
بسم الله الرحمن الرحيم

BLOOD MODULE
SKILL LAB /Physiology PRACTICAL
FIRST-YEAR MBBS BATCH 50

Cardiopulmonary Resuscitation

Usman

Date: 2nd September 2023

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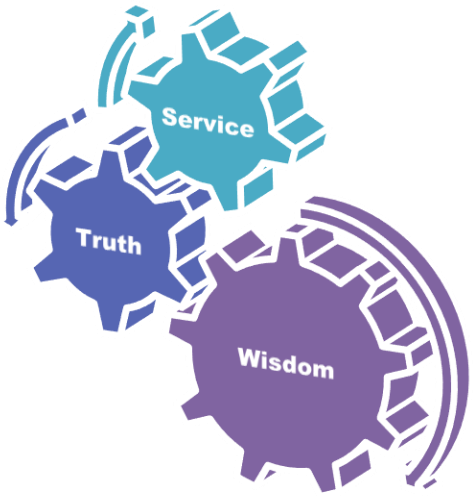
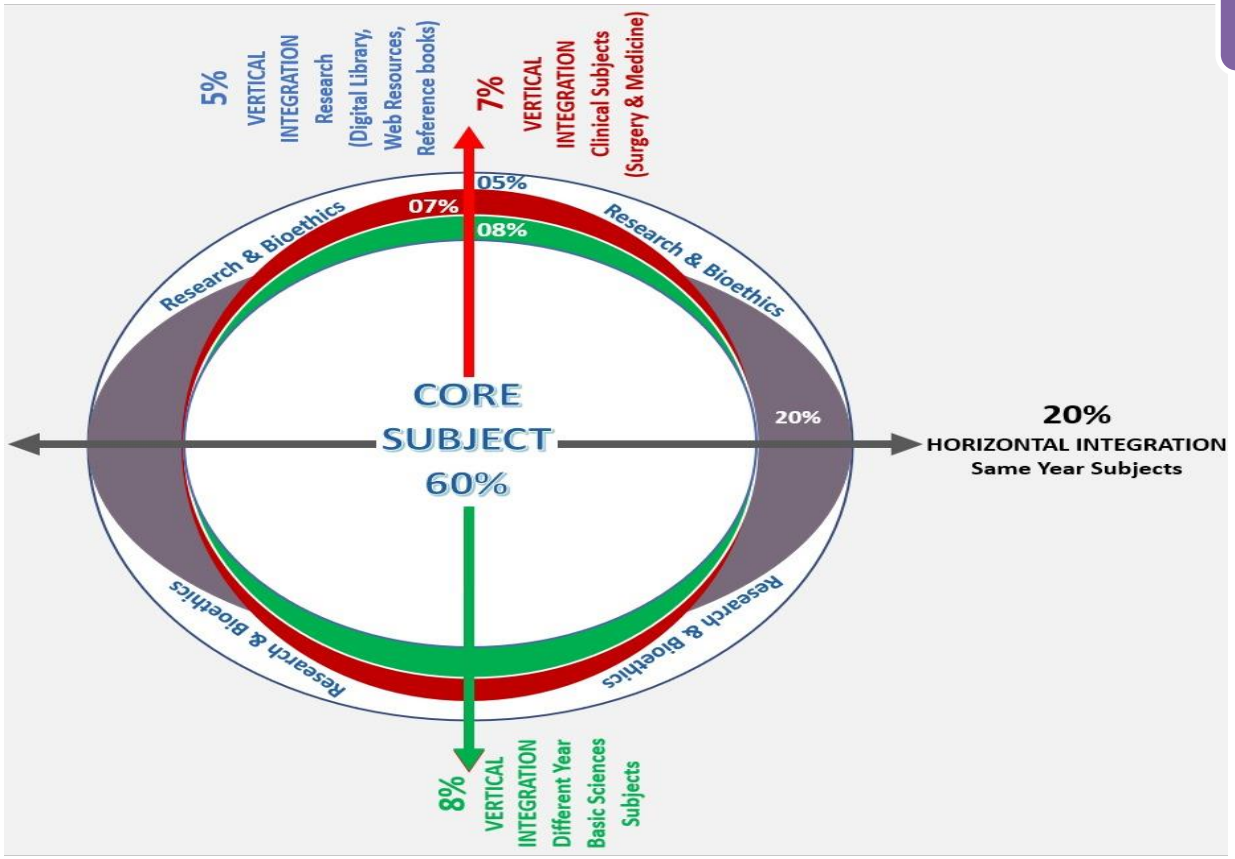
Motto



Vision; The Dream/Tomorrow

- To impart evidence based research oriented medical education
- To provide best possible patient care
- To inculcate the values of mutual respect and ethical practice of medicine

