

NEONATAL RESUSCITATION: THE GOLDEN MINUTES OF LIFE

A Guide to resuscitation of Newborn Infants

*Adapted from Neonatal Resuscitation Program
American Academy of Pediatrics*

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Preface

This handout is presented to the providers involved in taking care of newborn babies. This write-up is no way a replacement to any textbook. This work is an excerpt from the 7th edition of Text book of Neonatal Resuscitation®. The main idea is to summarize the concepts of newborn resuscitation and make it presentable to clinicians in net shell. However, it is strongly recommended that readers should refer to the main textbook for complete reference.

There are no financial benefits aimed from this handout. It is distributed free of cost and no charges should be claimed in distributing it further.

I would like to extend my thanks to Yahya AbdulGhaffar to his assistance in manuscript typesetting and proof reading.

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Learning Format (4 step approach)*

At Home: (THEORY session)

Step 1:

Read this hand-out and refer to the NRP Text book if available

Step 2:

Answer all questions at the end of the book (passing score is 80% , 12 out of 15)

In Hospital: (DEMO session)

Step 3:

See and practice the demonstration of the following with your instructor at your hospital:

- A) Positive pressure ventilation (PPV) and Oximetry (with the available equipments)
- B) Chest Compression and co-ordination with PPV (on the manikin)
- C) Endotracheal Intubation (on the head model of manikin)

Step 4:

Demonstrate the successful completion of step 3 (Skill stations/Integrated sessions)

*for resource limited settings, skip this page if you are taking the course in USA

Topics

1. About resuscitation - Why learn newborn resuscitation
2. Preparing for resuscitation
3. Initial steps of resuscitation
4. Oximetry & using supplemental oxygen
5. Positive Pressure Ventilation (PPV)
6. Chest Compression
7. Intubation
8. Medication / Vascular access
9. Post-resuscitation care
10. Beyond initial steps (special consideration)
11. Preterm infants (special needs)
12. Ethics

1) About resuscitation - Why learn newborn resuscitation

Birth asphyxia is associated with both increase mortality and morbidity. By learning the basic skills of neonatal resuscitation one can make a difference in changing this statistics. Key points:

- About 4% to 10% of newborns will receive positive-pressure ventilation
- While 1 to 3 per 1,000 will receive chest compression or medications

2) Preparing for resuscitation

Adopt a team approach. Identify risk factors (prematurity, preeclampsia, abruption, twins, macrosomia, breech, etc.)

4 questions to be asked:

1. Gestational age
2. Amniotic Fluid
3. How many babies expected
4. Any other risk factors

Equipment check:

Warmer, Towels, Hat, Suction, Stethoscope, PPV apparatus, Endotracheal tube, Medications, Catheters, Oxygen supply & Saturation monitor.

3) Initial steps of resuscitation

It is very important to prepare for the anticipated delivery (know the case). Gather maternal information (risk factors), check equipment (warmer, bag & mask, medication) and arrange for a team (for high risk delivery at least 3 members should be available).

Soon after delivery, ask these questions:

Initial questions: (3 Ts, term, tone, tantrum)

Is the baby TERM?

Does the baby has good TONE

Is the baby BREATHING or CRYING

Initial steps: (PPCDS)

Provide warmth (for preterm use warm mattress)

Position head and neck (sniffing position)

Clear airway (mouth then nose, M comes before N)

Dry thoroughly (< 32 week, no need to dry)

Stimulate (gentle)

If answers are yes to initial questions (Term, Tone good, Breathing) baby should stay with mom and initial steps be performed at mom's chest.

