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- I. Introduction: History
- II. Sudden cardiac arrest (SCA) and sudden cardiac death(SCD)
- III. Chest compressions
- IV. Airway and ventilation
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Cardiopulmonary resuscitation (CPR) started in the late 1950s.
 Elam and Safar: <u>mouth-to-mouth ventilation</u> in 1958.
 Kouwenhoven, Knickerbocker, and Jude subsequently described the benefits of <u>external chest compressions</u>.
 <u>External defibrillation</u>: first described in 1957 by Kouwenhoven

Kouwenhoven.



Incidence of SCD: 50 to 100/100,000 person-years

Most common cause of SCD in adults is CAD

40% to 86% survived SCA had > 75% coronary artery stenosis.

Others with structurally normal heart:

- Arrhythmia syndromes
- Cardiomyopathy



# Out of Hospital Cardiac Arrest (OHCA): Survival rate 12% (To Hospital DC)

In Hospital Cardiac Arrest (IHCA):
 Survival Rate 24.8% (Adult)
 Survival rate 36.8% (Children, in 2014)

### BLS: Why is this so important?

Risk factors for SCD are similar to those for CAD(adult)

CAD is the leading cause of death in the world (1/3)

Incidence of SCD is 10X higher than death from breast Ca

The incidence increases with

- Age

- Underlying heart disease
- Men: women 3:2 ratio

### Incidence of sudden death in men and women increases with age



During a 38 years follow-up of subjects in the Framingham Heart Study, the annual incidence of sudden death increased with age in both men and women. However, at each age, the incidence of sudden death is higher in men than women. *Data from Kannel, WB, Wilson, PWF, D'Agostino, RB, et al, Am Heart J* 1998; 136:205.



#### Risk of SCD is related to clinical manifestations of CHD



During a 38-year follow-up of subjects in the Framingham Heart Study, the annual incidence of sudden cardiac death (SCD) in both men and women was related to the clinical manifestations of coronary heart disease (CHD). It was highest in those with a myocardial infarction, intermediate in those with angina and no prior infarction, and lowest in those without overt CHD.

Data from: Kannel WB, Wilson PWF, D'Agostino RB, et al. Am Heart J 1998; 136:205.





Underlying <u>rhythm</u> during SCD:

 Ventricular tachycardia (VT), ventricular fibrillation (VF), or VT degenerating into VF:
 85% of cases

- Bradyarrhythmia: 15% of cases

### **BLS: Phases of Resuscitation**



I. The electrical phase:

The first 4-5 min of arrest due to ventricular fibrillation (VF). Immediate DC cardioversion is needed to optimize survival. Excellent chest compressions while the defibrillator is getting ready.

II. Hemodynamic or circulatory phase:

4-10 min after SCA, during which the patient may remain in VF.Early defibrillation and Compressions is essential for survival.III. Metabolic phase:

>10 minutes of pulselessness

Post resuscitative measures, including hypothermia therapy

If not quickly converted into perfusing rhythm pt generally do not survive.

### **BLS:** History



In the 2006 AHA guidelines A-B-C.
In the 2010 AHA guidelines C-A-B.
In the 2015 AHA guidelines C-A-B, Co only CPR

Collaboration between International Liaison Committee on Resuscitation (ILCOR) and AHA



### **BLS: Success**



Survival from SCA often depends on:

- Early recognition and willingness to intervene
- Immediate cardiopulmonary resuscitation.
- Availability and use of AED



- Early resuscitation and prompt defibrillation (within 1-2 minutes) can result in >60% survival
- AHA recommends AEDs in public locations: SCD >1 every 5 years.









#### **APPROACH SAFELY!**



#### **CHECK RESPONSE**





Shake shoulders gently

Ask "Are you all right?"

If he responds:

- Leave as you find him.
- Find out what is wrong.
- Reassess regularly.