Professor Umar Model of Integrated Lecture



60% CORE SUBJECT

20% HORIZONTAL INTEGRATION
Physiology
biochemistry

8% VERTICAL INTEGRATION
Pathology
pharmacology

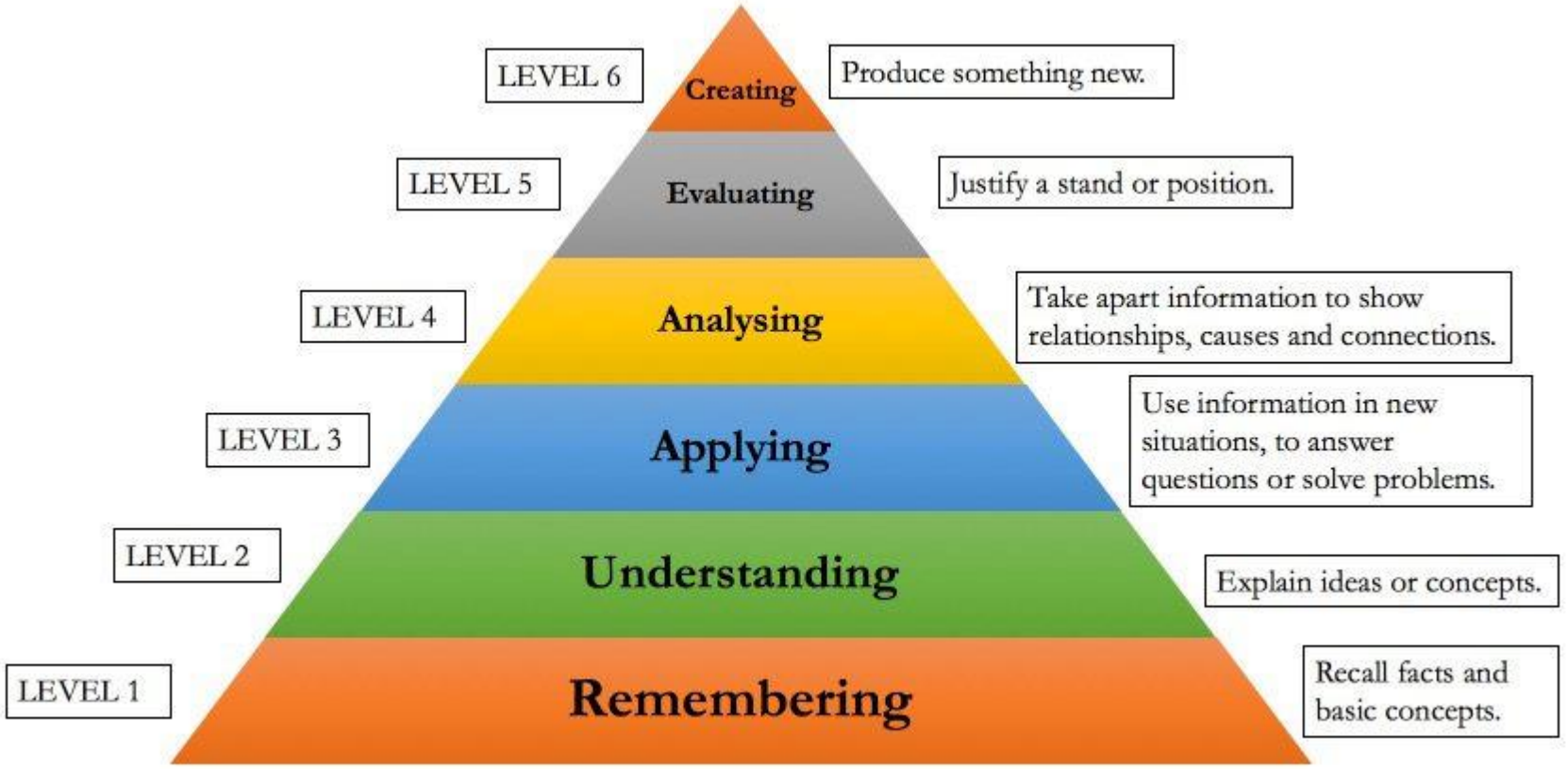
7% VERTICAL INTEGRATION
Clinical integration

5% VERTICAL INTEGRATION
Research, professionalism
Ethics
Digital library

BLOOM'S TAXONOMY : DOMAINS OF LEARNING

Sr. #	Domain of learning	Abbreviation	Levels of the domain	Meaning
1	cognition	C	C1	Recall / Remembering
2			C2	Understanding
3			C3	Applying / Problem solving
4	Psychomotor	P	P1	Imitation / copying
5			P2	Manipulation / Follows instructions
6			P3	Precision / Can perform accurately
7	Attitude	A	A1	Receiving / Learning
8			A2	Respond / Starts responding to the learned attitude
9			A3	Valuing / starts behaving according to the learned attitude