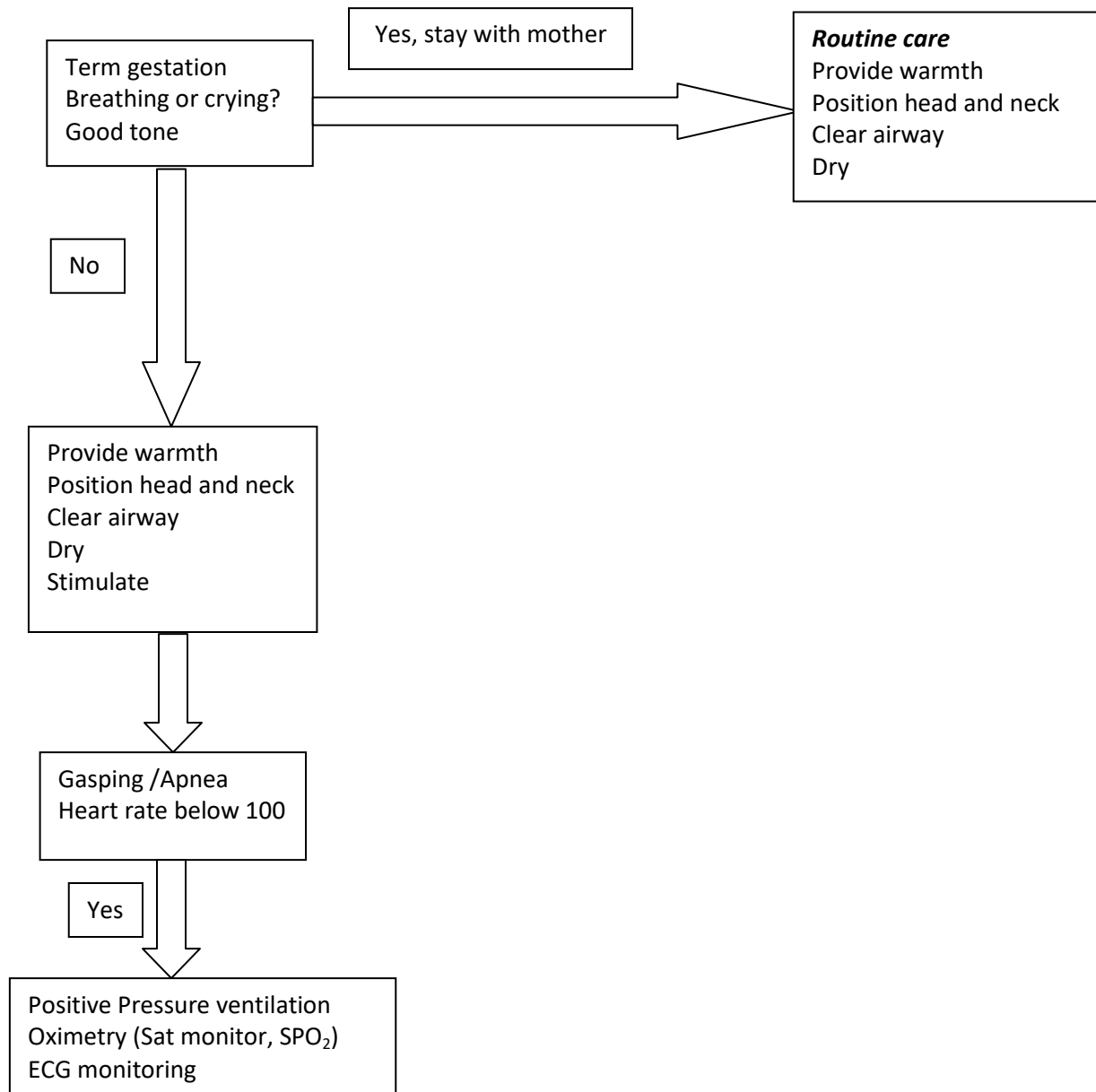
If answers are no, then start initial steps (PPCDS) at the warmer bed.

Then EVALUATE:

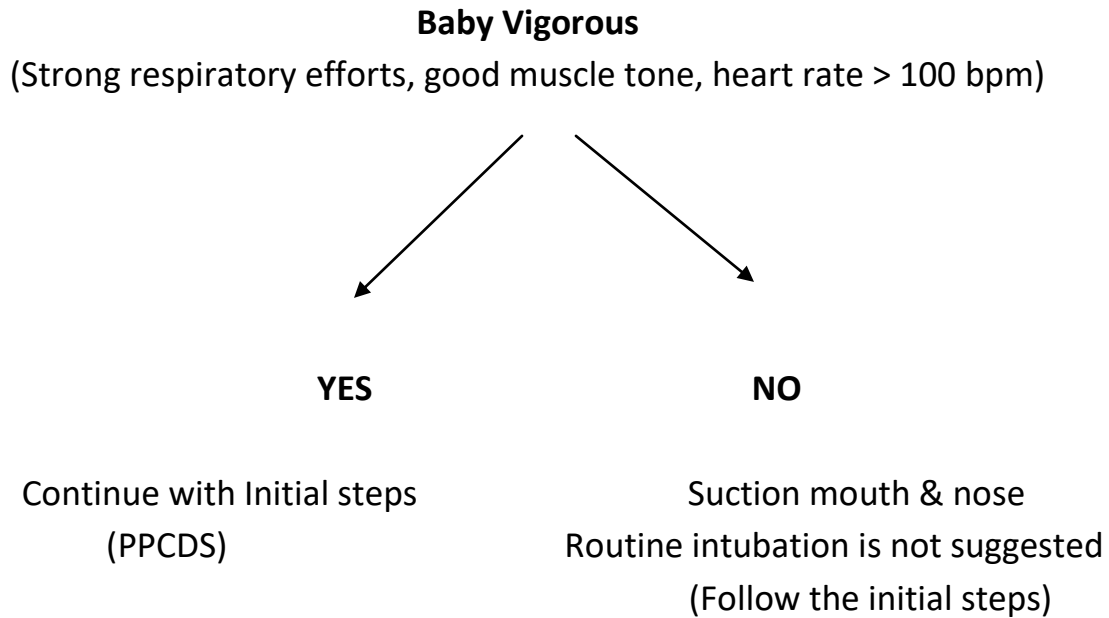
Respiration: gasping, apnea – start PPV (see flow diagram)

Heart rate: below 100 – start PPV (see flow diagram)

FLOW DIAGRAM



Initial steps in newborn born with history of Meconium stained amniotic fluid



Warmth:

- Skin to skin with mom
- Cover with towel or blanket
- Place under the Radiant warmer

Clear airway:

- Bulb suction
- Catheter (French 6-10) using suction pressure of 80-100 mm of Hg
- Suction mouth **before** nose (M before N)

Dry:

- Prevent heat loss (use towel or blankets)
- Remove wet blankets

4) Oximetry & Using Supplemental Oxygen

For equipment and principles of use, please refer to your hospital device. This topic will be addressed in detail in the DEMO session. Points to remember about Oxygen are:

- Use blenders (air + oxygen), flow 10 LPM
- DO NOT give supplemental O₂ based on color of the baby (color is very subjective)
- DO NOT give O₂ to achieve higher SPO₂ readings (> 95%) in first few minutes of life.
- Oxygen can be given as free flow by oxygen mask, tubing with cup hand, flow-inflating bag or T-piece resuscitator
- Self- inflating bags **CANNOT** be used to give supplemental oxygen or CPAP
- Use O₂ based on guidelines (Table 1)
- Adequate ventilation should be established ***before*** using supplemental O₂.
- Start with 21% O₂ (> 35 wks) and 21-30% (< 35 wks), set flow at 10 L/min, then adjust it based on guidelines (Table 1)
- Stop O₂ when target sats reached 85%

Table 1

Target pre-ductal SPO₂ after birth (pulse Oximetry chart) in first 10-minutes

Table 1 emphasizes on the fact that it takes 10 minutes to newborn to have saturations above 85%.

(Tip: In first five minutes, for every 1 min sats go up by 5%, 1-60, 2-65, 3-70, 4-75, 5-80)

Time	SPO₂
1 min	60-65%
2 min	65-70%
3 min	70-75%
4 min	75-80%
5 min	80-85%
10 min	85-95%

5) Positive-Pressure Ventilation

For the equipment and principles of use, please refer to your hospital device (self-inflating bag, flow-inflating bag or T-piece resuscitator). This topic will be addressed in detail in the DEMO session.

