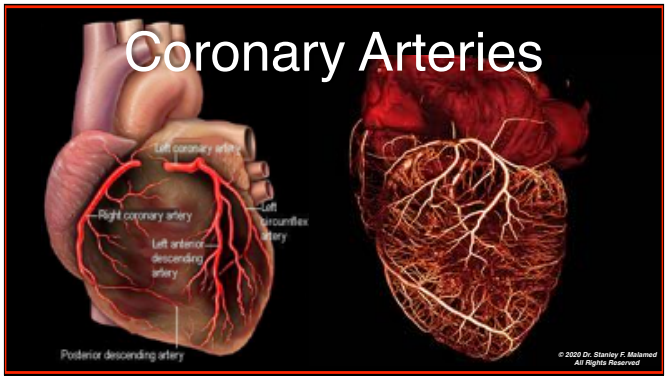



The HEART is a PUMP
HR 69
LEAD II
HR 69
LEAD II
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

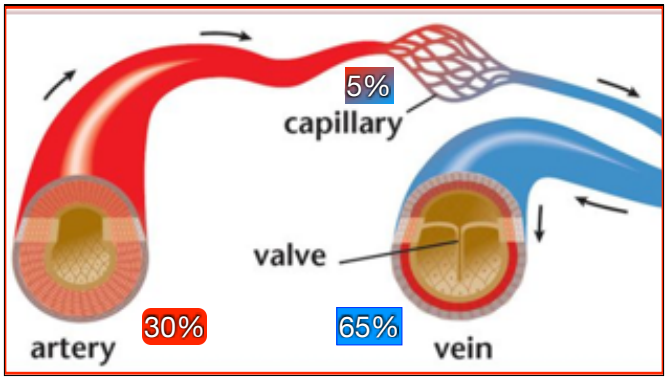
49


Right side of heart pumps blood into LUNGS
Aorta
Right Atrium
Left Atrium
Left Ventricle
Right Ventricle
Left side of heart pumps blood to ALL CELLS of body
© 2019 Dr. Stanley F. Malamed
All Rights Reserved

50


Coronary Arteries
Left coronary artery
Right coronary artery
Left circumflex artery
Left anterior descending artery
Posterior descending artery
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

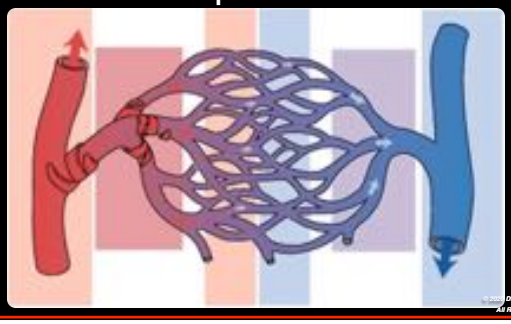
51


5%
capillary
valve
artery
30%
65%
vein

52

53

Capillaries



54

MYOCARDIUM

Blood flows through coronary arteries only during DIASTOLE, not systole

Skeletal muscle extracts **25%** to **30%**

Cardiac muscle extracts **60%** to **80%** of available O_2 in blood;

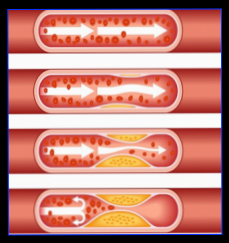
Coronary arteries dilate when myocardial workload increases

55

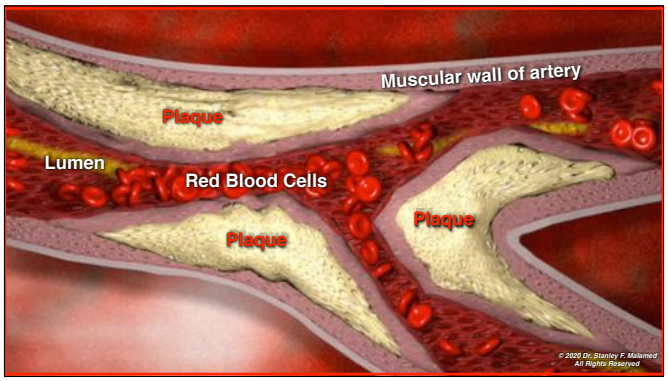
Healthy coronary artery

56

Coeur d'Alene



Kootenai County, Idaho



57

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%)

ALL patients
(Adult, Pediatric, Geriatric)

All ages
N = 4,307

58

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.