BLOOM'S TAXONOMY OF THE COGNITIVE DOMAIN

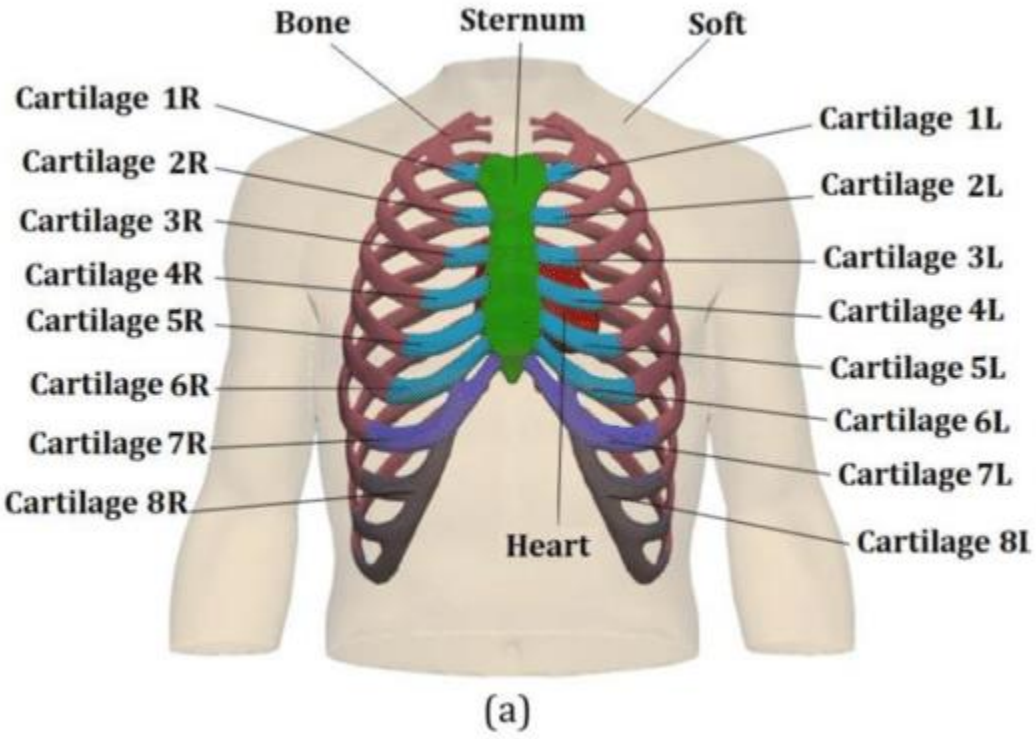


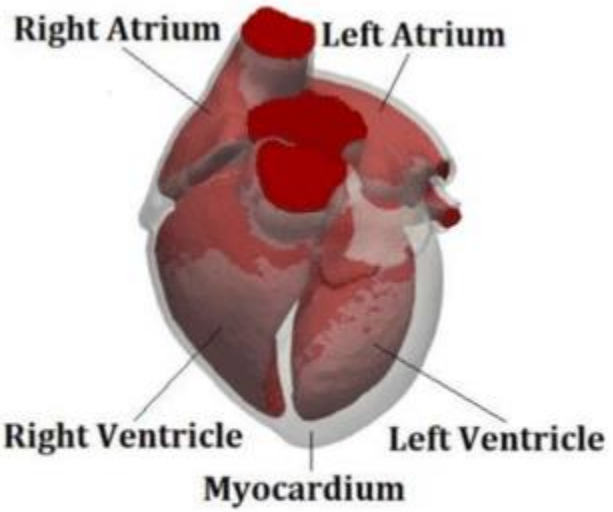
LEARNING OBJECTIVES

Sr. #	Learning Objective	Domain of Learning
1	To define CPR and its clinical significance.	C1
2	To identify the anatomical landmarks used for performing CPR	C2
3	To describe the various components of CPR procedure	C1
4	To explain the rationale behind performing CPR in terms of pathophysiological mechanisms.	C2
5	To understand the sequence of events in a patient who is suffering from asystole.	C2
6	To apply knowledge of precordium examination in a clinical context to assist in making diagnostic decisions	A3, P3, C3