Positive Pressure ventilation (PPV) or Bag & Mask ventilation is used when:

- Infant is in secondary apnea
- Initial steps fail in establishing adequate respiration
- When heart rate is below 100 bpm

{PPV rate should be 40-60 breath/min and pressure (PIP) should be 20-25 cmH₂O}

PPV when used adequately should result in improvement indicated by:

- Rising heart rate
- Increasing SPO₂ (oxygen saturations)

When PPV does not result in improvement do for the following: (MR SOPA)

M = Mask adjustment

R = Reposition

S = Suction airway

O = Open mouth

P = Pressure Increase

A = Airway alternative

When PPV is taking long:

- Consider intubation
- Insert orogastric tube to decompress stomach

6) Chest Compression

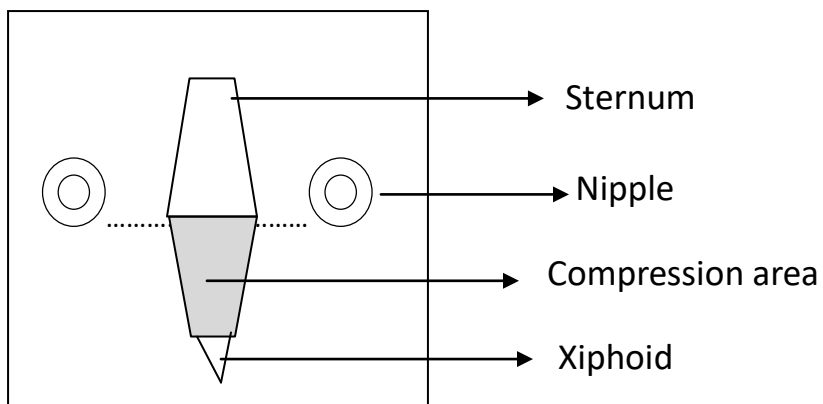
This topic will be addressed in detail in the DEMO session. The basic questions are: when to start chest compression, why, what and how.

WHEN: for heart rate below 60 bpm

WHY: to mechanically pump the blood flowing through the heart

WHAT: compress heart against the spine, increase thoracic pressure

HOW: compressing the $\frac{1}{3}^{\text{rd}}$ of the AP diameter of the chest with Two-thumbs (*preferred method*) OR Two-fingers pressing at an area above the xiphoid and a line joining the Nipples (see drawing below)

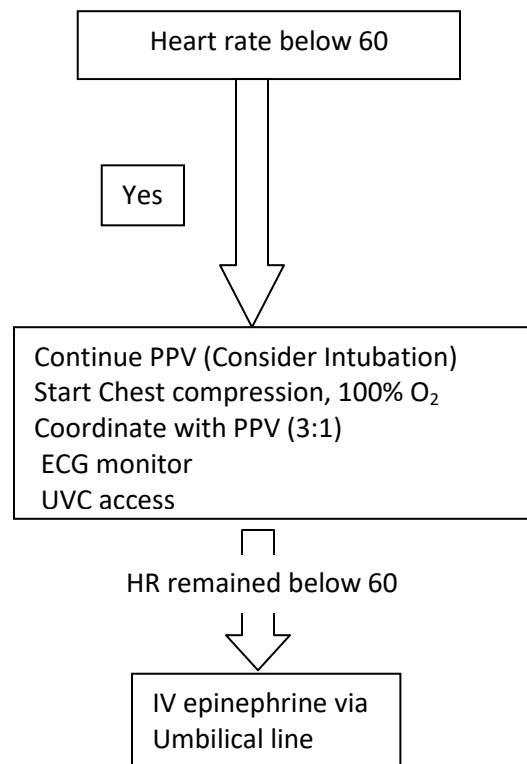


Pearls of Chest Compression:

- Co-ordinate chest compression with PPV
- Ratio is 3:1 (one-and-two-and-three and bag) i.e. 90 compression and 30 breaths in one minute
- Increase O₂ to 100% during chest compression
- Wait 60 seconds then evaluate (see the flow diagram below)

Key points:

- When heart rate is above 60 bpm, stop compression BUT continue PPV
- When heart rate is below 60 bpm, give IV epinephrine (place umbilical venous catheter & consider intubation if not done already)



7) Intubation

For equipment and techniques of Endotracheal (ET) intubation and use of Laryngeal Mask Airway (LMA) –if available, please refer to your hospital policies and manual. ET size and depth of insertion is based on expected weight and gestational age. Intubation should be completed in 30 secs. This topic will be addressed in detail in DEMO session.