59

Angina Pectoris

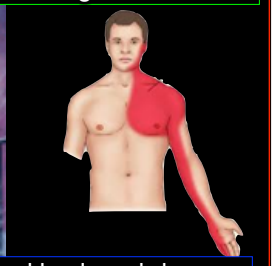
Anything increasing the workload of the heart can induce an anginal episode

The 4 E's of angina

Exertion
Emotion
Eating
Extremely cold or hot weather

60

Transient Myocardial Ischemia = Angina Pectoris



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

61

Angina Pectoris

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

62

Angina Pectoris . . . Management

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

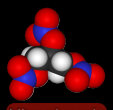
C . . . Assess . . . prn

A . . . Assess . . . prn

B . . . Assess . . . prn

D . . . **Nitroglycerin**, O_2

D . . . Determine cause, modify future treatment

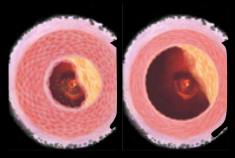


Nitroglycerin

63

Nitroglycerin

Nitroglycerin produces a 28% increase in coronary artery lumenal diameter



64

65

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**

66

Consider Myocardial Infarction:

ALWAYS
when there is no prior history
of
cardiovascular disease

67

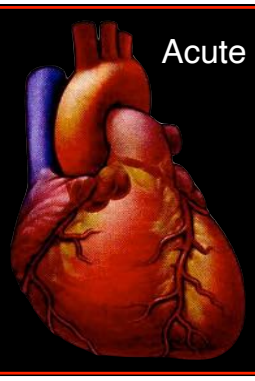
Consider Myocardial Infarction

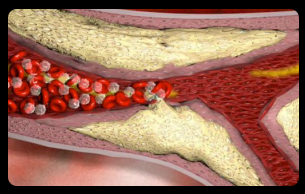
In anginal patient when:

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

68

Acute Myocardial Infarction





69

Infarction

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

70

Prolonged Myocardial Ischemia

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

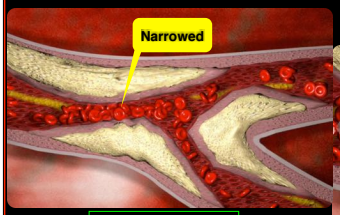
71

Activity at time of infarction

Activity	Percentage
At rest	51
Modest or usual exertion	18
Physical exertion	13
Sleep	8
During surgical procedure	6
Other	4

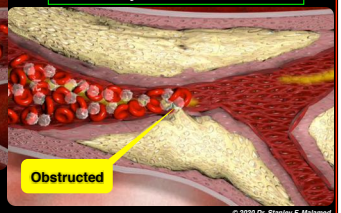
72

Acute Coronary Syndrome



Angina Pectoris

Acute Myocardial Infarction



First Time Chest ‘Pain”

911

P . . .

C . . .

A . . .

B . . .

D . . .

73

Signs of a myocardial infarction (“heart attack”)

Chest discomfort
uncomfortable chest pressure, squeezing, fullness or pain, burning or heaviness

Sweating

Upper body discomfort
neck, jaw, shoulder, arms, back

Nausea

Shortness of breath

Light-headedness

74

Acute Myocardial Infarction

SILENT MI

- Women (up to 50% of MIs)
- Elderly
- Diabetics

- Do not present with classic signs & symptoms

75

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

76

MONA

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

77

MONA

Morphine

Oxygen

Nitroglycerin

Aspirin

Prehospital management of suspected MI

78

MONA	=	NONA
Morphine	=	N_2O-O_2
		Oxygen
		Nitroglycerin
		Aspirin

Prehospital management of suspected MI

79

Oglesbee S.
Nitrous oxide. New delivery of an old drug.
J Emerg Med Serv JEMS. 2014; 39(4):34-37

Nitrous oxide has been used effectively in cases of chest pain secondary to infarction and angina;
kidney stones;
acute urinary retention;
severe burns;
fractures, dislocations & other forms of musculoskeletal trauma;
pediatrics;
sedation & analgesia prior to IV cannulation
childbirth to treat labor pains

80

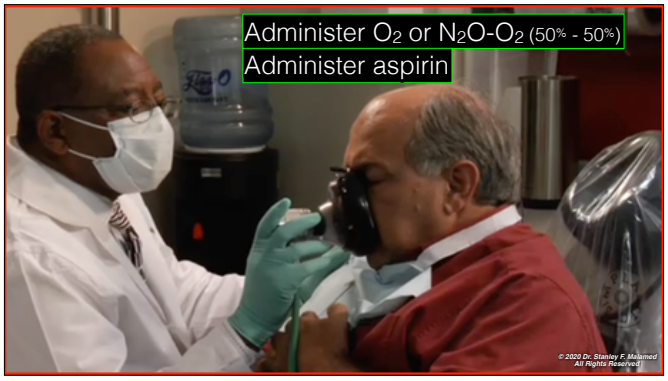
81

N_2O-O_2 in Emergency Medicine

Commonly used in Australia, Canada & France & United Kingdom (1970 Wales)
Entonox (50% N_2O 50% O_2 premixed)