Horizontal integration
With Anatomy

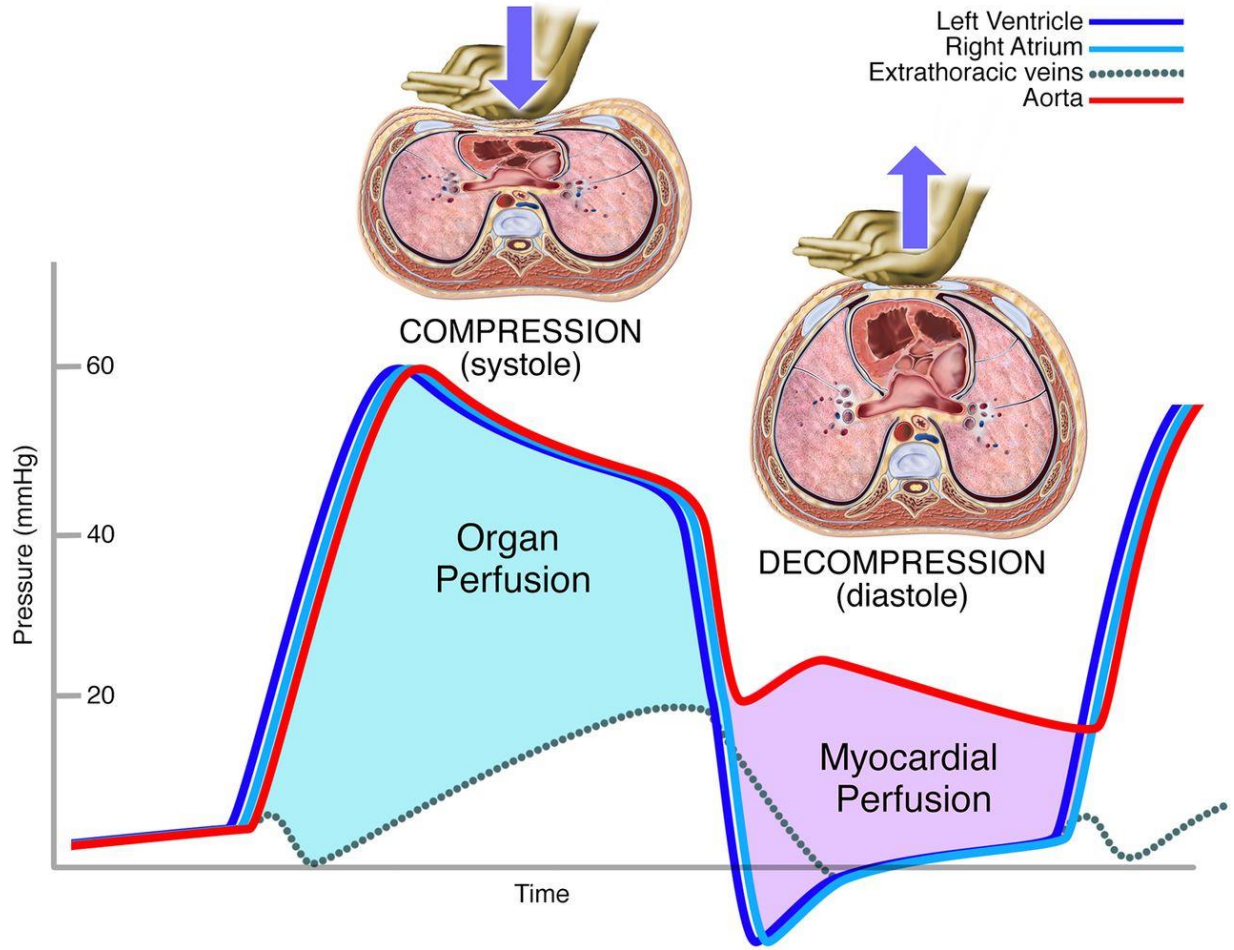
Sternal angle and ICS





http://dx.doi.org/10.48550/arXiv.2205.15804

Position of Hands During CPR



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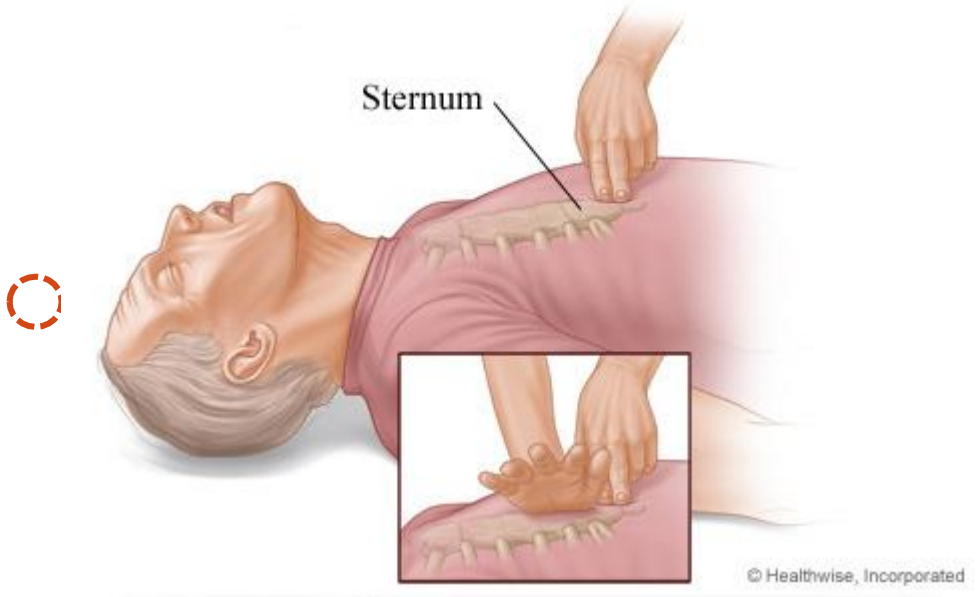


Core Concept

CPR Facts

- Heart disease is the number 1 killer in the U.S.
- 330,000 Americans die yearly
- 50% of these will die before they get to the hospital

CPR Facts

- The most common cause of death from a heart attack in adults is ventricular fibrillation
- Ventricular fibrillation:
  - A disturbance in the electrical rhythm of the heart
  - Can be treated with defibrillation (applying an electrical shock to the chest)
  - If a defibrillator is not readily available, brain death will occur in less than 10 minutes

CPR Facts

- During cardiac arrest, the heart stops pumping blood.
  - CPR is one way of buying time until normal heart function is restored or a defibrillator becomes available.
  - CPR provides artificial breathing and circulation, keeping oxygenated blood flowing to the heart and brain.
  - The earlier you give CPR, the greater the chance of success.
- CPR is a combination of rescue breathing and chest compressions.

When to Give CPR

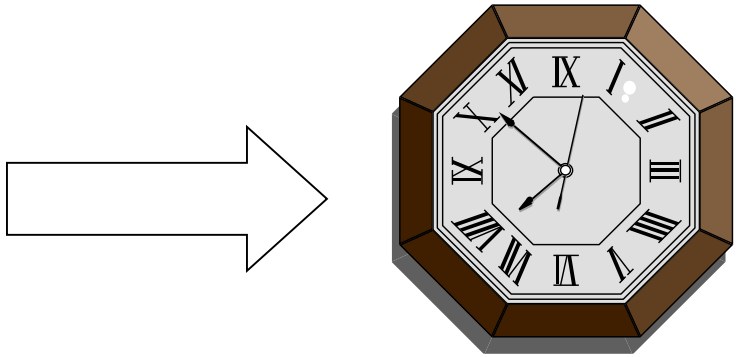
- Someone is not breathing and has no pulse
- If someone is not breathing, but has a pulse, perform rescue breathing

Diagnosis of cardiac arrest

~~Blood pressure measurement~~

~~Taking the pulse on peripheral arteries~~

~~Auscultation of cardiac tones~~



Loss of time !!!

Diagnosis of cardiac arrest

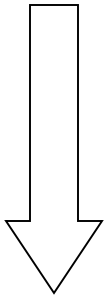
Symptoms of cardiac arrest

- absence of pulse on carotid arteries – a pathognomonic symptom
- respiration arrest – may be in 30 seconds after cardiac arrest
- enlargement of pupils – may be in 90 seconds after cardiac arrest

Sequence of operations

- Check responsiveness
- Call for help
- Correctly place the victim and ensure the open airway
- Check the presence of spontaneous respiration
- Check pulse
- Start external cardiac massage and artificial ventilation

In case of unconsciousness, it is necessary to estimate quickly



- ✓ the open airway
- ✓ respiration
- ✓ hemodynamics

Main stages of resuscitation

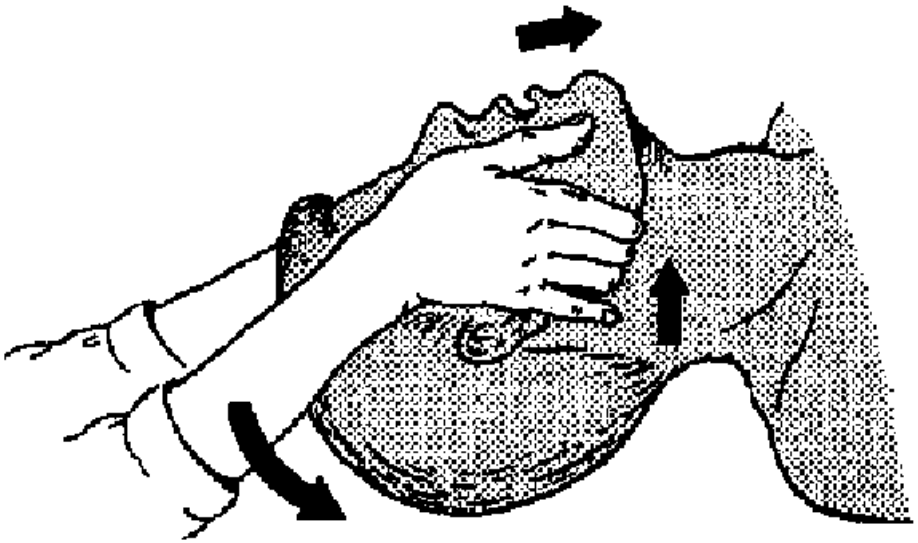
A (Airway) – ensure open airway by preventing the falling back of tongue, tracheal intubation if possible

