Advanced Life Support in perspective

- **Chain of survival:**
  1. Early access to emergency services [911].
  2. Early Basic life Support [by hands only].
  3. Early defibrillation.
  4. Early Advanced Life Support.
Causes & prevention of Cardio respiratory arrest

• **Definition:** A respiratory arrest is when breathing stops (apnea). A cardiac arrest is when the heart stops contracting & pumping blood.

• **Causes:**
  1. Airway problems.
  2. Breathing problems.
  3. Cardiovascular problems.
Airway Obstruction

• Complete airway obstruction will rapidly result in cardiac arrest.

• Partial airway obstruction may lead to cerebral or pulmonary edema, hypoxic brain damage as well as cardiac arrest.

• Causes of airway obstruction [blood, vomitus, F.B., direct throat / face trauma, CNS depression, epiglottitis, epileptic fit, bronchial secretions, mucosal edema, laryngeospasm, bronchospasm].
Cardiac Abnormalities

• **Primary causes [ventricular fibrillation]:**

1. Ischemia.
2. M.I.
3. Drugs [digoxin, quinidine, phenothiazide, tricyclic antidepressant].
4. Alcohol abuse.
5. Acidosis.
6. Abnormal electrolytes conc. [Ca, Mg & K].
Secondary causes of cardiac abnormalities:

1. Asphyxia.
2. Apnea.
3. Acute severe blood loss.
4. Acute pulmonary edema.
5. Suffocation.
6. Hypoxemia, anemia, hypothermia, end-stage septic shock are having longer heart effect.
• **Prevention:**

1. History, examination & investigation when needed.

2. Breathing problems is pre cardio respiratory arrest clinical abnormalities.

3. Hypotension, confusion, restlessness lethargy & L.O.C. should be considered.

4. Metabolic abnormalities particularly acidosis.

5. Consider ICU admission in your plan.
Ventilation

• **Face mask:** [45 - 50% if more than 6 L/m].
• **Nasal Cannulae:** [30 - 35% on 3 L/m].
• **Ventorien:** [24 – 90%].
• **Non re-breathing mask:** [90%].
• **Laryngeal mask airway:** [100%].
• **Endo tracheal tube:** [100%].
• **Needle cricothyroidotomoty:** [full neck extension, feel the cricoid & prick 0.5 cm below it].
Cardiac Monitoring & rhythm Recognition

• Remember: Treat the patient not the ECG.

• A normal HR is defined as 60–100 b/m, a rate below 60 is known as bradycardia & a rate of 100 is known as tachycardia.

• Rhythms causing cardiac arrest:
  1. Supra-ventricular tachycardia [above bundle of His bifurcation].
  2. Ventricular tachycardia [distal to bifurcation].
• **Supra-ventricular tachycardia:**

1. Atrial fibrillation: [absent P wave & normal QRS complex].

2. Atrial flutter: [there is P wave but saw tooth in appearance & rate more than 200/m (250-300/m) with regular QRS complex].

3. Supra-ventricular tachycardia: [you might find P wave or not, because it might start from A/V node].
- **Ventricular tachycardia:**
  1. wide QRS complex.
  2. rare more than 100/m.
  3. may sustain for more than 30 seconds (take it seriously). But if it was for less than 30 seconds it might be d.t. lytes imbalance or hypoxia.

- **Ventricular Fibrillation:**
  1. no pulse.
  2. **ECG** show absent QRS & T wave & replaced by cont., very rapid, bizarre, irregular appearance of apparently random frequency & amplitude.
Drugs & Their delivery

• **Priority in drug delivery:**
  1. central line [30 seconds].
  2. Peripheral line [5 minutes].
  3. E.T. Tube [but we double or triple the IV dose].
  4. Intra Cardiac [not used any more]:
     a) technically difficult.
     b) while doing the procedure CPR should stopped.
     c) high rate of complications:
        1. coronary laceration.
        2. intra mural injections.
        3. pneumothorax.
**Defibrillation**

- We paralyze the heart, to let S. A. Node to start working again.
- The delay in DC >>> the sever the arrhythmia >>> less favorable prognosis & less responsive to treatment.

**Types:**
1. Synchronized Cardio-version.
1. Synchronized Cardio-version:
if is used to convert Atrial or ventricular tach., it is important that the shock is synchronized to occur with the R wave of the ECG rather than with the T wave.