8) Medication

Epinephrine:

Strength: 1: 10,000

Dose: Intravenous: 0.1-0.3 ml/kg (use 1 ml syringe) – *preferred route*

Endotracheal: 0.5-1ml/kg (use 5 ml syringe)

Give as rapid push followed by 1-2 ml of normal saline flush

Volume: Normal saline or Ringer's lactate

10ml/kg, give over 5-10 minutes

Venous access – Umbilical venous catheter Insertion:

For equipment and insertion technique, please refer to your hospital policies and manual. This topic will be addressed again in the DEMO session.

9) Post-resuscitation care

Monitor respiratory efforts, oxygenation, BP, temperature and glucose.

10) Beyond initial steps (special consideration)

As stated earlier, most of the babies respond to initial steps of resuscitation. If not then consider the following:

- Hypovolemia (give volume expanders)
- Pneumothorax (aspirate with needle)
- Airway disorders [(Choanal atresia, Robin syndrome) – use LMA]
- Diaphragmatic hernia (Intubate and place OG tube)
- Pneumonia, pleural effusion, pneumonia, pulmonary hypoplasia

11) Preterm Infants (special needs)

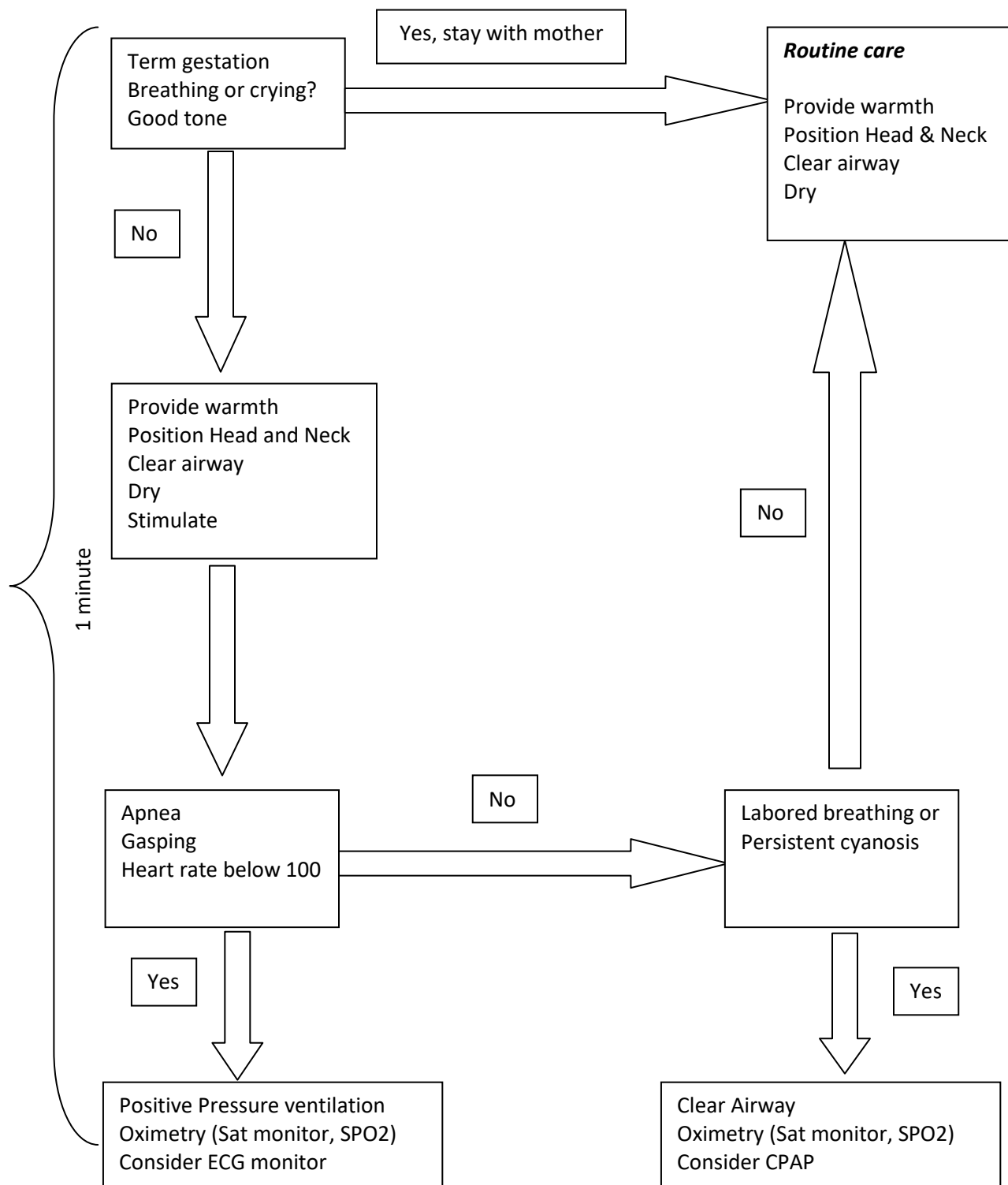
General resuscitation principles are not much different from the term infants. But following points should be considered:

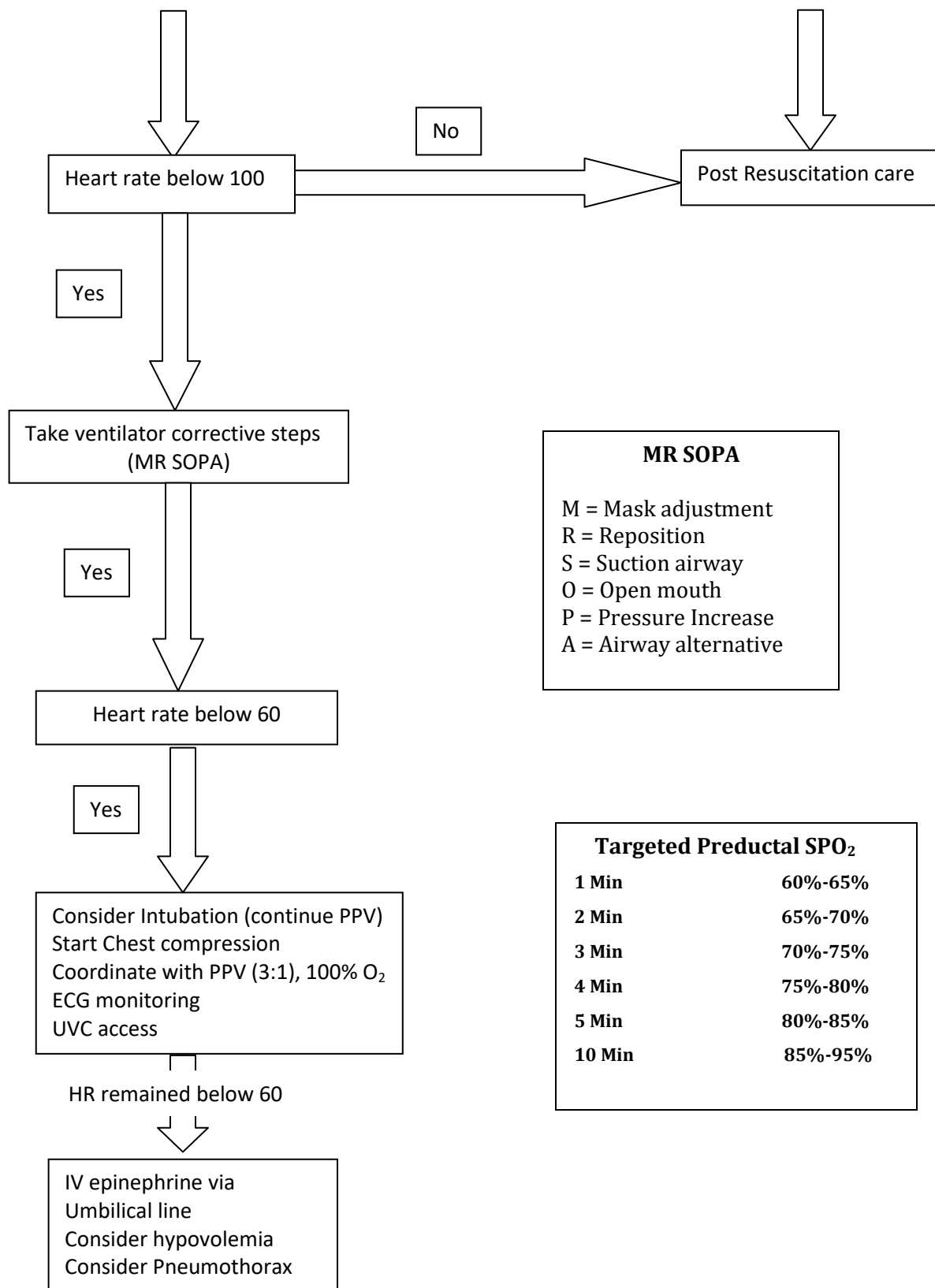
- Ask for additional trained personnel
- Use Plastic bags and heated mattress to prevent hypothermia
- Handle gently, no rapid pushes of IVFs
- PPV inflation pressure should start with the lowest
- Use appropriate size mask, catheters and tubes