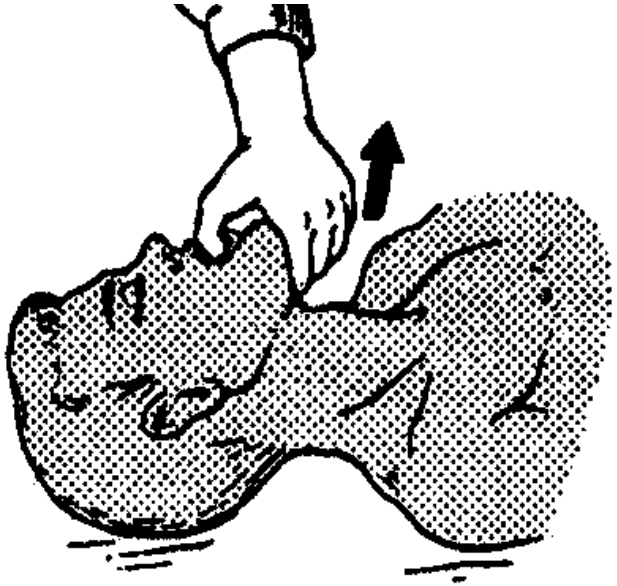
B (Breathing) – start artificial ventilation of lungs

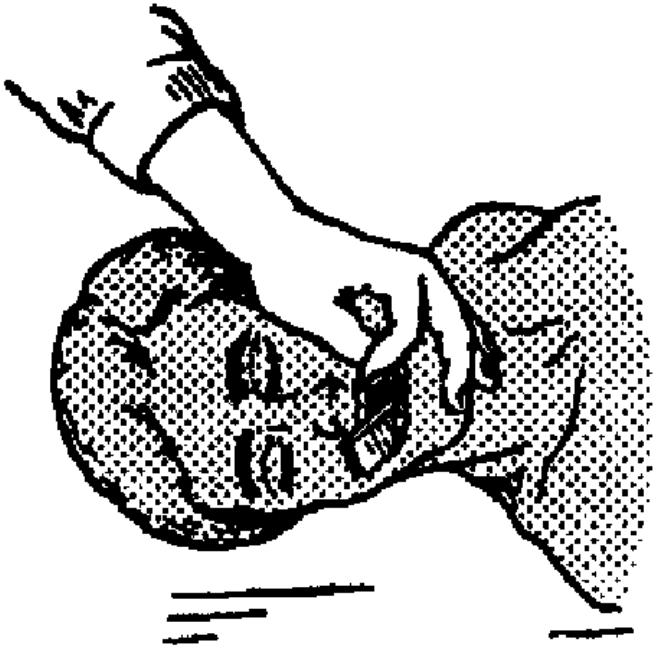
C (Circulation) – restore the circulation by external cardiac massage

D (Differentiation, Drugs, Defibrilation) – quickly perform differential diagnosis of cardiac arrest, use different medication and electric defibrillation in case of ventricular fibrillation

A (Airway) ensure open airway





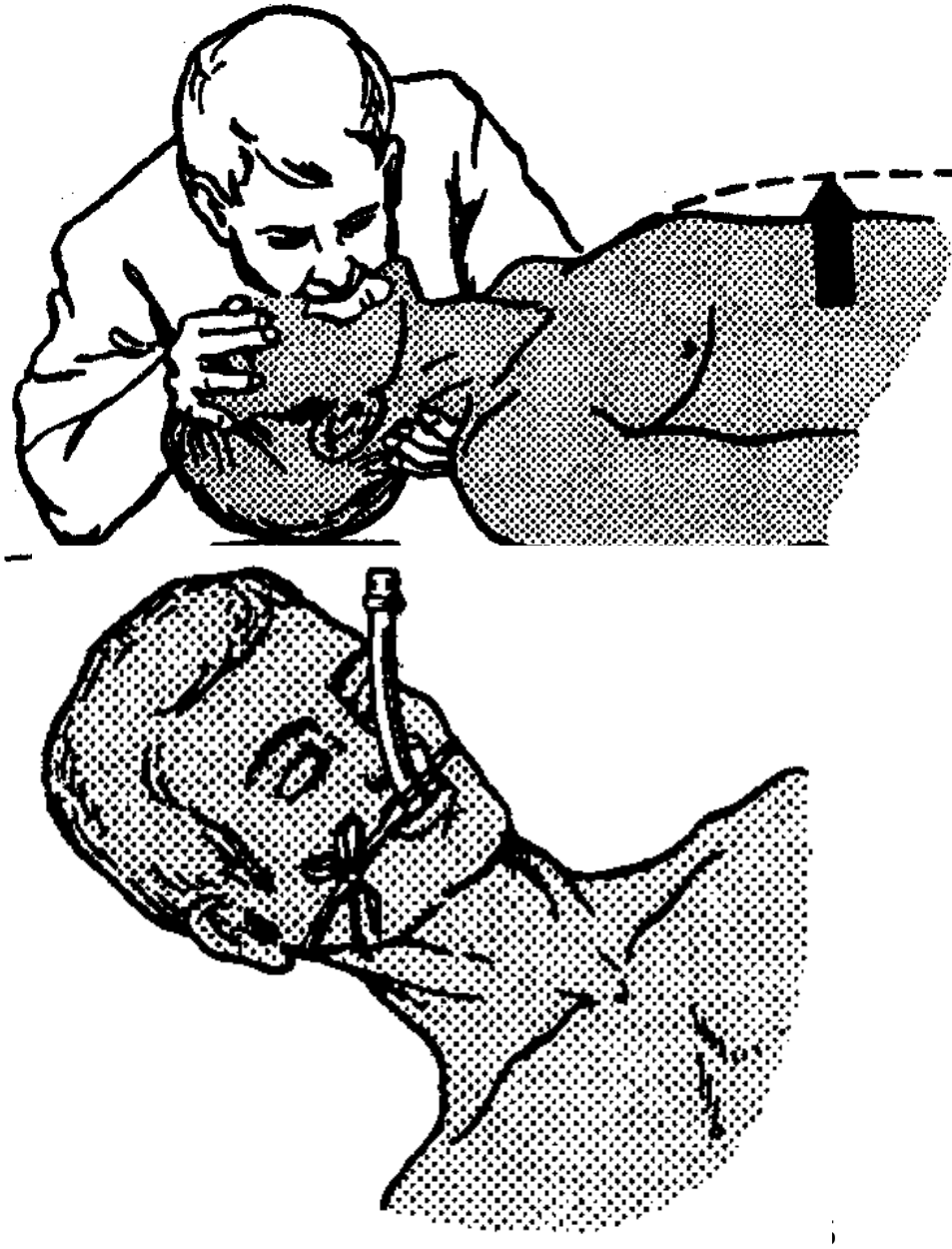


Open the airway using a head tilt lifting of chin. Do not tilt the head too far back

Check the pulse on carotid artery using fingers of the other hand

B (Breathing)

Tilt the head back and listen for. If not breathing normally, pinch nose and cover the mouth with yours and blow until you see the chest rise.