USA - 30 states EMS employ N_2O-O_2
Individual cylinders (per FDA), mixing valve delivers 50% each gas

82



83

Nitrous Oxide - Oxygen

50% - 50%

As analgesic as IV morphine (10 mg)
- Separates pain from suffering

Sedative
- Relaxes scared patient

50% O_2
- 2.5 times ambient air

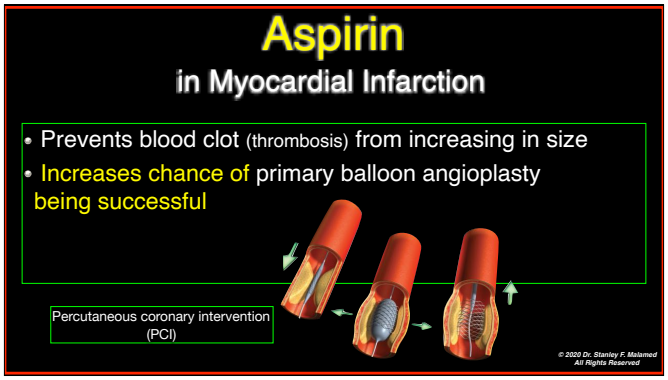
Prehospital management of suspected MI

84

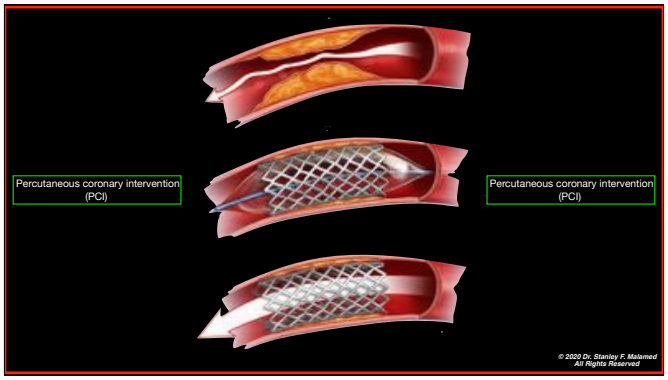
Aspirin

in Myocardial Infarction

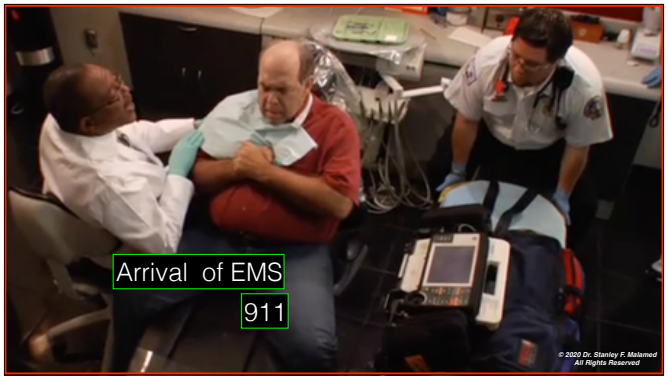
325 mg. **POWDERED**, if available, with water
20 minute onset


Aspirin
in Myocardial Infarction
• Prevents blood clot (thrombosis) from increasing in size
• Increases chance of primary balloon angioplasty being successful
Percutaneous coronary intervention (PCI)
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

85


Percutaneous coronary intervention (PCI)
Percutaneous coronary intervention (PCI)
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

86


Arrival of EMS
911
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

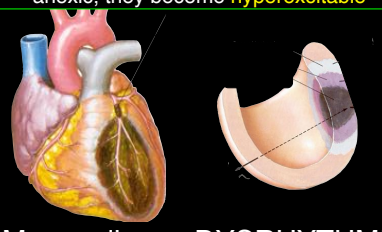
87


ECG monitoring
Transport to hospital ED
EMERGENCY
911
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