#### SHOUT FOR HELP







### BLS: AGONAL BREATHING



Occurs shortly after the heart stops in up to 40% of cardiac arrests

Described as barely, heavy, noisy or gasping breathing

Recognise as a sign of cardiac arrest



# The patient must be placed on a hard surface



## BLS: CHEST COMPRESSIONS



- Place the heel of one hand in the centre of the chest
- Place other hand on top
- Compress the chest
  - Rate 100-120 /min
  - Depth 5-6 cm, 2"-2.4"
  - Allow complete chest recoil
  - When possible change CPR operator every 2 min

# BLS: CHEST COMPRESSIONS

- Compressions during cardiac arrest provide blood to both the heart and brain
- Coronary perfusion pressure is a function of diastole(recoil)
- As compressors fatigue, they tend to lean on the chest wall, thus inhibiting full expansion.
- Switching the compressor often (every two minutes) helps to avoid this problem.
- Depth of compressions 2-2.4 inches(5-6cm)

# BLS: Major Changes Made in 2015

Compression fraction of CPR at least 60%.

- Increased compressions from at least 100 to 100-120 compressions per minute.
- Lay rescuers encouraged to intervene with, at a minimum, compression-only CPR (Co-only CPR)until help or AED arrives.
- CO-only CPR is not recommended for children or arrest of noncardiac origin (eg, near drowning).

### **BLS:** Question



Question: The most common mistake during CPR compressions is compressions that are too shallow?!

A. True

B. False

The CPR mantra is: "push hard and push fast (but not too hard nor too fast) on the center of the chest."



Interruptions should be minimized to <10 second intervals</p>

Immediately following defibrillation, compressions should be started without pause. Rhythm or pulse checks are unnecessary !

### Airway Management

- Airway management after compressions or simultaneously in proper sitting.
- <u>Head tilt-chin lift</u> method for opening the airway
- If evidence of trauma is present, the <u>jaw thrust</u> without head tilt should be used.





#### **CHECK BREATHING**





• Look, listen and feel for NORMAL breathing

 Do not confuse agonal breathing with NORMAL breathing

#### **RESCUE BREATHS**





- Pinch the nose
- Take a normal breath
- Place lips over mouth
- Blow until the chest rises
- Allow chest to fall

## **BLS: Airways Management**



Breaths should be delivered over one second, enough to cause chest rise.

A compression to ventilation rate of 30:2 should be used.

Once an advanced airway has been placed, give 1 breath every 6 seconds



#### Mouth-to-mouth

Bag valve mask

Laryngeal mask airway or the King Airway

Intubation

#### Bag-Mask E-C Technique



Above the Head

Mask on Face

E-C clamp technique -Tilt head

Make a "C" (pressing edges of mask on face)

Form an "E" (lifting angles of jaw)

Squeeze the bag



#### **BLS: CONTINUE CPR**







#### 

### Advanced Cardiac Life Support



"The foundation of successful ACLS is good BLS"

Continuous waveform capnography remained a Class I recommendation for confirming placement of an ETT

### BLS: New 2015



 For patients with known or suspected opioid overdose who have a definite pulse but no normal breathing or only gasping (ie, a respiratory arrest)

In addition to providing standard BLS care, it is reasonable for appropriately trained BLS healthcare providers to administer IM or IN <u>Naloxone</u>





### **BLS: AED**



#### **Follow voice prompts**



#### **ATTACH PADS TO CHEST**





#### ANALYSING RHYTHM DO NOT TOUCH VICTIM





#### SHOCK INDICATED





- Stand clear
- Deliver shock

#### SHOCK DELIVERED FOLLOW AED INSTRUCTIONS





30

#### NO SHOCK ADVISED FOLLOW AED INSTRUCTIONS



GERC



30

#### IF VICTIM STARTS TO BREATHE NORMALLY PLACE IN RECOVERY POSITION











### **BLS:** Children



Infants and children most often experience cardiac arrest as the result of untreated respiratory arrest.

Rapid and effective intervention in the out-of-hospital setting can result in survival rates greater than 70%.

The 2015 Guidelines maintain the C-A-B (Compressions-Airway-Breathing) sequence in pediatric CPR.