Algorithm

for artificial ventilation

mouth to mouth or mouth to nose respiration

ventilation by a face mask and a self-inflating bag with oxygen

↓

2 initial subsequent breaths

↓

wait for the end of expiration

↓

10-12 breaths per minute with a volume of app. 800 ml, each breath should take 1,5-2 seconds

↓

Control over the ventilation

↓

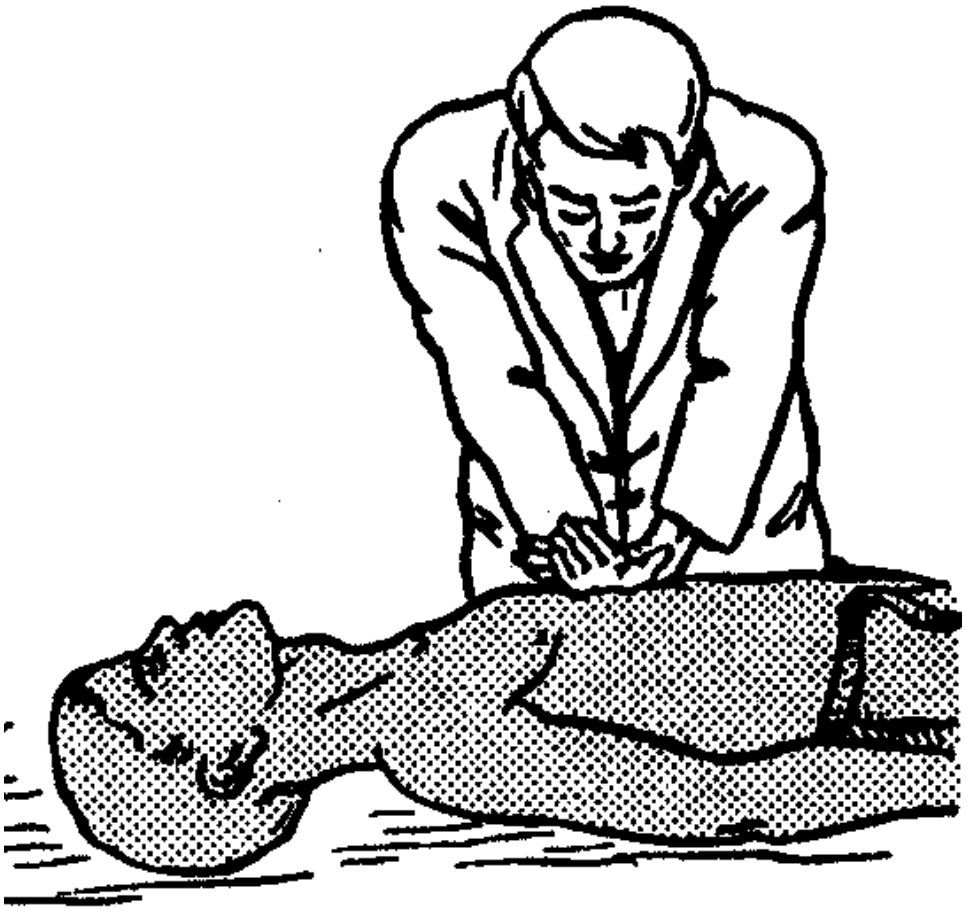
check chest movements during ventilation

↓

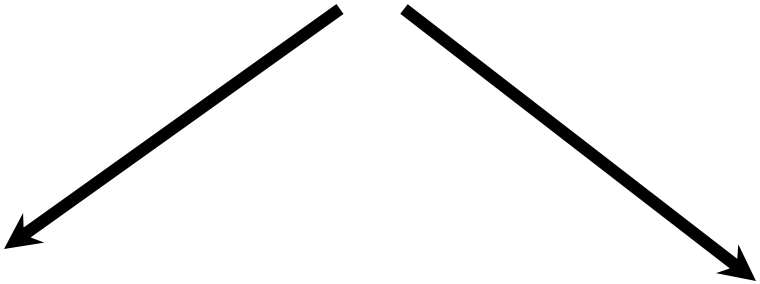
check the air return

C. Circulation

Restore the circulation, that is start external cardiac massage



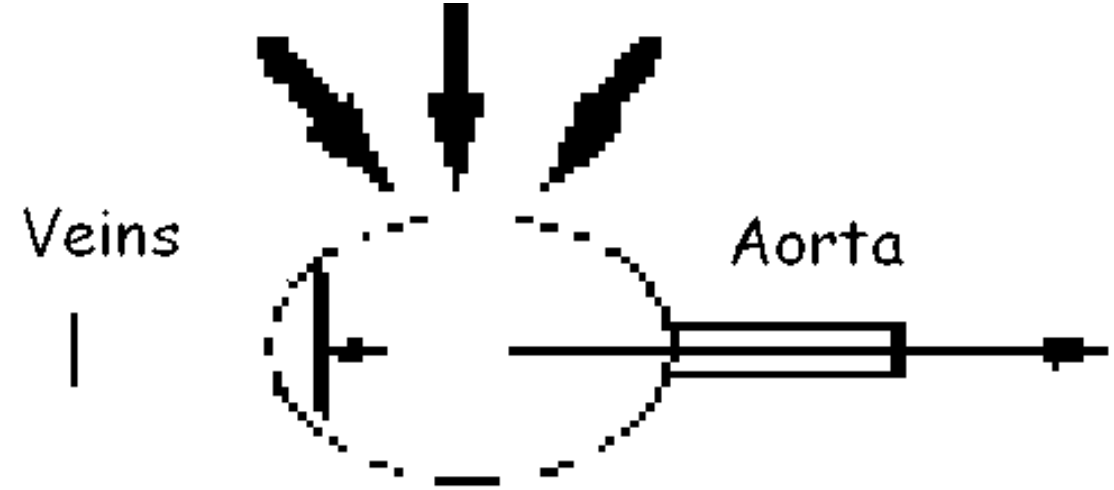
2 mechanisms explaining the restoration of circulation by external cardiac massage