88

Acute Myocardial Infarction

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



Myocardium = DYSRHYTHMIAS

89

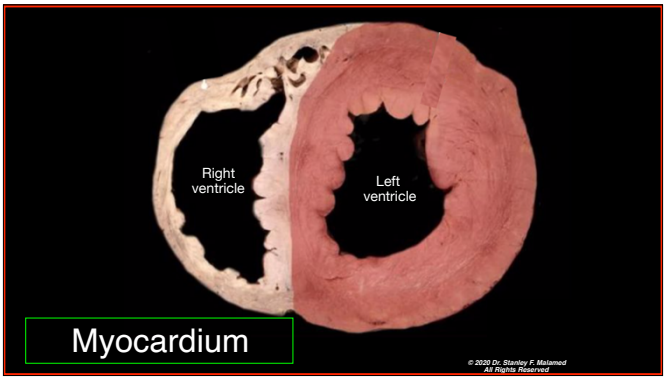
Automaticity is the cardiac cell's ability to spontaneously generate an electrical impulse (depolarize). Cells that are dedicated to the purpose of generating an impulse to maintain a heart rate commensurate with the body's need are called pacemaker cells.

AUTOMATICITY

90

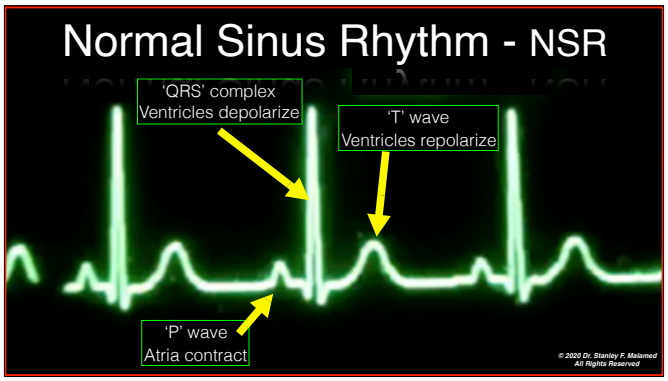
Normal Sinus Rhythm - NSR

91

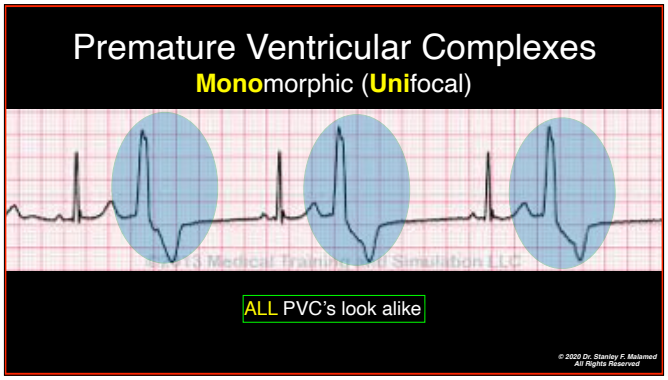


Myocardium

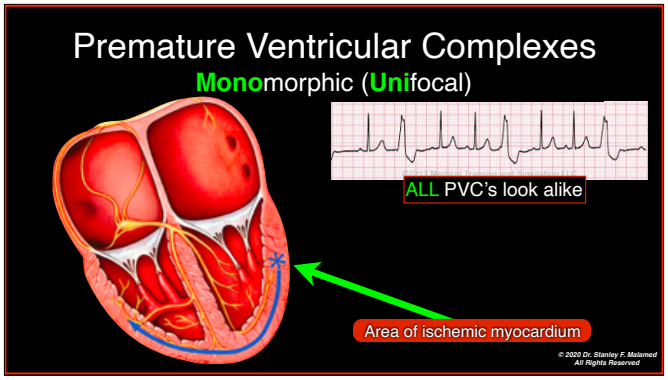
92


Normal Sinus Rhythm - NSR
'QRS' complex
Ventricles depolarize
'T' wave
Ventricles repolarize
'P' wave
Atria contract
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

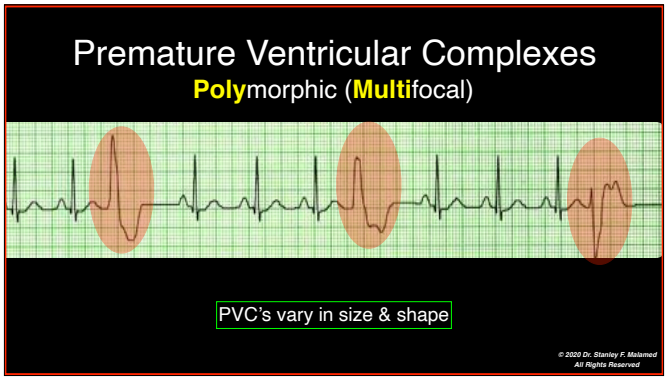
93


Premature Ventricular Complexes
Monomorphic (Unifocal)
ALL PVC's look alike
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

