Disaster Management

Cardio Cerebro Pulmonary Resuscitation

EDITED & Published BY

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On behalf of Bharatiya Sangyaharak Association

(ASSOCIATION OF ANAESTHESIOLOGISTS OF INDIAN MEDICINE)

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Editorial:

The Association of Anesthesiologist of Indian Medicine came in existence in the year 1996 and we planned to publish an official journal of the Association. Thus a Journal Sangyaharan Shodh came in existence with an Inaugural edition in the year 1997 at the inaugural function of First National Conference of A.A.I.M. on 7th March 1997, at B.H.U. Varanasi. The Association continuously tried to raise its voice for development of Ayurved and helped the society by its activity. In this chain we planned to start a regular workshop on **C.C.P.R. for Ayurvedic / Unani / Homeopathic Physician and surgeons** as well as for the Paramedical staffs. In collaboration with Section of Sangyaharan the workshop got very popularity in the Ayurvedic world.

We first started a 15 days workshop and arranged dummy for neonatal resuscitation with an Intubations Model. Further Prof. V.P. Singh the then Director of IMS provided finance to purchase an adult Resuscitation Model and thus a full set was now in hand for training purpose. Till date nearly 200 participants had all ready received this training.

Now we felt a need of resource material for these participants and keeping in view we compiled all the lectures in the form of a book which is now available in hand. It will be a guideline and be helpful for **C.C.P.R. Trainers** and **Trainees both.** I am very thankful to the committed authors who participated in this book.

Devendra Nathe Pande
Chief Editor

CHAPTER-1

Aim & Object of Workshop:

Dr. D.N. Pande, I/c Section of Sangyaharan, Faculty of Ayurved, I.M.S., B.H.U., Varanasi-221005.

Even though lacks of Ayurvedic/Unani/ Homopathic doctors are present all over the country but Ayurvedic, Unani and Homeopathic practitioners are ignored for emergency management. Neither the government nor the N.G.O. recognized their strength for the management of DISASTER. I thought that if we will train these lacks of hands in C.C.P.R., they will be helpful for the society

during any emergency/ DISASTER./calamity, The society will also show its interest as well as respect to these force- doctors of Indian system of medicine.

Further it will be also helpful to the doctors who are still not in a position to train their paramedical staff for this very essential service.

Thus with a dream to serve the humanity this workshop came in existence. In nut shell workshop is focused on –

1. To provide a skilled rescue personal every corner of the country.
2. To provide training to each and every doctors of Indian system of medicine all over the country.
3. To provide training to paramedical staffs.
4. To provide training to youngsters and even school boys and girls.
5. To draw attention of AYUSH to create facility for this programme.

Situation in which CCPR is required:-

1. Traffic accidents
2. Natural calamity flood/earth quack etc.
3. Drug reactions
4. Cardiac patients and in some diseases
5. In the wards and O.T.

What is C.C.P.R.?-

Our heart pumps blood to the tissues of our body and blood carry oxygen provided by respiration in which our lungs take part. Thus the oxygen is available to the brain. If due to any reason our lungs stop working heart will not get oxygenated blood and the oxygen will thus not reach to the brain. If this condition remains for 5 minutes the oxygen saturation to brain tissue will diminish and start to swell and finally nonfunctioning will occur which will be irreversible.

Therefore lungs and heart are responsible for function of brain. Delay in resuscitation will cause **Brain Death** even though lungs and heart may be functional. It is why cerebral (brain) resuscitation is our prime aspect.

1. C = Cardio = Cardiac Resuscitation
2. C = Cerebro = Cerebral Resuscitation
3. P = Pulmonary = Lungs Resuscitation
4. R = Resuscitation

Lungs are the driving force in this process and are tried to keep functioning at the beginning then the heart. If the lungs start functioning well the heart will take its charge

automatically if it is not damaged due to any other reason.

The steps to restore the function of lungs & heart will be explained in the next chapter.

CHAPTER-2

Cardio Cerbro Pulmonary Resuscitation in adult and children.

Dr. D.N. Pande, I/c Section of Sangyaharan, Faculty of Ayurved, I.M.S., B.H.U., Varanasi-221005

Cardio Cerebro Pulmonary Resuscitation is termed as C.P.R.- Cardio Pulmonary Resuscitation. But due to importance of cerebral oxygenation now it is termed as C.C.P.R. which is more suitable. I will include C.C.P.R for all the emergency conditions due to any reason. The following three are to be managed during any emergency-

A. Cardiac Arrest
B. Respiratory Arrest
C. Unconsciousness

These all of the three or any one of the three can occur during any accident or calamity or during normal course

of treatment. Any one of these three conditions or all of the three requires immediate attention of the clinician or rescuer. The line of management is very similar and interrelated for all these three conditions. This emergency can occur any where at any time. The rescue personnel /clinician should be able to resuscitate a victim of these conditions.

Early cerebral oxygenation is the key to success

Cardiac Arrest:

Causes

- Hyperactivity of the vagus nerve
- Severe oxygen deficit or excess of carbon dioxide
- Sensitivity to drugs
- Degenerative conditions of the blood vessels and nervous tissue of the heart
- Electric shock
- Hemorrhage
- Electrolyte changes
- Cardiac Catheterization and Angiocardiography
- Air embolism and Pulmonary Embolism
- Stimulation of vagus nerve
- Airway obstruction

- Failure of oxygen supply during anaesthesia
- Asphyxia due to any cause

Sign:

Pallor, Cold Clammy Skin, Imperceptible pulse (Carotids), Loss of muscle tone, cessation of respiration, dilated pupil.

Type:

A systole: when heart stopped completely

Ventricular fibrillation: The fibers of the heart muscle contract at its own rate and in place of regular forceful contraction of the whole ventricle irregular twitches all over the surface are found. Thus the heart fails to expel any blood from the ventricle. During cardiac massage heart feels like a bag of warms.

Diagnosis:

- Absence of arterial pulsation
- ECG shows Asystole/ Ventricular fibrillation
- Absence of heart sound
- Pupils widely dilated
- Absence of breathing
- Pale or cyanosed

- Opthalmoscopy – the veins of fundus show segmentation of blood.

Management:

Aim: to provide oxygen to the brain.

Equipments required: Pharyngeal airways of different sizes.