### **BLS: Children**



- Check for Responsiveness and Breathing
- Chest Compressions:
  - 1.5 inches in infants
  - 2 inches in children
  - or at least 1/3 of the ant-post depth of the chest wall.
- Chest Compressions:
  - In the infant, two thumb wrap around the chest wall.
  - One or two hands to the child.
- For the lone rescuer: 30 compression :2 breaths
- For two rescuer: 15 compression: 2 breaths

### **BLS:** Children





### CPR IN CHILDREN





 Adult CPR techniques can be used on children

• Compressions 1/3 of the depth of the chest

### AED IN CHILDREN



- Age > 8 years
   use adult AED
- Age 1-8 years

   use paediatric pads / settings if available (otherwise use adult mode)
- Age < 1 year
  - use only if manufacturer instructions indicate it is safe

























#### High-quality CPR

- Rate at least 100/min and not faster than 120/min
- Compression depth at least 2 inches (5 cm) but no more than 2.5 inches (6 cm)
- Allow complete chest recoil after each compression
- Minimize interruptions in chest compressions
- Avoid excessive ventilation

### **BLS: Summary**



- Immediate recognition of SCA
- Immediate initiation of excellent CPR "push hard, push fast"
- Minimizing interruptions in CPR
- For health care rescuers, taking no more than 10 sec to check for a pulse
- For single untrained rescuers, encouraging excellent chest Co-only CPR
- Using automated external defibrillators as soon as available
- Activating emergency medical services as soon as possible





Relieving Chocking in Responsive Adults & Children Abdominal Thrusts (Heimlich Maneuver) With Victim Standing or Sitting

#### Steps:

Behind + Stand/ Kneel
+ Wrap arms around waist
- Fist + Thumb against abdomen (between navel & breastbone)
- Gasp fist + Quick upward thrust

- Repeat until object expelled OR victim unresponsive

> Examine for Complications (damage to internal organs) NOT for Infants





Relieving Chocking in unresponsive Adults & Children Abdominal Thrusts (Heimlich Maneuver) With Victim Lying Down



Examine for Complications (damage to internal organs) NOT for Infants

#### Relieving Chocking in Responsive Pregnant & Obese Victims Chest Thrusts



#### **Relieving Chocking in Responsive Infants**

#### Up to 5 Back Slaps

(heel + middle back between shoulder blades) Free hand on back + Palm on head (first arm as above) Turn infant as a unit with Support + Hold on back

#### **Up to 5 Chest Thrusts**

(quick downward + just below nipple line + 1 per sec)

#### **Repeat Cycle**

until obstruction removed OR unresponsive







### **BLS: References**



Kleinman ME, Brennan EE, Goldberger ZD, et al. Part 5: Adult basic life support and cardiopulmonary resuscitation quality: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2015;132:S414-S435.

Link MS, Berkow LC, Kudenchuk PJ, et al. Part 7: Adult Advanced Cardiovascular Life Support: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2015;132:S444-S464.



Questions?

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Question: Survival rate to hospital discharge for Out of Hospital Cardiac Arrest (OHCA) is :

A. 40% B. 30% C. 20% D. 10%



Question: We can not start CPR-compressions unless we confirm absence of pulse in an unresponsive subject?!

A. True B. False

In an unresponsive victim:

"Lay rescuers should not attempt to assess the victim's pulse and, unless the patient has what appear to be normal respirations, should assume the patient is apneic. A knowledgeable clinician may check for a carotid pulse; however, no more than 10 seconds should be spent assessing pulselessness" Major causes of sudden cardiac death

Ischemic heart disease

#### No structural heart disease

Primary electrical disease (idiopathic ventricular fibrillation)

#### Brugada syndrome (right bundle branch block and ST segment elevation in leads V1 to V3)

Long QT syndrome

Preexcitation syndrome

Complete heart block

Familial sudden cardiac death

Chest wall trauma (commotio cordis)

#### Noncardiac disease

Pulmonary embolism

Intracranial hemorrhage

Drowning

Pickwickian syndrome

Drug-induced

Central airway obstruction

#### Sudden infant death syndrome

Drug-induced Central airway obstruction Sudden infant death syndrome

# BLS: Major Changes Made in 2015

- Use of social media by dispatchers to notify potential rescuers nearby to respond.
- Use of cell phones for calling 911, and then placing them on speaker phone
- Encouraging and training dispatchers to do (dispatcher-guided CPR).
- Early activation of the Emergency Response System, whether that be the in-hospital system or the 911 system, and rapid, early defibrillation remain an important part of Basic Life Support.