94


Premature Ventricular Complexes
Monomorphic (Unifocal)
ALL PVC's look alike
Area of ischemic myocardium
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

95

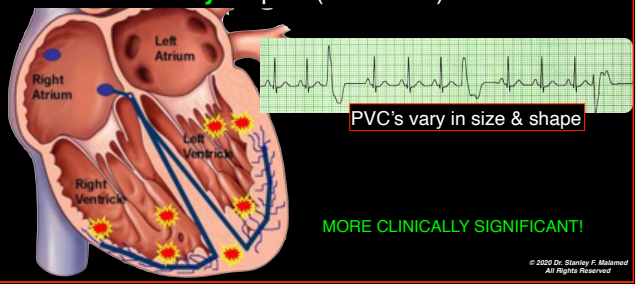

Premature Ventricular Complexes
Polymorphic (Multifocal)
PVC's vary in size & shape
© 2020 Dr. Stanley F. Malamed
All Rights Reserved

96

97

Premature Ventricular Complexes

Polymorphic (**Multi**focal)



MORE CLINICALLY SIGNIFICANT!

98

Left Ventricular Ejection Fraction

LVEF

LVEF is the percentage of blood ejected from the left ventricle during systole

LVEF ranges from 0.55-0.70

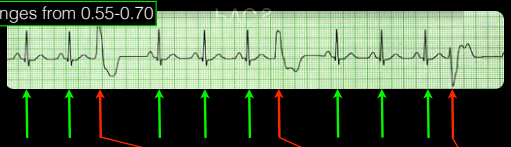
55% to 70%

99

Premature Ventricular Contractions

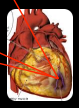
PVC's

LVEF ranges from 0.55-0.70



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

Output of blood is 73% of normal



100

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

101

The doctor's goal in a medical emergency situation

Try to **keep the victim alive until:**

(1) Recovery occurs or

(2) Help arrives to take over management

102

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

103

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

NOTHING

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

104

2015

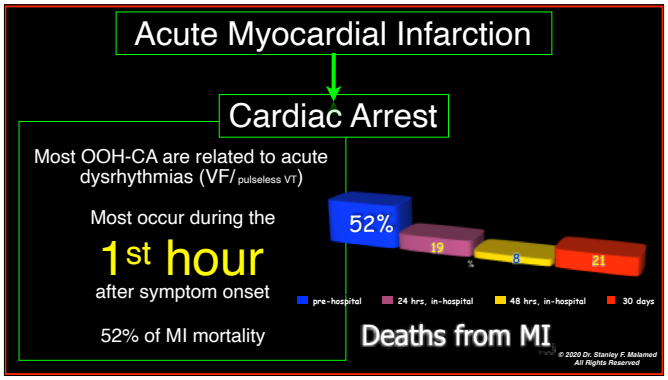
70% of out-of-hospital cardiac arrests (OHCA) occur in the victims home

19.8% in public settings

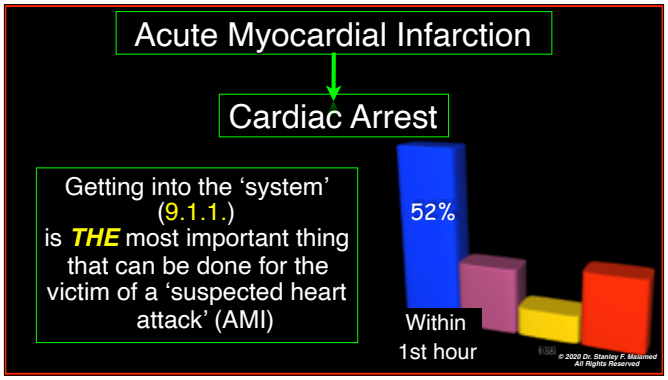
10.6% in nursing homes

American Heart Association | American Stroke Association

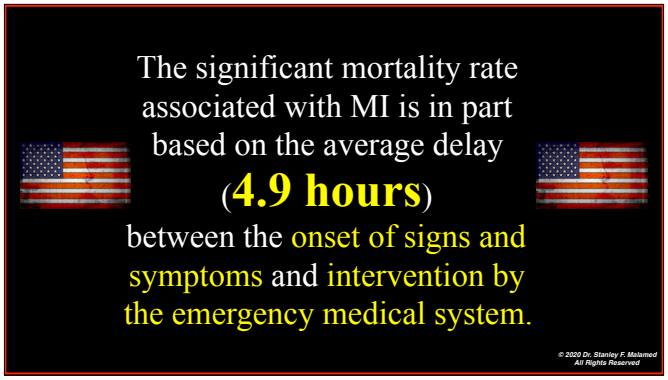
Heart Disease and Stroke Statistics 2017 At-a-Glance