- Oxygen facilities
- Venti masks, Catheters, Flow regulators, Oxygen tent, Oxygen cylinder,
- Ambu Bag -Neonatal, Pediatric, Adult
- E.M.O. /Boyles Machine/Ventilator
- Suction apparatus
- I.V. canola/ Drip set/ I.V. fluids

Drugs- Atropine, Adrenaline, Aminophyline, Avil, Cortisone, Dopamine, Mephentine, Sodium bicarbonate, Potassium Chloride, Calcium Chloride and sodium chloride.

- Pulse oxy meter
- Cardiac Monitor and defibrillators
- Endotracheal tubes- 0 to 10 Numbers

Line of Treatment:

(I) Basic life support (BLS)

A. Airway

B. Breathing

C. Circulation

(II) Advance life support (ALS)

D. Drugs

E. ECG Electrolyte Equipments

BLS:

- First try to call the victim
- Hay/ Hallo
- Check Pulse
- Feel the breath& the chest falling

Positioning of the patients:

Head should be lowered and leg should be elevated. The patient should be placed on a rigid surface and neck should be slightly extended.

Airway (A): Should be made patent by clearing the nose and oral cavity by suction. An oropharyngeal airway should be properly placed.

Breathing (B): If the patient is not able to breath spontaneously with above procedure then artificial ventilation should be started either by mouth to mouth or by mask and bag (Ambu Bag).

Even then if it is difficult to continue the endotracheal intubations should be done with intermittent positive pressure ventilation.

Circulation (C): For maintenance of circulation external cardiac compression should be started simultaneously with ventilation in the ration of 2:30 (2 time ventilation and 30 times cardiac compression, total five cycles per minute).

Technique:

Heel of the left hand should be placed over the lowered IIIrd of sternum with Rt. Hand placed over it.

Both arms should be straight and whole body pressure should be given to sternum with thrusting movement -30 times per cycle, total 5 cycles in one minutes.

Whole body pressure should be given so that the sternum be displaced back ward about one inch towards the

vertebral column. Pressure must not be extended towards the ribs as they may easily be fractured.

After each 30 compression two breaths should be given.

In children only one hand and limited pressure should be used.

In infants only thumb pressure should be exerted.

If pulse is palpable in carotid or femoral artery, the cardiac compression is successful.

The total resuscitation time is 3 to 4 minutes only.

Assessment of Resuscitation (A+B=C):

30 Second to 60 Second for Airway and breathing.

Next 2 minuets to 3 minutes for Cardiac compression + breathing.

If pulse is + five proceed for further ventilatory support for 10 minutes.

If H.R. – less than 60 per Minutes and Spontaneous breathing is absent proceed for Advance Life Support.

Advance life support (ALS):

Drug (D): Adrenaline 0.05 to 0.2 mg for conversion of slow fibrillation to rapid fibrillation.

I.V. infusion of 8.4% sod. Bicarbonate

E .C.G. monitoring to diagnose:

Asystole – I.V. 5 to 10 ml 1% Cal. Chloride

Ventricular fibrillation – Electrical defibrillation before C.C.

Cardiac Compression – if fail within 10 minutes – direct card compression is advisible.

Vent Arrhythmia – I.V. Lignocaine (5 ml 1% Solution)

Cerebral Ocdema- Manitorl Solution 20%

Electrolyte: - If K + increases treat with Glucose and insulin/Peritoneal dialysis .

Afler Care:

- Continuous observation in ICU /Monitoring
- Biochemical estimation- IOP Chart, Elect., PCV
- Fluid balance

- Blood loss/ Protein estimation
- Mouth care
- Chest infection – Physiotherapy, Antibiotics
- Body care – to prevent bed sores
- Feeding with – I.V., Gastric tubes
- Monitoring- Resp. Rate, Vol, Blood Gases,
- Haemodynamics – H.R., B.P., C.V.P. E.C.G., Temp.
- CNS- ECG, Pain, Consciousness

Special Consideration for Unconscious Patient:

1. Endotracheal intubations
2. Gastric Lawage- Ryles tube/Feeding tube
3. I.V. infusion if unconsciousness is due to overdoses of drugs
4. Forced diuresis with frusemide .

If urine Out Put decreases:

A. 500 ml 5% Dextrose + 5 ml Sod. Bicarbonate.
B. 500 ml 5% dextrose + 24 ml. Mob. Potassium chloride
C. 500 ml. Normal sodium

Sequence = a,b,c, at rate of 500 ml per hour

5. Dialysis – Peritoneal / Haemo dialysis.

6. Control of Convulsion- with I.V. diazepam 10-20 mg/4-6 hours,

I.V. Nondepolarizing muscle relaxant with I.P. P.V.

7. Control of Temperature:

Hyperpyrexia by – Surface cooling with chlorpromazine,

Drugs – Aspirin / Paracetamol

Hypothermia by – using warm blankets.

Respiratory Arrest: is managed according to the line of treatment described in the heading A (Airway) and B (Breathing)

Complication of resuscitation –

Rib fracture.

Tracheal injuries.

Aspiration of gastric content.

By Your Small Effort of Giving a breath will save a life.

CHAPTER-3

Neonatal Resuscitation

Dr. K.K.Pande, Associate Professor, Section of Sangyaharan, I.M.S., B.H.U., Varanasi.

Neonatal resuscitation skills are essential for all health care providers who are involved in the delivery of newborns. The transition from fetus to newborn requires intervention by a skilled individual or team in approximately 10% of all deliveries.

100 million babies born worldwide annually .10% of newborn require some resuscitation assistance, while 1% require intensive resuscitative efforts. More than a

million babies die annually from complications associated with birth asphyxia.

In India 3.5% of the approximate 25 million babies born an annually experience asphyxia at birth.

Anticipation, adequate preparation, accurate evaluation and prompt initiation of support are critical for successful neonatal resuscitation.

Basic causes of Asphyxia during labor and delivery are:

- Interruption of umbilical blood flow (e.g. cord compression).
- Failure of gas exchange across the placenta (e.g. placental abruption)
- Inadequate perfusion of the maternal side of the placenta (e.g. severe maternal hypertension).
- An otherwise compromised fetus who cannot further tolerate the transient, intermittent hypoxia of normal labor (e.g. Anemic or growth retorted fetus)
- Failure to inflate the lungs and complete the change in ventilation and lung perfusion that must occur at birth.

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Risk factors are associated with Neonatal asphyxia:

Maternal age > 35 yrs or , 16 yrs. Maternal disease like diabetes; hypertension; Anemia; Blood type or group allo-immunization; ante partum hemorrhage, Prolong labor; premature rupture of membrane; prolonged ROM, cord prolapsed, me conium staining amniotic fluid. Substance abuse by mother: Maternal analgesia / sedation/ general anaesthesia, pre/post term fetus, lack of prenatal care and difficult delivery of baby.