12) Ethics

- Know your regional statistics (mortality & morbidity) - that will guide to counsel parents about babies born at the limit of viability
- Know the religious and cultural background of the community
- Be supportive to the families and consider their wishes

FLOW DIAGRAM





QUESTIONS

1. About _____ per 1,000 newborn will need cardiac compression or medication.
2. One minute Apgar score usually determines the need for resuscitation (True/False)
3. It is NOT suggested to intubate non-vigorous babies born with meconium stain amniotic fluid (True/False)
4. The four questions before delivery are _____.
5. The three questions soon after birth are _____.
6. After 30 seconds of birth, if the baby is not breathing one should intubate (True/False)
7. After 5 minutes of birth an uncomplicated infants born at term has Apgar score of 9/9. His oxygen saturation would be 80-85% (True/False)
8. Flow-inflating bags could be used to give free flow oxygen (True/False)
9. The chest is not rising with positive pressure ventilation (PPV) one should do all EXCEPT
 - A- Adjust Mask
 - B- Reposition the head
 - C- Suction the airway
 - D- Check Oxygen source
10. When PPV is provided for long period, oral airway should be inserted (True/ False)
11. Chest compression in newborns should be started for heart rate below 80 beats/min. (True/False)
12. Endotracheal epinephrine dose is higher than intravenous epinephrine dose (True/ False).
13. During chest compression the depth should be 1/3rd of the anterior-posterior diameter of the chest (True/False)
14. The correct ratio of Chest compression to PPV is 1:3. (True/False)
15. A baby born at 23 weeks gestation is not viable and should NOT be resuscitated (True/ False)

ANSWERS

1. 1-3 per 1,000 will need chest compression or medications
2. False (Don't need to wait for 1 minute- vital 60 seconds are wasted)
3. True (intubation is not suggested, suction and airway and provide routine care)
4. Gestational age, Amniotic fluid, How many babies, any risk factors
5. Term, Tone, Crying / breathing
6. False (Provide PPV before intubation)
7. True (sats 80-85% by 5 minutes of life, see Table 1)
8. True (Can't use self inflating bag to give free flow Oxygen)
9. D (oxygen source is not a factor in good chest rise, all others are. In MR SOPA, O is open mouth not Oxygen)
10. False (oro-gastric tube NOT oral airway should be used to decompress or evacuate the air from the stomach)
11. 60 not 80 bpm (for HR < 100 bpm provide PPV, and for HR > 60 stop chest compression)
12. True (IV is preferred for better absorption, dose is 0.1-0.3 ml/kg that is lower than 0.5-1 ml/kg used for ETT dose)
13. True (It should be 1/3rd)
14. 3:1 not 1:3 (3 compressions 1 breath; 90 compressions & 30 breaths in one minute cycle)
15. False (> 22 wk should be resuscitated per AAP and ACOG guidelines)

If you scored 80%, you pass. Now proceed with your practical session with the instructor at the hospital.