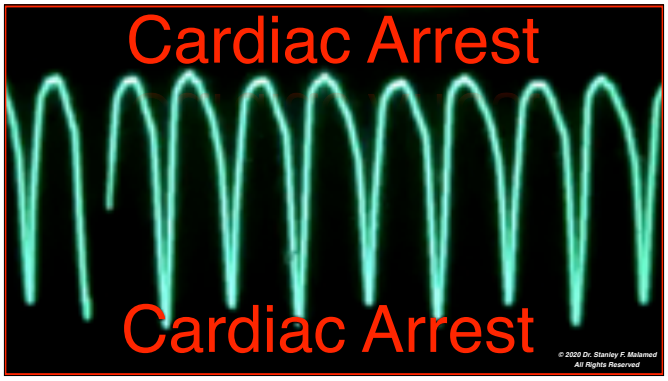
105



106



107



108

109

CARDIAC ARREST
occurs when the heart ceases to
PUMP BLOOD

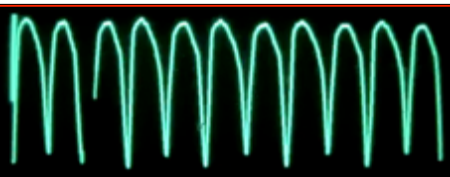
In CARDIAC ARREST
the heart, usually, is still
BEATING
It is no longer PUMPING

110

There are 4 rhythms that constitute cardiac arrest

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

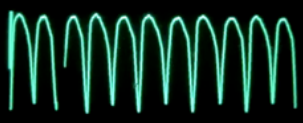
111



Ventricular Tachycardia
VT
VT with a pulse or pulseless VT

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

112



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

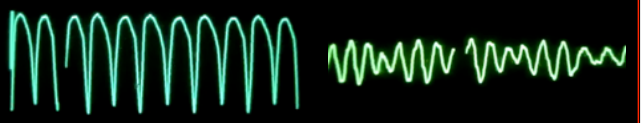
Ventricular Tachycardia

Coarse Ventricular Fibrillation

113

Cardiac Arrest

Shockable rhythms



Ventricular Tachycardia

Ventricular Fibrillation
coarse & fine

114

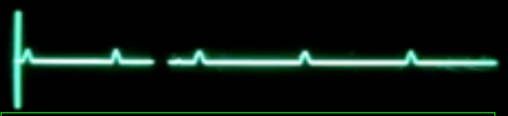
Cardiac Arrest

Non-shockable rhythms

Asystole

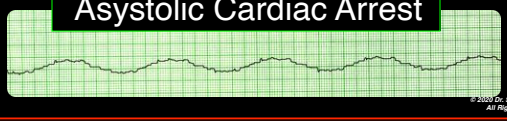
Pulseless Electrical Activity

115



NOT A
SHOCKABLE RHYTHM

Asystolic Cardiac Arrest



116

What happens when the heart stops *PUMPING* blood?

Blood pressure falls to zero, (<60mmHg)

Pulse is not palpable,

Consciousness is lost, and

Respirations cease.

And the victim is . . .

117

DEAD

UNCONSCIOUS

NOT BREATHING

NO PULSE

clinically, DEAD

118

Sudden Cardiac Arrest

In the absence of any treatment death is a certainty

119

Sudden Cardiac Arrest

Doing ‘something’ gives the victim a chance at survival

120

121

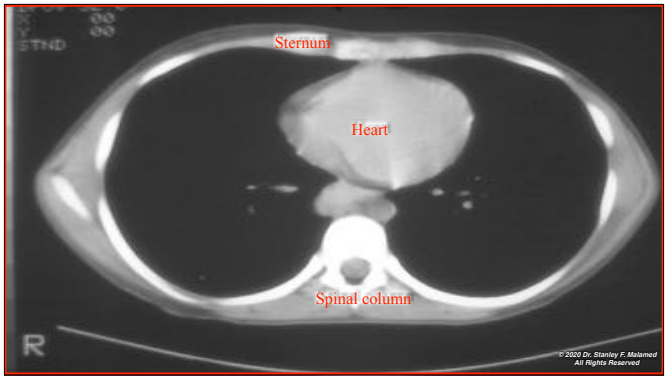
Our goal in resuscitation is to prevent the *PERMANENT* death of the victim.