Pathophysiology

Asphyxia is characterized by progressive hypoxia; hypercapnia, hypo perfusion and acidosis. If it is not corrected promptly lead to multi organ system dysfunction including hypoxic ischemic encephalopathy (HIE) and long term neuromotor sequale.

Recognition and treatment of primary and secondary Apnea.

Primary Apnea*:* When asphyxiated, the infant responds with an increased respiratory rate. If the episodes continue, the baby becomes panic, followed by a drop in heart rate and a slight increase in blood pressure. The neonate will respond to stimulation and O2 therapy with spontaneous respirations.

Secondary Apnea: When asphyxia is allowed to continue after primary apnea, the infant responds with a period of gasping respiration, falling heart rate and falling blood pressure. The infant takes a last breath and then enters the secondary apnea period. The infant will not respond to stimulation and death will occur unless resuscitation begins immediately. Because after delivery of an infant it is practically impossible to differentiate

between primary apnea and secondary apnea, assume the infant is in secondary apnea and begin resuscitation immediate.

Initiation of Respiration

Introduction of air into previously fluid filled lung and transfer within seconds from placental to pulmonary circulation is the most important adaptation at birth. To inhale air into the fluid filled lungs, large surface force about 15 - 25 cm of water pressure is necessary for a new born baby in first few breaths. Sometimes it is as high as 70 cm of water. During vaginal delivery as chest is squeezed causing removal of one-third of lung fluid through mouth and nose (the vaginal squeezed) and remaining fluid in lung absorbed through lymphatic. While initial breathing fails, additional pressure is often required to expand the alveoli and clear the fluid.

Mechanism of establishment of continuous neonatal breathing:

- The onset of breathing activities occurs in uterus, as a part of normal fetal development.
- Clamping of umbilical cord initiates rhythmic breathing.
- Relative hyperoxia with air breathing compared to low fetal Pao2 augments and maintain the rhythmic breathing.
- Pao2 does not interfere with continuous breathing.
- Carotid denervation does not affect breathing.
- Hypoxia depresses or abolishes continuous breathing.

Resuscitation - A proper approach

Phases of Resuscitation

1. Preparation
2. Resuscitation
3. Post resuscitation care.

Preparation

1. Readily available skilled team should have at least 2 persons. At every delivery there should be at least one person, must be capable of initiating resuscitation, including administration of positive pressure ventilation and chest compression. 2nd one should have skills required to perform a complete resuscitation, including endotracheal intubation and administration of medication.
2. Available functioning equipment and medication e.g.

   Radiant Warmer with canopy heater.

   Suction equipment (Bulb syringe, Mechanical Suction or DeLee meoustrap with 10 Fr catheter , suction catheters ,5 Fr to 10 Fr, 8 Fr feeding tube.

   Bag and mask and intubation equipment, self inflating resuscitation bag or 500 ml reservoir bag,.

   Endotracheal tubes with connectors 2, 2.5, 3, 3.5.

Infant laryngoscope 0.1 size, oropharyngeal airway 000,00 Humidified warmed 02 source.

Umbilical Vessel catheterization tray.

ECG, Pulse Oximeter, pressure transducer and monitors for Vascular pressure capnometer and medication.

Others are stethoscope, adhesive tape, syringes, gauge gloves, linen, shoulder roll and clock, Firm padded resuscitation surface.

Resuscitation

TABC (T = Maintenance of temperature, A = Establishment of an open airway, B = Initiate breathing, C = Maintain circulation.

The decision to progress from one step to next is determined by simultaneous assessment of 3 vital signs: Respiration, heart rate and color, 30 minutes is allowed to complete each step, reevaluate and decide whether to progress to next step.

Initial steps for Resuscitation

Warm and dry infant:
Place infant under radiant heat warmer bed and dry infant. In premature asphyxiated infant likely to hypothermic additional warming technique should be used like plastic wrapping and monitor for development of hyperthermia.

Initiate ABCs.

A. ***Establish an open Airway****:* Position - Head in neutral position and Bulb .Suction mouth and nose..

B. ***Initiate breathing****:* Use tactile stimulation i.e. slapping the soul of the foot, Flicking the heel, or Rubbing the infants back

Bag and mask ventilation or Bag & Endotracheal tube always with 100% Fio2 .

C. ***Circulation****:* Assess heart rate by listening to apical pulse with stethoscope, pulse in umbilicus or brachial pulse; stimulate and maintain circulation with chest compression, medications, and volume expanders.

Evaluate infant for

1. **Color**: Central vs Acrocyanosis. If centrally cyanosis gives infant blow by oxygen.
2. **Signs of Respiratory distress**
    a. Increased Work of Breathing,
    b. Nasal flaring,
    c. Tachypnea,
    d. Grunting,
3. By APGOR Score.

Score			
Sign	0	1	2
Heart-rate	Absent	< 100	>100
Respiratory effort	Absent	Weak, irregular	Good, Cry
Muscular Tone	Flaccid	Some flexion of extremities	Well flex
Reflex irritability (response to catheter in the nose)	No response	Grimace	Cough or sn
Colour	Blue or pale	Body Pink Extremities Blue	Complete p

Assessment done at 1 minute and 5 minutes with this score. Don't wait till 1 minute to initiate resuscitation. The scoring is meant for assessing the effectiveness of resuscitation.

4. Neonate is also assessing by Neurobehavioral changes.

Administration of oxygen

Supplementary oxygen is recommended whenever positive pressure ventilation is indicated for resuscitation. Free-flow oxygen is indicated to babies who are breathing but have central cyanosis.

In terms babies 100% oxygen is recommended when baby is cyanotic or need positive pressure ventilation. If oxygen is needed during resuscitation, one may begin with less than 100% or room air.

But oxygen should available to use if there is no appreciable improvement within 90 seconds after birth. Use of variable concentration of oxygen guided by pulse oximetry may improve in ability to achieve normoxia more quickly. If supplemental O2 is unavailable ventilation should started with room air. In case of

preterm babies (< 32 weeks gestation) use an oxygen blender and pulse oximeter during resuscitation. Begin PPV with oxygen concentration between room air and 100% oxygen. Adjust oxygen concentration up or down to achieve saturation between 90 and 95%. If heart rate does not respond, > 100 per min, correct any ventilation problem and use 100% oxygen. If no facility of oxygen blender use 100% oxygen.