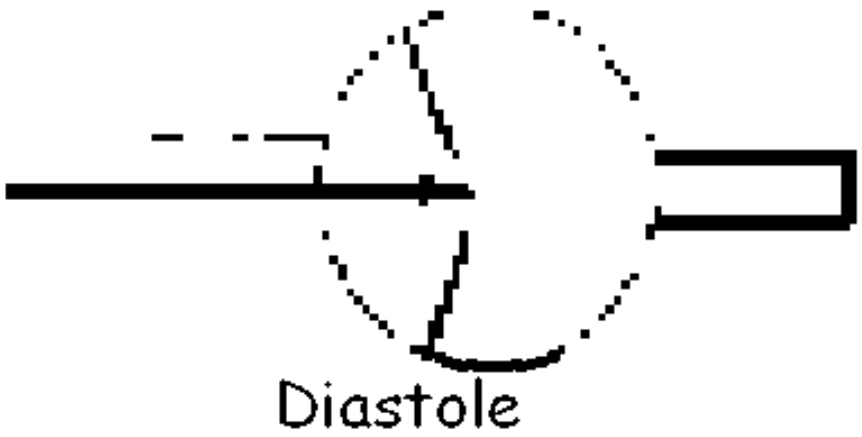
Cardiac pump

Thoracic pump

Cardiac pump during the cardiac massage



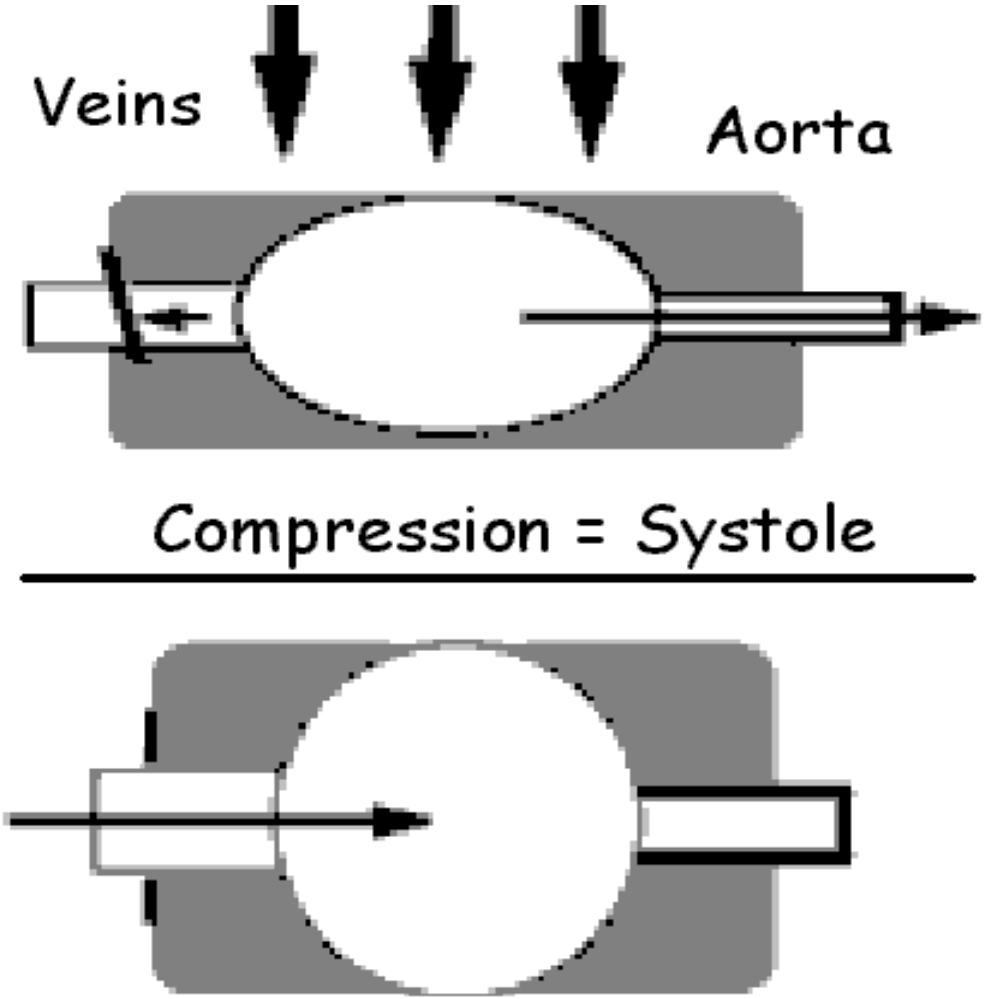
Compression = Systole



Blood pumping is assured by the compression of heart between sternum and spine

Between compressions thoracic cage is expanding and heart is filled with blood

Thoracic pump at the cardiac massage



- **Blood circulation is restored due to the change in intra thoracic pressure and jugular and subclavian vein valves**
- **During the chest compression blood is directed from the pulmonary circulation to the systemic circulation. Cardiac valves function as in normal cardiac cycle.**

ALGORITHM

2 breaths (duration 1 – 1.5 sec.)

palpation of pulse on carotid arteries (5 – 10 sec.)

in case of absence of pulse initiate external cardiac massage

- 1 person
- 2 persons

1 person:

compression rate 80 – 100/min.
compression/breath = 15 : 2

2 breaths in 4 – 7 sec.