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

122

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

123



124

Chronology of Sudden Cardiac Arrest

Time = up to 1 hour before SCA	Signs & symptoms
Time 0	Occurrence of sudden cardiac arrest
Time = less than 10 seconds	Loss of consciousness
Time = 4 to 6 minutes	Brain damage begins
Time = 10-14 minutes	Biological (cellular) death

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 4-6 minutes.

125

Doctors and nurses also tend to give up too soon. CPR is typically performed for 15 to 20 minutes, but research shows that longer attempts at CPR, up to one hour, can lead to survival. These patients ultimately may fare as well those who are resuscitated more quickly. In patients with a chance of recovery, experts now advise attempting CPR for at least 45 minutes.

126

Therapeutic Hypothermia

Circulation

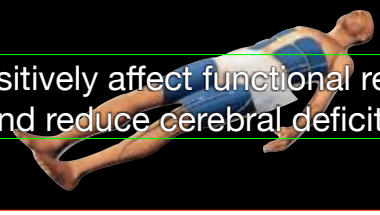
ILCOR Advisory Statement

Therapeutic Hypothermia After Cardiac Arrest
An Advisory Statement by the Advanced Life Support Task Force of the International Liaison Committee on Resuscitation

Unconscious adult patients with spontaneous circulation after out-of-hospital cardiac arrest should be cooled to 32°C to 34°C for **12 to 24 hours** when the initial rhythm was ventricular fibrillation (VF). Such cooling may also be beneficial for other rhythms or in-hospital cardiac arrest. 89.6 to 93.2 F

127

Therapeutic Hypothermia



. . . positively affect functional recovery and reduce cerebral deficits.

Induction of hypothermia after return of spontaneous circulation post cardiac arrest has been found to positively affect functional recovery and reduce cerebral deficits.

128

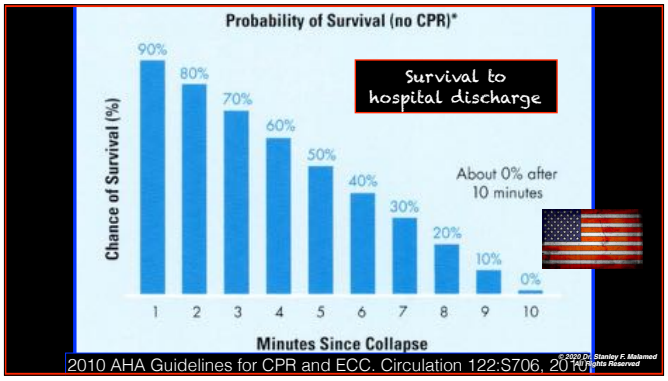
129

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%

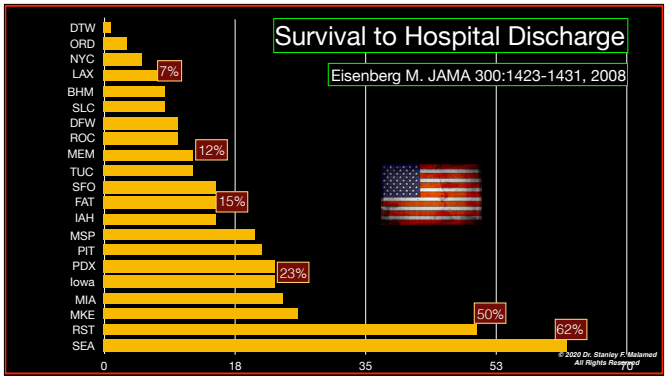
Survival to hospital discharge

130



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

131



132

2017 Stats of the State of Idaho 2017

ID Leading Causes of Death, 2017	Deaths	Rate***	State Rank*	U.S. Rate**
1. Heart Disease	3,084	162.4	22nd	165.0
2. Cancer	3,020	153.2	28th (tie)	152.5
3. Chronic Lower Respiratory Diseases	925	47.2	18th	40.9
4. Accidents	876	49.8	32nd	49.4
5. Stroke	726	38.5	22nd	37.6
6. Alzheimer's Disease	672	36.6	16th	31.0
7. Diabetes	394	20.3	29th (tie)	21.5
8. Suicide	392	23.2	5th	14.0
9. Flu/Pneumonia	255	13.7	31st	14.3
10. Parkinson's Disease	206	11.1	1st	8.4