Bag and mask Ventilation Indication:

- Infant remains apneic or gasping
- Heart rate remains < 100 per minute, 30 seconds after administering the initial step.
- Persistent central cyanosis despite 100% the flow oxygen.

Self inflating bag or flow inflating bag can provide PPV during resuscitation. Improvement during bag and mask ventilation is indicated by

- Increasing heart rate, if heart rate is not improving assesses chest movements and check breath sounds.

Laryngeal mask Airway is effective for ventilating term and near term babies.

Intubations for Neonate

Indication for endotracheal intubation includes the following:

- To suction trachea in presence of meconium.
- If bag and mask ventilation is ineffective or prolong.
- When chest compression are performed.
- Endotracheal administration of medication is desired.
- In case of congenital diaphragmatic hernia or extremely low birth weight (< 1000 g).

Correct placement of E.T. tube in the mid trachea is indicated by :

1. Increase in heart rate,
2. Vapor in the tube during exhalation,
3. Chest movement,
4. Auscultation of breath sound over both lung,
5. No gastric distension with ventilation,
6. Exhaled Co2 detection is the recommended method of confirmation.

Chest Compression:

Indication:
If after 15-30 seconds of positive pressure ventilation with 100% Fio2 the heart rate is < 60 per minute between 60-80 and not increasing.

Technique a) 1 finger breadth below nipple line
2. Using 2 fingers.
c) Ventilation ratio is 3:1 or 90 compression to ventilation in 1 minute,
d) Rate 120 per minute.
Other technique :

Thumb technique:
2 thumbs with fingers encycling the chest and supporting back. If the infant's heart beat is below 80 beats /min despite adequate ventilation and chest compression for 30 seconds or if the heart rate is 0 medication is started.

Epinephrine :

1: 10,000
Dose IV : 0.1 to 0.3 mg / kg.
Endotracheal Route : upto 0.1 mg per kg.

Naloxone hydrochloride: *Indication:* Severe Respiratory depression or history of maternal narcotic administration within past 4 hrs.

Route 1/v or 1/m : dose 0.1 mg /kg.

Naloxone has shorter half life than the original maternal opioid, so neonate should monitor the recurrent apnea or hypoventilation. Its administration may result seizures.

Sodium Bicarbonate:

Helps correct metabolic acidosis PH < 7.05, indicated for prolong cardiac arrest that does not respond to other therapy, it is used when adequate ventilation is there; as it is hyper osmotic solution, give slowly in order to minimize risk of intraventicular hemorrhage

Dose : 2 m Eq/kg, concentration 4.2% solution.

Volume Expansion:

Indication : When blood loss is suspected or infant appears in shock (pale skin, poor perfusion, weak pulse, decrease in blood pressure) and not responding adequately to other resuscitative measures. Isotonic crystalloid is better choice dose is 10ml/kg which may need to repeat. In premature infants rapid infusion of large volumes is associated with intraventicular hemorrhage.

Post resuscitation care:

When adequate ventilation and circulation have been established infant should be transferred to an environment where close monitoring and anticipating care can be given.

Evaluate temperature, acid base, blood glucose, x-ray, manage any complication and screen for neonatal encephalopathy.

Severely asphyxiated infants may manifest failure of various organ failures. Thrombocytopenia is common finding.

Glucose:

When hypoxia and acidosis have been relieved continuous infusion of 10% dextrose in water at 3 ml/kg/hr providing 5 mg/kg/per minutes to maintain normal glucose level in blood.

Induced Hypothermia:

- Hypothermia may reduce the extent of brain injury following hypoxia -ischemia.

Guidelines for withholding and Discontinuing Resuscitation

Resuscitation is not indicated in following conditions:

1. Confirmed gestation less than 23 weeks or birth weight less than 400 g.
2. Anencephaly
3. Chromosomal abnormalities such as trisomy 13.

Discontinuing resuscitation efforts:

After 10 minutes of continuous and adequate resuscitative efforts, discontinuation of resuscitation may be justified if there are no signs of life (No heart beat and no respiratory effect).

CHAPTER-4

Fluid and Electrolyte Management

Dr. K.K.Pande, Associate Professor, Section of Sangyaharan, I.M.S., B.H.U., Varanasi.

In utero, nutrients are provided in their basic form. Glucose is the major energy substrate of the fetus. Fetal glucose uptake parallels maternal blood glucose concentration. The liver, heart, and brain receive the greatest cardiac output and, therefore, the greatest amount of glucose. The fetus uses glucose, lactate, and amino acids to store fuels that are used during transition. Neonates must develop a homeostatic balance between energy requirements and the supply of substrate as they move from the constant glucose supply of fetal life to the normal intermittent variations in the availability of glucose and other fuels. With the clamping of the cord, the maternal glucose supply is cut off. A fall in blood glucose during the first 2-6 hours of life occurs in healthy newborns. The blood glucose usually reaches a nadir and stabilizes at 50-60 mg/dL.

The immediate goal of fluid and electrolyte support following resuscitation is to maintain an appropriate intravascular volume and to provide glucose homeostasis and electrolyte balance. The neonatal cardiovascular system is very sensitive to preload, requiring adequate intravascular volume to maintain adequate cardiac output. Therefore, expansion of intravascular volume with appropriate solutions (eg, isotonic sodium chloride solution) often is considered in the neonate with inadequate blood pressure or perfusion.

Additionally, as discussed in previous sections, hypoglycemia may occur rapidly in critically ill or premature infants. Blood glucose determinations should

be performed as soon as possible and a continuous infusion of glucose should be started at 4-6 mg/kg/min for those infants who are not able to tolerate enteral feedings. Dextrose boluses should be limited to symptomatic infants because they may result in transient hyperosmolarity and rebound hypoglycemia.

Electrolytes, such as sodium, potassium, and chloride, should not be added initially because the fluid shifts from other body compartments allow for adequate electrolyte supply until adequate renal function is documented.

The practitioner should monitor the weight, clinical hydration status, urine output, and serum sodium concentrations closely because inappropriate fluid overload or restriction can lead to increased mortality and morbidity.

Taking the infant's environment into account when calculating fluid requirements is very important. Fluid rates may be started at 60-80 mL/kg/d for the infant in a humidified incubator, whereas fluid rates may be much higher for the infant in a dry radiant warmer environment.

CHAPTER-5

COMPLICATION OF C.C.P.R.

Dr. P.K. Bharati, M.O. Anaesthesia, I.M., S.S.H., I.M.S., B.H.U., Varanasi.

In general complication complicates the situation or additional problem that arises during procedure.