4 cycles: 15 compression and 2 breaths

2 persons:

compression rate 80 – 100/min
compression/breath = 5 : 1

breath during 1 – 1.5 sec. after each 5th compression

10 cycles: 5 compression and 1 breath

check the pulse on carotid arteries (5 sec)

in case of absence of pulse continue resuscitation

VENTRICULAR FIBRILLATION OR PULSELESS TACHYCARDIA

Witnessed

Precordial thump

Check pulse, if none:

Unwitnessed

- ✓**Begin CPR**
- ✓**Defibrillate with 200 joules**
- ✓**Defibrillate with 200-300 joules**
- ✓**Establish IV access, intubate**
- ✓**Adrenaline 1 mg push**
- ✓**Defibrillate with 360 joules**
- ✓**Lidocaine 1 mg/kg IV, ET**
- ✓**Defibrillate with 360 joules**

Vertical integration with Clinical & Paraclinical Sciences

Possible arrhythmias after cardiac defibrillation

- ✓ventricular tachycardia
- ✓bradyarrythmia including electromechanical dissociation and asystole
- ✓supraventricular arrhythmia accompanied with tachycardia
- ✓supraventricular arrhythmia with normal blood pressure and pulse rate

Operations in case of asystole

Asystole

- **Start CPR**
- **IV line**
- **Adrenaline:IV 1 mg, each 3-5 min.**

  -or

  - intratracheal 2 - 2.5 mg

  - in the absence of effect increase the dose

  -Atropine 1 mg push (repeated once in 5 min)

  •Na Bicarbonate 1 Eq/kg IV

  •Consider pacing

Drugs used in CPR

- **Atropine** – can be injected bolus, max 3 mg to block vagal tone, which plays significant role in some cases of cardiac arrest
- **Adrenaline** – large doses have been withdrawn from the algorithm. The recommended dose is 1 mg in each 3-5 min.
- **Vasopresine** – in some cases 40 U can replace adrenaline
- **Amiodarone** **-** should be included in algorithm
- **Lidocaine** – should be used only in ventricular fibrillation

Biomedical Ethics

4 PILLARS OF MEDICAL ETHICS

THE PILLAR OF BENEFICENCE

THE PILLAR OF NON-MALEFICENCE

THE PILLAR OF AUTONOMY

THE PILLAR OF JUSTICE

Non-maleficence (Lesson of the day)

- The principle of non-maleficence holds that there is an obligation not to inflict harm on others.
- Example: stopping a medication known to be harmful or refusing to give a medication to a patient if it has not been proven to be effective.

Brain Storming

Question & Answer

QUESTIONS

QUESTION 1:-

Define central venous pressure?

Ans: The mean (average) right atrial pressure that equals right ventricular end-diastolic pressure (the amount of pressure at the end of diastole-filling)

QUESTIONS

Question 2: Why do we examine jugular veins? Give two reasons.

Answer

1. To estimate the amount of central venous pressure
2. To monitor pressure fluctuations in the right atrium during the cardiac cycle.

QUESTIONS

Question 3: What is the main determinant of right ventricular preload?

Answer

The mean right atrial pressure which equals right ventricular end-diastolic pressure - central venous pressure

Suggested Research Article

Related Research Article

ORIGINAL RESEARCH

Health Science Reports Open Access WILEY

Efficacy of heads-up CPR compared to supine CPR positions: Systematic review and meta-analysis

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Abstract

Background and Aim: Cardiopulmonary resuscitation (CPR) in full-coded patients requires effective chest compressions with minimal interruptions to maintain adequate perfusion to the brain and other vital organs. Many novel approaches have been proposed to attain better organ perfusion compared to traditional CPR techniques. The purpose of this review is to investigate the safety and efficacy of heads-up CPR versus supine CPR.

Methods: We searched PubMed Central, SCOPUS, Web of Science, and Cochrane databases from 1990 to February 2021. After the full-text screening of 40 eligible studies, only seven studies were eligible for our meta-analysis. We used the RevMan software (5.4) to perform the meta-analysis.

Results: In survival outcome, the pooled analysis between heads-up and supine CPR was (risk ratio = 0.98, 95% confidence interval [CI] = 0.17–5.68, $p = 0.98$). The pooled analyses between heads-up CPR and supine CPR in cerebral flow, cerebral perfusion pressure and coronary perfusion pressure outcomes, were (mean difference [MD] = 0.10, 95% CI = 0.03–0.17, $p = 0.003$), (MD = 12.28, 95% CI = 5.92–18.64], $p = 0.0002$), and (MD = 8.43, 95% CI = 2.71–14.14, $p = 0.004$), respectively. After doing a subgroup analysis, cerebral perfusion was found to increase during heads-up CPR compared with supine CPR at 6 min CPR duration and 18 to 20 min CPR duration as well.

Conclusion: Our study suggests that heads-up CPR is associated with better cerebral and coronary perfusion compared to the conventional supine technique in pigs' models. However, more research is warranted to investigate the safety and efficacy of the heads-up technique on human beings and to determine the best angle for optimization of the technique results.

KEYWORDS
cardiac arrest, cardiopulmonary resuscitation, emergency medical services, heads-up CPR

https://doi.org/10.1002%2Fhsr2.644

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Link:https://www.topstudyworld.com/2020/05/access-hec-digital-library.html?m=1

References

Sr.#	Types of reference material	Names/links of reference material
1	Text book	Guyton AC, Hall JE. Textbook of Medical Physiology. 14th ed. Philadelphia, PA: Saunders; 2020
2	Text book	Boron WF, Boulpaep EL. Medical Physiology: A Cellular and Molecular Approach. 3rd ed. Philadelphia, PA: Elsevier; 2017.
3	Text book	Sherwood L. Human Physiology: From Cells to Systems. 10th ed. Boston, MA: Cengage Learning; 2020.
4	Text book	Widmaier EP, Raff H, Strang KT. Vander's Human Physiology: The Mechanisms of Body Function. 16th ed. New York, NY: McGraw-Hill Education; 2021.
5	Text book	Costanzo LS. Physiology. 7th ed. Philadelphia, PA: Saunders; 2021.
6	Research papers	https://doi.org/10.1016/S0140-6736(09)61925-5 https://doi.org/10.3390/jcdd9110402
7	YouTube Video	https://www.youtube.com/watch?v=baxNxWIWdK8&ab_channel=AMBOSS%3AMedicalKnowledgeDistilled

Thank You