133

Survival Rates from SCA

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

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

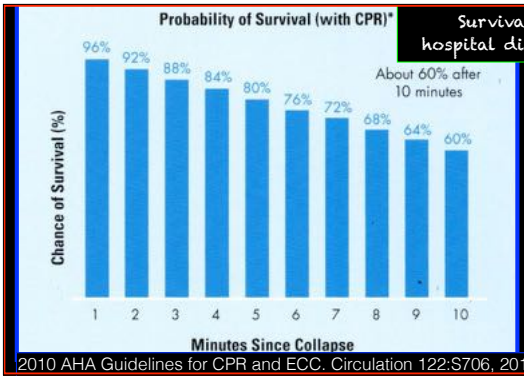
134

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

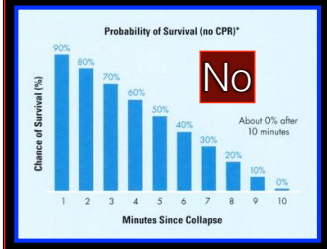
135



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

136

Bystander Initiated CPR



137

30 Day Survival from Cardiac Arrest

138

30 - day survival

30 - day survival

Prearrival Care Often Means the Difference Between Life and Death

N Engl J Med
2019;381:2242-2251

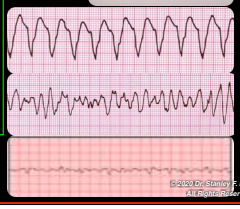
139

Automated External Defibrillators
(AED's)

140

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"



141

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'

142

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)

143

How to use an AED

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

144

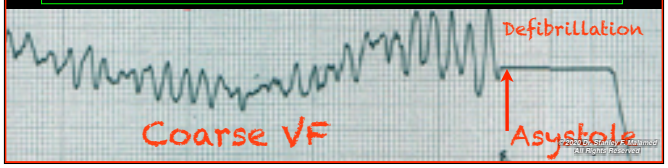
How an AED works

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

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



145

How an AED works

146

How an AED works

AUTOMATICITY

Heart muscle
- MYOCARDIUM -
loves to contract

147

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

148

149

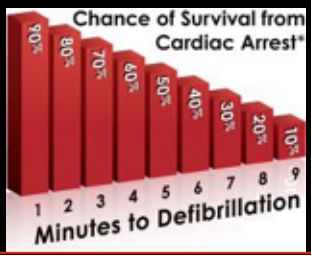
Can the chest be compressed adequately with the victim in the dental chair?

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)

150

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



151

Figure. Automated External Defibrillator (AED)-Equipped Drone (Unmanned Aerial System)

A Drone during flight

B Bystander unloading automated external defibrillator (AED)

A, Drone has an AED symbol and text in Swedish and English. The fluorescent-yellow coloring and light-emitting diodes attract attention. B, AED is placed at the rear of the drone to improve aerodynamics. The bystander unloads the AED after landing by releasing the straps.

Claesson A, Backman A, Ringh M, Svensson L etal
J Amer Med Assoc 317(22): 2332-2333, 2017

152

Sweden

Sweden

153

Time to delivery of an automated external defibrillator using a drone for simulated out-of-hospital cardiac arrests vs Emergency Medical Services

MedianMedian time from dispatch to arrival - **DRONE** = 5.21 minutes
Median time from dispatch to arrival - **AMBULANCE** = 22 minutes

Claesson A, Backman A, Ringh M, Svensson L etal
J Amer Med Assoc 317(22): 2332-2333, 2017

154

Time to delivery of an automated external defibrillator using a drone for simulated out-of-hospital cardiac arrests vs Emergency Medical Services

Discussion | This preliminary study found that it was possible to autonomously transport and deliver an AED using a drone in out-of-sight flights. The drone arrived in less time than the EMS in all simulated cases. Therefore, drones carrying AEDs may reduce time to defibrillation in OHCAs. Saving 16 minutes is likely to be clinically important.

Claesson A, Backman A, Ringh M, Svensson L etal
J Amer Med Assoc 317(22): 2332-2333, 2017

155

Northern
NEVADA

February 2018

REMSA to use drones to deliver defibrillator for cardiac arrest emergencies

156

Rules to Remember

The very first step in management of all medical emergencies is

BASIC LIFE SUPPORT,

as needed

Emergency Management

non-Cardiac arrest

- **P** . . . position
- **C** . . . circulation
- **A** . . . airway
- **B** . . . breathing
- **D** . . . definitive care

Drug therapy is **ALWAYS** secondary to basic life support

Cardiac arrest

- **P** . . . position
- **C** . . . circulation
- **A** . . . airway
- **B** . . . breathing
- **D** . . . defibrillation

157

P - C - A - B - D

Try to keep the victim alive

158

Emergency Medicine

CARDIOVASCULAR

ISDA IDAHO STATE DENTAL ASSOCIATION

6 March 2020

ISDA IDAHO STATE DENTAL ASSOCIATION

159