Common complication of C.C.P.R.

Broken teeth

Due to faulty technique of Laryngoscopy.- Injury to Larynx.

Gastric distension –If breathing is given too quickly and forcefully will cause air entry of air into the stomach.

Disease transmission-During procedure if protective masks are not used then the chances of infection may arise through the patients.

Most common infection:

Is Influenza; Staphylococcus, Herpes, HIV, Hepatitis etc.

Vomiting-

Causing difficulty with continued mouth breathing and possible aspiration into lungs.

COMPLICATION OF COMPRESSION:

Rib Fracture-Most common.

This is especially common when working with the elderly who are more likely to have brittle bone. It is due to the fact that in order to maintain the pumping action of the heart while administering C.C.P.R, one has to apply quite a lot of pressure or to some one who may already has weakened bones.

Pneumothorax-

This is due to high pressure ventilation during C.P.R. resulting rupture of alveoli or after rib fracture. improper hand position which could have further complication of punctured lung.

Patient with multiple rib fracture may cause FLAIL CHEST.

During CCPR cervical trauma or fracture may happen and adding to injury may actually lead to Paralysis.

Local trauma on the compression site

Cardiac rupture or pericardial haematoma.

CHAPTER-6

ESSENTIAL EQUIPMENTS IN C.C.P.R.

Dr. Sanjeev Sharma, Reader, Post Graduate Institute of Ayurved, Jammu.

Basic life Support initially need not many types of equipment but if these are

in hand will make the procedure easy and safe.

In hospital/ nursing home set up warmed blankets, source of oxygen,

instruments for visualizing and establishing an airway, a source of regulated

suction, instruments and supplies for establishing intravenous access, trays

equipped for emergency procedures, and drugs that may be useful in

resuscitation should be always available..

The minimum equipment necessary includes the following:

- **For Respiration**
  - Oxygen supply
  - Masks
  - Neonatal bag and tubing to connect to an oxygen source
  - Manometer
  - Pharyngeal airways-0-4
  - Endotracheal tubes (0-10)
  - Tape and scissors
  - Laryngoscope (0 -4 sized blades)
  - Extra bulbs and batteries
  - CO_2 detectors
  - Stylettes for endotracheal tubes (optional)
  - Laryngeal mask Airway (optional)

- **For Suction**
  - Regulated mechanical suction
  - Suction catheters
  - Suction tubing
  - Suction canister
  - Feeding tube /Ryle`s Tube
  - Syringes

- **I.V. Fluids**
  - Intravenous catheters (18-24 g)
  - Tape and sterile dressing material
  - Dextrose 10% in water (D10W)
  - Isotonic saline solution

For Monitoring:

- Stethoscope
- Manometer-Blood Pressure Instrument
- E.C.G.
- Pulse Oxymeter

For Defibrillation

Cardiac Difibrillator

CHAPTER-7

ESSENTIAL DRUGS IN C.C.P.R.

Dr. Hari Om Singh, Treasurer, Workshop On C.C.P.R., A.A.I.M., Varanasi

Despite widespread and long-standing use, no drug has definitively been shown to increase survival of patients with cardiac arrest. Some drugs can improve the return of spontaneous circulation and thus may reasonably be given.

First-line drugs:

Epinephrine -ADRENALIN is the main drug used in cardiac arrest although its benefit is increasingly challenged. It is given q 3 to 5 min.has combined α- and β-adrenergic effects. The α-adrenergic effects may augment coronary diastolic pressure, thereby increasing sub endocardial perfusion during chest compressions.

Epinephrine also increases the likelihood of successful defibrillation. However, β-adrenergic effects may be detrimental because they increase O_2 requirements (especially of the heart) and cause vasodilatation.

Intracardiac injection of epinephrine –ADRENALIN is not recommended because pneumothorax, coronary artery laceration, and cardiac tamponade may occur.

A single dose of vasopressin -40 units is an alternative to epinephrine-ADRENALIN. (adults only). It is not proven superior to epinephrine -ADRENALIN

Atropine sulfate

Atropine sulfate is a parasympatholytic drug that increases heart rate and conduction through the atrioventricular node. It is given for asystole (except in children), bradyarrhythmias, and high-degree atrioventricular nodal block, although no survival benefit has been demonstrated.

Amiodarone -CORDARONE
can be given once if defibrillation is unsuccessful following epinephrine-
ADRENALIN.

vasopressin -PITRESSIN

. It is also of potential value if VT or VF recurs following successful defibrillation; a lower dose is given over 10 min followed by a continuous infusion.

Other drugs*:*

Ca chloride is recommended for patients with hyperkalemia, hypermagnesemia, hypocalcemia, or Ca channel blocker toxicity. In others, because intracellular Ca is already higher than normal, additional Ca is likely to be detrimental. Because cardiac arrest in patients on renal dialysis is often a result of or accompanied by hyperkalemia, these patients may benefit from a trial of Ca if bedside K determination is unavailable. Caution is necessary because Ca exacerbates digitalis toxicity and can of itself cause cardiac arrest.

Mg sulfate has not been shown to improve outcome in randomized clinical studies. However, it may be helpful in known or suspected Mg deficiency (i.e., alcoholics, protracted diarrhea).

Procainamide -is a 2nd-line drug for treatment of refractory VF or VT. However, procainamide is not recommended in pulse less arrest in pediatric patients.

Phenytoin -DILANTIN
may rarely be used to treat VF or VT, but only when it is due to digitalis toxicity and is refractory to other drugs. Dose is 50 mg/min given until rhythm improves or total dose reaches 18 mg/kg.

$NaHCO_3$ is no longer recommended unless cardiac arrest is caused by hyperkalemia, hypermagnesemia, or tricyclic antidepressant overdose with complex ventricular arrhythmias. In pediatric patients, $NaHCO_3$ should be considered when cardiac arrest is prolonged (> 10 min); it is administered only if there is good ventilation. When $NaHCO_3$ is used, arterial pH should be monitored before infusion and after each 50-mEq dose (1 to 2 mEq/kg in children).

Lidocaine -XYLOCAINEand bretylium are no longer used during CCPR.

Dysrhythmia Treatment

VF/pulse less VT is treated with one DC shock, preferably with biphasic waveform; chest compression is interrupted as little as possible. Recommended energy levels vary: 120 to 200 joules for biphasic waveform and 360 joules for monophasic.

If this is unsuccessful, epinephrine -ADRENALIN 1 mg IV is administered and repeated q 3 to 5 min. Alternatively, vasopressin -PITRESSIN 40 U IV can be given only once (not in pediatric patients).