2. A synchronized Cardio-version:
it will shock at any ECG phase, & it can cause ventricular fibrillation.

• Mechanism of action:
 1. Monophasic:
  receive single burst, 1 pad to another & don’t come back.
2. Biphasic:

less Jules (electric shock waves move from 1 pad to the other then go in reverse direction).

*Types of Biphasic Defibrillator:*

1. **Manual** (which we are using).
2. **Shock Advisor** (for non-expert people), with big electrodes they can read the rhythm then talk or write the order to be done.
3. **Automated External** (you just connect it to the patient & it will work & calculate the electric wave by itself & when to give it).
• **Position:**
  1. Right of the upper sternum below the clavicle
  2. **left** 5\textsuperscript{th} inter-costal space ant. Axillary's line.

• **Technique:**
  1. apply pressure to the paddle [10kg] to decrease thoracic impedance (the distance by pr. The fat).
  2. keep the defibrillator paddles at least 12.5 cm from the pace maker if there is.
  3. **Keep oxygen flow away from from paddle** (not to kill the patient by burning instead of arrest)
  4. Don’t remove the paddle until 3 DC shock performed.
Treatment of Algorithms

• **During CPR:**

[If not already]

1. Check electrode/paddle position & contact.
2. Attempt/verify airway, oxygen & IV access.
3. Give adrenaline every 3 minutes (cycle).
4. Consider:
   a. Anti-arrhythmic.
   b. Atropine.
[Correct Reversible causes (4 H’s & 4T’s)]

1. Hypoxia.
2. Hypovolemia.
3. Hypo/Hyperkalemia & metabolic disorders.
4. Hypothermia.
5. Tension pneumothorax.
6. Tamponade.
7. Toxic/Therapeutic disturbances.
8. Thrombo-embolic/mechanical obstruction.
**Management of VF/pulse-less VT**

- **In each CPR cycle we provide:**
  - 1mg adrenaline IV.
  - 3 DC shocks (200, 200, & 360 joules).
  - 1 minute CPR.

- Then after 1 min. CPR 3 DC shocks (each 360 joules) + 1 minute CPR & adrenaline.
**Algorithm for management of non VF/VT rhythms**

- In case of a systole there is no rule of DC shock unless fine VF.
- 1mg adrenaline + 3mg atropine (USA)
- 3mg atropine but 0.5mg every 3 min & total of 3mg + 1mg adrenaline in each cycle.
- Post DC shock heart can enter into a systole for 15 sec. Then return to normal.
Cardiac Arrest in special Circumstances

- Hypothermia.
- Near drowning.
- Pregnancy.
- Poisoning.
- Electrocution.
- Anaphylaxis.
- Acute severe asthma.
Hypothermia

- Hypothermia exist when the body core temp. falls below 35C.
- (A&B) with high conc. Warm O2.
- (C) palpate a major artery for a minimum of 1 minute before concluding that there is no C.O.P.
- As body temp. falls $\rightarrow$ sinus bradycardia $\rightarrow$ A.F. $\rightarrow$ V.F. $\rightarrow$ finally a systole. When core temp. $< 30$C ; VF will not respond to cardioversion or drugs. Arrhythmias other than VF tend to revert spontaneously as the core temp rises [in open heart surgery when we rise temp 33C the heart rate pick up systole & sinus rhythm].
- Rewarming:
  1) Remove cold wet clothing ASAP & cover with blankets.
  2) Warm bathes (40C).
Severe hypothermia (<28C) [maintain in ICU for 24 hrs]:
1) Ventilate with warm humidified O2.
2) I.V. warm Fluids (40C).
3) Gastric, peritoneal, or pleural lavage with warm fluids (@40C).
4) Heated blankets.
5) Blood rewarming by haemodialysis or cardiopulmonary bypass.

**N.B:**
- U.O.P. increase with hypothermia
- Hypothermia promotes the transfer of fluid from the circulation into the tissues.
- Warm slowly (1 degree/30 minutes).
Near Drowning

- Associated with hypothermia & Bradycardia.
- Defined as asphyxiation in fluid (water).
- Respiratory arrest 1st event & cardiac arrest is 2nd event.
- BLS & ALS shouldn’t be less than 45 min.
- Placed horizontally & head down (to prevent aspiration & regurgitation).
- In 10% of cases no fluid is aspirated (dry drowning due to spasm).
- Hospitalization is needed for:
  - Secondary pulmonary edema.
  - ARDS (aspirated fluid).
- Patient can be discharged after 6 hrs if clinically, ABG, CXR normal.
Pregnancy

• Two people to resuscitate.