Cardio version at the same energy level is attempted 1 min after each drug administration (the role of escalating biphasic energy levels is unclear).

If VF persists, amiodarone -CORDARONE 300 mg IV is given.

Then, if VF/VT recurs, 150 mg is given followed by infusion of 1 mg/min q 6 h, then 0.5 mg/min.

CHAPTER-8

GASTRIC ASPIRATION

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Aspiration is the entry of secretions or foreign material into the trachea and lungs.

The patient may either inhale the material, or it may be blown into the lungs during positive pressure ventilation or CCPR. As the right main bronchus is more vertical and of slightly wider lumen than the left, aspirated material is more likely to end up in this branch or one of its subsequent bifurcations.

Risk factors

As a rule of thumb, any condition which compromises a patient's level of consciousness is a risk factor for pulmonary aspiration.

Causes of unconsciousness where aspiration may occur include trauma (especially head injuries), poisoning (including drug/alcohol overdose), general anaesthetics, and diseases or metabolic conditions.

Gastroesophageal reflux, a full stomach, pregnancy, and obesity all increase the risk of aspiration in the semiconscious.

Normally fasting for six hours before elective surgery is enough to empty the stomach. Severe injuries can slow the movement of digesta from the stomach and through the duodenum.

Acute alcohol poisoning is a relatively common cause of severe pulmonary aspiration as the alcohol renders the victim unconscious and can induce vomiting. Patients

with neurological conditions may also aspirate food or drink.

During labour (childbirth), early respiratory movements by the baby facilitate filling of alveolar ducts and alveolar lumens with elements of amniotic fluid: amniotic cells, squamous and squamous cells from fetal skin, lanugo, meconium. Reduced inflammatory infiltrate (neutrophils) and capillary congestion is present.

Consequences

If enough material enters the lungs, the patient may simply drown. However, small volumes of gastric acid contents can fatally damage the delicate lung tissue. Even small volumes of aspirated food may lead to bronchopneumonia infection. Chronic aspiration may lead to bronchiectasis and may cause some cases of asthma.

Prevention

The lungs are normally protected against aspiration by a series of *protective reflexes* such as coughing and swallowing. Significant aspiration can only occur if the protective reflexes are absent (in neurological disease, coma, drug overdose, sedation or general anesthesia).

In intensive care, sitting patients up reduces the risk of pulmonary aspiration and ventilator associated pneumonia.

Measures to prevent aspiration depend on the situation and the patient. In patients at imminent risk of aspiration, endotracheal intubations by a trained health professional provides the best protection.

A simpler intervention that can be implemented is to lay the patient on their side in the *rescue position* (as taught in first aid and C.C.PPR. classes), so that any vomitus produced by the patient will drain out their mouth instead of back down their pharynx. Some anesthetists will use sodium citrate (to neutralize the stomach's low pH) and Metoclopramide (a pro-kinetic, to empty the stomach).

CHAPTER-9

COMMON MISTAKES IN C.C.P.R.

Dr. Dipak Poman, J.R.3, Sangyaharan Section, I.M.S., B.H.U, Varanasi.

C.C.P.R. is a Combination of rescue breathing and chest compressions which revive brain (cerebro), heart (cardio) and lung (pulmonary) functioning.

To Remember:

- ✓ Use when there is no breathing and no pulse
- ✓ Provides O2 to the brain until ACLS arrives
- ✓ Start CCPR immediately because Brain damage starts in 4-6 minutes
- ✓ Brain damage is certain after 10 minutes without CCPR

- ✓ Effective CPR provides 1/4 to 1/3 normal blood flows.
- ✓ Rescue breaths contain 16% oxygen.

Survey the Scene

The worst thing a rescuer can do is become another victim. First and foremost, you must evaluate the scene of the act if it's secured for you to give a hand. Don't allow yourself to be the succeeding victim. When it's clear, then you can start rescuing.

R - Responsiveness - Tap shoulder and shout "Are you ok?"

You can do by tapping his cheeks, rocking his shoulders or rubbing your knuckles on the chest.

A - Activate E .M. S. - Call emergency medical services.

P - Position - All body parts rolled over at the same time.

Victim must be on a hard surface

Place victim level or head slightly lower than body

Always be aware of head and spinal cord injuries.

Support neck and spinal column.

Do Not Move the Victim Until C.P.R. is given and Qualified Help Arrives

Main stages of resuscitation

A – Airway

- ✓ Open the airway using a head tilt, lifting of chin.

B – Check for Breathing

- ✓ Look, listen and feel for breathing- No longer than 10 seconds.
- ✓ If the victim is not breathing, give two breaths (1 second or longer)

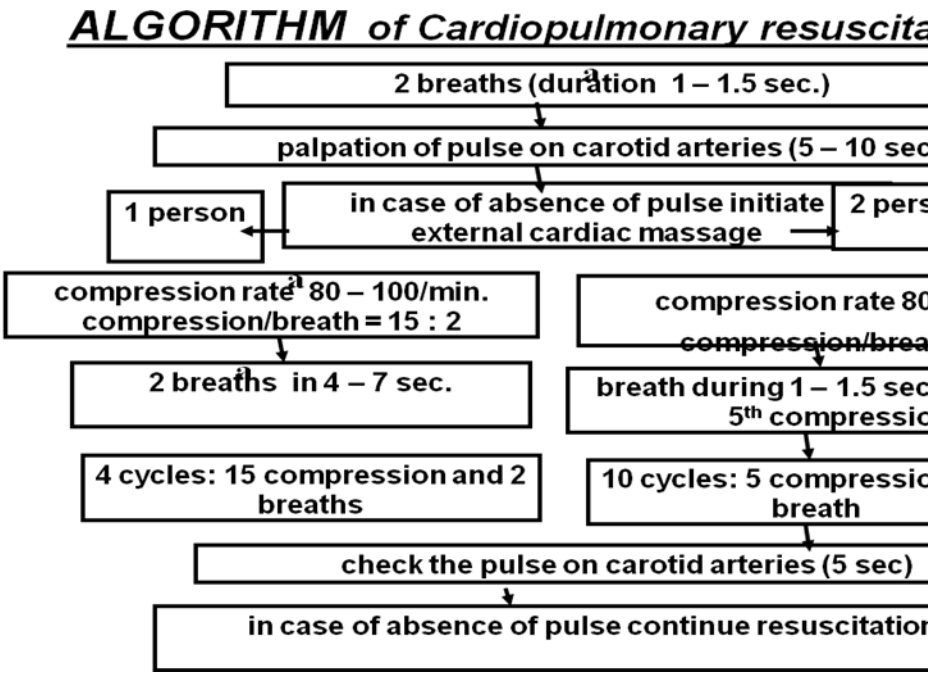
- ✓ If the first two don't go in, re-tilt and give two more breaths (if breaths still do not go in, suspect choking)