• Causes of maternal cardiac arrest:
  - Hemorrhage.
  - Pulmonary embolism.
  - Amniotic fluid embolism.
  - Placental abruption.
  - Eclampsia.

• After 5 minutes of unsuccessful in-hospital resuscitation, emergency C/S is indicated to save the fetus (in the 3rd trimester of pregnancy).
Poisoning

• A.B.C. & **NO** mouth to mouth breathing.
• Increase risk of pulmonary edema, aspiration, early intubation is recommended in thermal injury & airway burns.
• Arrhythmias commonly results from the ingestion of drugs with negative inotropic action (treatment is with positive inotropic drugs i.e. adrenaline & dobutamine).
• Antidote:
  - Opiod X Naloxone 1.2mg
  - Bradyarrhythmia X atropine 2mg or isoprenaline 10-100ug/min.
  - B.blockers X glucagon 5mg IV.
  - Organophosphate insecticides X high-dose atropine.
  - Cyanides X dicobalt edetate.
  - Digoxin toxicity X digoxin specific FAB.

• Pass NGT & lavage stomach from ingested toxins & give activated charcoal.
Electrocution

- The severity of injury depends on the area & the magnitude & the path of the current.
- Electricity tends to pass along muscles, nerves & vessels. It may therefore paralyze the respiratory muscles or disturb the myocardium, leading to respiratory or cardiac arrest (V. Fibrillation, immediate asystole, extra pace maker).
- Electrocution is like a bullet goes in & out, but if it remains in it will settle at the heart.
- Those who have survived an electric shock should be monitored in hospital if they have suffered (L.O.C, cardiac arrest, ECG abnormalities, contact injury)
Anaphylaxis

- Due to (insect bite, food, blood products & drugs) \(\rightarrow\) IgE Antibodies \(\rightarrow\) histamine release \(\rightarrow\) increase vascular permeability & peripheral V.D. (decrease V.R. & C.O.P.) \(\rightarrow\) sudden collapse & death.

- Anaphylactoid reaction (there is no IgE mediators & no previous sensitization).

- Resuscitation with:
  1. 100% oxygen.
  2. Adrenaline (if stridor, wheeze or respiratory distress) 0.5cc 1/1000 I.M. & repeat Q5 minutes if no clinical improvement is clear.
  3. CPR or ALS.
  4. Antihistamines.
  5. Hydrocortisone.
  6. IV Colloids.
Acute Severe Asthma

- Normal or low PCO2.
- **Resuscitated with:**
  - 1) ABGs.
  - 2) Intubation.
  - 3) Exclude pneumothorax & consider open cardiac message.
- Resist arrhythmias in case of metabolic disorders.
Peri-arrest

- Arrhythmias complications of M.I. & in certain circumstances may also precede ventricular fibrillation, named:
  1. Bradycardia.
  2. Broad complex tachycardia (90% ventricular in origin).
  3. Narrow complex tachycardia (90% atrial in origin).

- Principle of treatment:
  1. How is the patient?
  2. What is the arrhythmia?

- Three options available in the immediate treatment of arrhythmias:
  2. Anti-arrhythmic & other drugs.
  3. Cardiac pacing.
• **Bradycardia:**
  blood pressure < 90 mmHg.

• **Broad complex tachycardia:**
  1) Pulse → sedation → synchronize DC shock…
  2) Pulseless → no C.O.P. → VF/VT.

• **Narrow complex tachycardia:**
  1) AF > 130 b/min → ask help → BP < 90 mmHg → synchronized DC shock.
  2) Vagal maneuver → adenosine → ask help → BP < 90 mmHg → synchronized DC shock.
Cardiac Pacing

- **SAN** (60 - 70 beats/minute).
- **AVN** (40 - 50 beats/minute) [narrow QRS].
- **His/Purkinje fibers** (30 beats/minute) [wide QRS].

N.B.

In open heart surgery the pace maker should be 100 beats/minute to overcome SAN.
Artificial pacemakers classification:

- **Non-invasive:**
  - Percussion pacing \((\text{decrease } HR \rightarrow \text{decrease COP})\).
  - Transcutaneous pacing \((\text{stickers})\).

- **Invasive:**
  - Temporary transvenous pacing \((\text{central line placed in Rt. ventricle})\).
  - Permanent implanted pacing \((\text{catheter with patery})\).
  - Implantable cardioverter defibrillators.
patient is stable

Thank you