C- Check for circulation

- ✓ Check for Carotid pulse.
- ✓ After giving breath, locate proper hand position for chest compressions
- ✓ Place heel of one hand on center of chest between the nipples **OR** using both hands, give 30 chest compressions, Count 1, 2, 3 … .
- ✓ Have a second rescuer check pulse while you give compressions
- ✓ After 30 chest compressions give 2 slow breaths (30:2)
- ✓ Continue until help arrives or victim recovers
- ✓ If the victim starts moving: check breathing

D-Differentiation, Drugs, Defibrilation)

Quickly perform differential diagnosis of cardiac arrest, use different medication and electric defibrillation in case of ventricular fibrillation



When Can I Stop CPR?

Victim revives
Trained help arrives
Too exhausted to continue
Unsafe scene
Cardiac arrest of longer than 30 minutes (controversial)

<u>Common Mistakes</u>
Before starting CCPR:

- Trying to memorize steps without understanding *why* you are doing what you are doing.
- Forgetting to check the scene for safety e.g.Victim- Known positive hepatitis B or C, HIV or AIDS.
- Not using a combination of tapping and shouting.
- Getting so busy with the physical steps that you forget to have someone call E M S.
- Not supporting the victim's head *and* neck while rolling the victim.
- Not rolling the victim as a single unit

Main stages:
General:

- Skipping or combining parts because you think it will save time.
- Describing to the instructor what you should be doing instead of doing it
- Checking for breathing or pulse for too short a time
- Forgetting to use protective equipment (breathing barrier / pocket mask and gloves)
- Not looking for movement and rechecking for breathing and a pulse after about two minutes of rescue breathing
- Stepping over the victim if you need to move around

A-Airway

- Not looking in the victim's mouth for a foreign object, vomit.
- Not looking tongue - Most common obstruction in the unconscious victim.

- Not tilting the head back far enough on an adult to open the airway OR tilting it too far on an infant or child.
- Not putting the airway (lung bag) into the manikin properly and engaging it with the knob at the back of the manikin face
- Forgetting to lift the chin and Closing the mouth when lifting the chin
- To open the airway, putting your hand under the neck
- Incorrect placement of the fingers when lifting the chin, such as putting the fingers on the soft tissues under the jaw instead of under the bony area at the centre of the lower jaw

B- Breathing

- Not placing the ear closes enough to the mouth and nose of the victim to check for breathing.
- Not pinching the nose while mouth to mouth breathing.
- Forget to give two initial breaths and to observe response (1 second or longer)
- Not keeping the airway open when/if an unconscious victim starts breathing again
- Not looking at the chest (clearly rise and fall) when checking for breathing. If your first two rescue breaths do not make the chest clearly rise," unconscious choking may be the cause.
- Not checking long enough for breathing.
- Giving breaths too quickly or forcefully
- Breathing too fast or too hard
- Not taking a breath before giving each breath.

- If you are using the mask- Not firmly pressing down on a pocket mask or breathing barrier to ensure a tight seal.
- Breathing too much on an infant/child
- Not considering mouth to nose breathing when massive mouth trauma, stomach distension.

C-Circulation

- You are taught to do this skill differently than the public, they will not check for a pulse.
- When checking for a pulse, not checking for pulse at the groove at the side of the neck on an adult.
- Using your thumb to check for pulse instead of your fingers
- Waiting for a long period to check pulsation.
- Forgetting to check brachial pulse on an infant and checking their carotid pulse at the neck instead
- Kneeling in the wrong position or place beside the victim
- Not properly locating hand position for compressions in the center of the chest. Compressions done out on the ribs or too high or low on the chest will not be effective.
- If you could see through to the rib cage, this is what it would look like where you correctly place your hand on the sternum, but not as low as the xyphoid.
- Placing the palm rather than the heel of the hand on the chest when giving compressions.
- Not pressing straight down on the chest
- Not locating your shoulders right over your hands; it is wrong to have your arms at an angle.

- Pressing with bent elbows instead of straight arms and locked elbows.
- Not giving compressions deep enough - about 1.5 to 2 inches for an adult, about 1 to 1.5 inches for a child, 0.5 to 1 inch for an infant
- Jabbing the compressions, that is pushing down faster than you let up. Compressions should be rhythmic, you should spend the same amount of time compressing as you spend releasing.
- Letting your hands lift off the victim, even slightly, between compressions.
- Failing to keep your fingers off the chest
- Trying to use muscular strength to do compressions instead of your body weight
- Not letting the chest fully recoil to its normal position after each compression.
- Compressions too fast or slow - at a rate of 100 compressions per minute, 30 compressions should take about 18 seconds.
- Not stopping CPR if you notice an obvious sign of life.

D-Drugs, Defibrillation

- Failing to glove up and as a result, getting a dose of Nitroglycerin when you take off a suspected Nitrogylcerin patch and getting a big headache as a result
- Failing to take off a suspected Nitrogylcerin patch and having the plastic in the patch explode
- Wasting time trying to decide if a patch you see is Nitrogylcerin or nicotine
- Getting gloves stuck on the pads (the real pads are much stickier than the practice pads)

- Being in such a hurry you fail to wipe the chest dry
- Wasting time trying to shave the chest of a victim with a lot of chest hair until you have tried using the pads first.
- Incorrect placement of the pads
- Using an adult pad on a child or child on an adult.
- If the pads are touching each other on a child, failing to place one pad on the front and one on the back
- Plugging in the electrode cable at the wrong time
- Not being certain there is no one using a cell phone or radio within 6 feet.
- Not staying clear, or telling others to stay clear, when pushing the shock button or during shocking
- Checking to be certain others are staying clear, but forgetting to look at you.
- Wasting time checking for a pulse after a shock has been given. Start CPR again right away.

Common mistakes in two-rescuer CPR

- Any of the CPR mistakes above
- Failing to communicate with each other
- Failing to call for a change at the right time, after about 2 minutes of compressions and breaths
- Stepping over the victim the change roles
- Wasting time trying to check for a pulse before continuing CPR after a position change. Changing positions should take LESS than 5 seconds
- Being so busy with the steps that you fail to be sure that there are no flammable materials in the

area, or fail to move a victim from puddles of water.

Why CPR May Fail

- Delay in starting
- Improper procedures or Improper techniques
- No ACLS follow-up and delay in defibrillation- Only 15% who receive CPR live to go home.
- Terminal disease or unmanageable disease (massive heart attack).

CHAPTER-10

Blood and Blood Transfusion

Dr. R.K.Jaiswal, M.O. Anaesthesia-I.M., S.S.H., I.M.S., B.H.U., Varanasi.

Blood Transfusion (BT) is the process of transferring blood or blood products from one person to the circulatory system of another person. The whole blood was used in past but now in modern medical practice components of the blood are commonly used.

Aim of Blood Transfusion

The following 3 are the main aims of blood transfusion –

1. To increase oxygen caring capacity
2. To counteract bleeding & coagulation disorder
3. To increase intra vascular volume

Indications of Blood Transfusion

The following conditions are the main indication of blood transfusion –

1. Patients sufferings form the major hemorrhagic shock
2. Major operation where expectation of loss of more than 1 liter of blood
3. Different bleeding disorder e.g. Hemophilia A, B & thrombocytopenia
4. In case of severe anemia
5. In case of ante infection like septicemia gas gangrene etc.
6. In case of burn
7. In some diseases for temporary benefit, like in leukemia, Hodgkin's disease or in case of chemotherapy, blood transfusion may be beneficial.

8. In case of blood loss >20% in adult & >10% loss of blood volume in children's need blood transfusion.

Who con Donate the Blood?

Every person who fulfills the following criteria can donate the blood. The criteria are –

Age: The age of donor should be between 18 to 60 years.

Hemoglobin (Hb): The level of Hb in male should be 13.0 gm/dl or more.

Blood Pressure (BP): The range is very wide -from 100/50 mm Kg to 180/100 mm Hg.

The donors should not suffer from any serious disease like hepatitis, A/D etc.

Blood grouping Method & Procedure:

There are three methods for knowing the blood group.

1. Glass slide or white porcelain tile
2. Glass test tube
3. Micro well plate or micro plate

Newer techniques:

The following two are the latest techniques for knowing the blood group –

1. Column technique (Sephadexgel)
2. Solid phase test

In above all the method, the glass slide method is most popular which in done as follows –

Glass Slide or Tile Method:

It is usually done in out door camp which is as follow –

Procedure:

1. Place 1 drop or anti A and 1 drop of anti **B** reagent separately on a labeled slide or tile.
2. Add 1 drop of 20% test red cell suspension to each drop of the typing antiserum the suspension may be prepared by adding 20 parts of red cells to 80 parts of normal saline.
3. Mix the cells & reagent using a clean stick. Spread each mixture evenly on the slide over an area of 10-15 mm diameter.

4. Tilt the slide and leave the test for 2 minutes at room temperature (22-24^{0C}) then sock again & look for agglutination
5. Record the result.

Interpretation:

Anti – A	Anti – B	Result (Group)
+	-	A
-	+	B
-	-	O
+	+	AB

Rhesus factor or Rh factor:

In 80% peoples, apart from A & B agglutinogen another thing is found which is called as Rh-factor. This is also an Antigen. The person contain these factor are known as Rh^{+ve} & other are called as Rh^{-ve}.

Storage of Blood:

The blood should be kept at nearly 4^{0C} in the refrigerator. In should never be kept in freezer. The blood an be store up to 35 days in CPDA solution. Some

other solutions are also used for storage of blood like ADSOL, NUTRICE etc. In India normally CPDA solutions are used. The content & utility of CPDA solution are as follows

CP= Citrate phosphate - Act as Anticoagulant
D= Dextrose – Act as energy source for red cells
A= Adenine – Act as to increase the life span of RBC

Precaution for blood transfusion:

1. Before transfusing the blood the group of donor as well as receiver (patients) should transfusion the blood.

2. Cross matching must be done before transfusion is blood.

3. The temperature of blood should maintain up to the temperature of patient (usually 37^{0c}) before transfusing the blood because in case of very cold blood transfusion, the can face the shocking condition.

4. During blood transfusion always use micro filter.

5. During blood transfusion 5% Dextrose should not used due to Roeslex for motion.

6. Fresh blood should be used 7 component should be used.

Sign of Incompatible Blood Transfusion:

The following signs are found during hemolytic transfusion reaction –
Urticaria, Purities, Bronchospasm, Dysnoea, Tachycardia, Restlessness, Nausea & Vomiting, Rigar or Pyrexia, Cireculatory collapse.

Management of Incompatible B.T.:

The following steps are taken for the management of incompatible blood transfusion –

1. Stop blood transfusion immediately.
2. Support blood pressure with I.V. colloids or crystalloids & vasoconstrictor if needed.
3. Give 100% O_2 (Oxygen).
4. Antihistamine should be given.
5. High doses of steroids are used.
6. Forced dieresis should be done by manitoll & frucemide.

Delayed Reaction of Blood:

Transfusion:

The following complication may occur often 4 to 10 days of blood transfusion.

1. Anemia
2. Fever
3. Jaundice
4. Renal failure

Complications of Blood Transfusion:

The following complication may occur with blood transfusion-

1. Hyponatremia
2. Hyper Kalmia
3. Hypocalcaemia
4. Metabolic Acidosis
5. The following infections complication may occur as follows-

i) Hepatitis C

ii) Bacterial infection

iii) Parasitic infection

iv) Viral infection

6. Micro embolism

7. Hypothermic shock
8. Over loading circulation e.g. in anemic patents pulmonary edema & in cardiac patients CHF may occur

Autologus Blood Transfusion:

It is the pre operative blood donation of he patient for himself use. The following criteria are follows for the autologus blood transfusion.

a) No age limit
b) Hemoglobin (Hb) should be more than 11 gm / dl
c) One unit may be given once or tierce in a week.
d) Last unit of donation should be before 72 hrs. of operation
e) 4-6 units can be donated.
f) In cardiac patients donation should be with great care.

Component therapy:

There are so many problems with whole blood like electrolyte & pH changes, if it is not used within 35 days, it will waste, so use of component of blood like

fresh frozen plasma, cryoprecipitate, platelets, RBC are new trend.

Advantage of blood component use:

1. It is cost effective
2. It decreases transfusion related complication
3. Safety margin increases
4. Improves better quality management with appropriate component replacement therapy.
5. It can be stored for a longer duration.