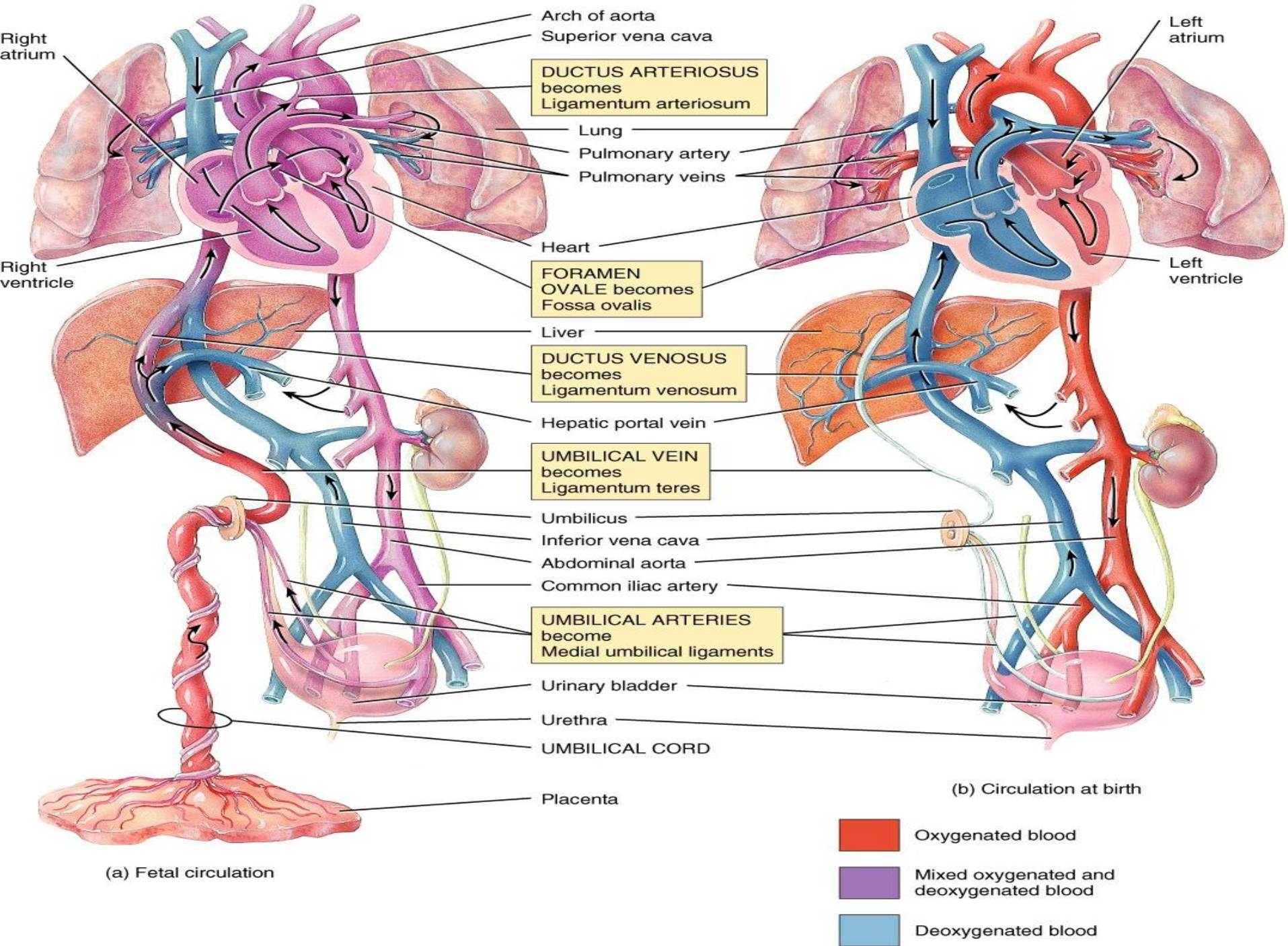


احیای نوزاد

دکتر قره باغی
استاد گروه کودکان و نوزادان
دانشگاه علوم پزشکی تبریز

- اهمیت احیای نوزاد
- ۴-۱۰ درصد نوزادان ترم نیاز به تهویه
- ۱-۳ در هزار نیاز به ماساژ قلبی یا دارو
- تغییرات فیزیولوژیک حین تولد
- الگوریتم احیا
- کار تیمی برای احیا

- گذار از زندگی جنینی به زندگی نوزادی نیازمند تغییرات فیزیولوژیک سریع و قابل ملاحظه است که در آن ریه جایگزین ریه می شود. این نکته قابل توجه است که **بیش از ۹۰ درصد** نوزادانی که متولد می شوند به کمک نیاز ندارند و یا کمک مختصری می خواهند، و بیشتر برای چند درصد باقیمانده است که برنامه احیاء نوزاد **NRP** نوزادان طراحی شده است.



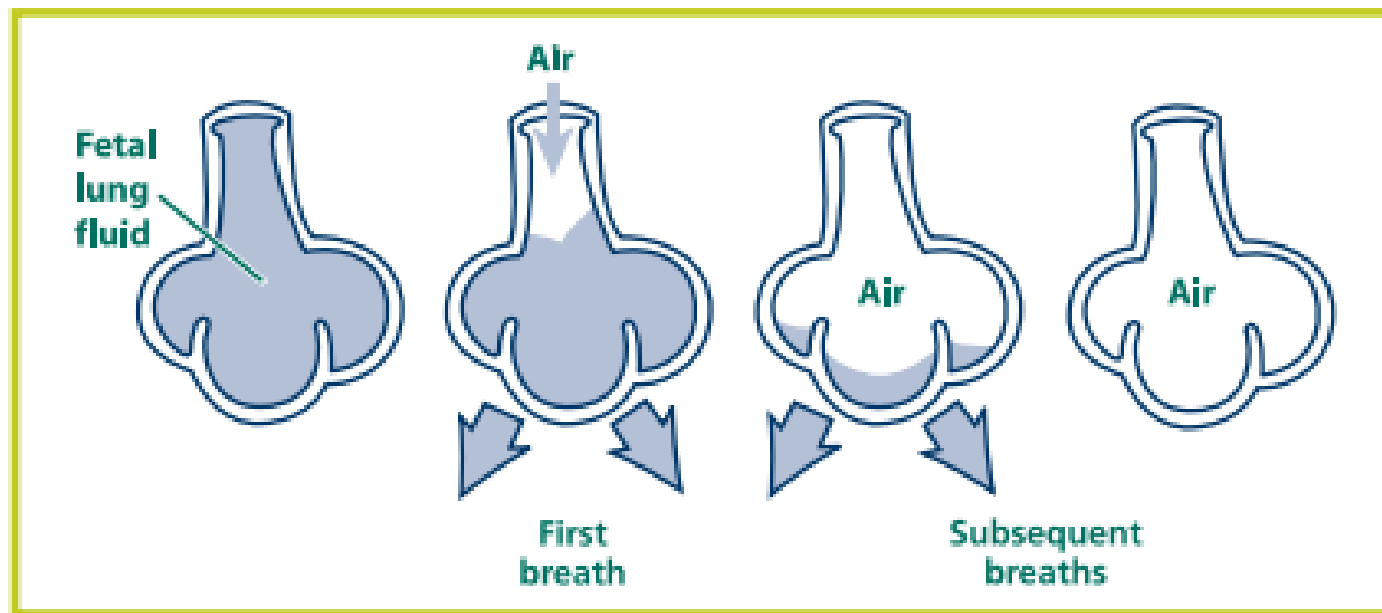


Figure 1.2A. Air replaces fluid in the alveoli.

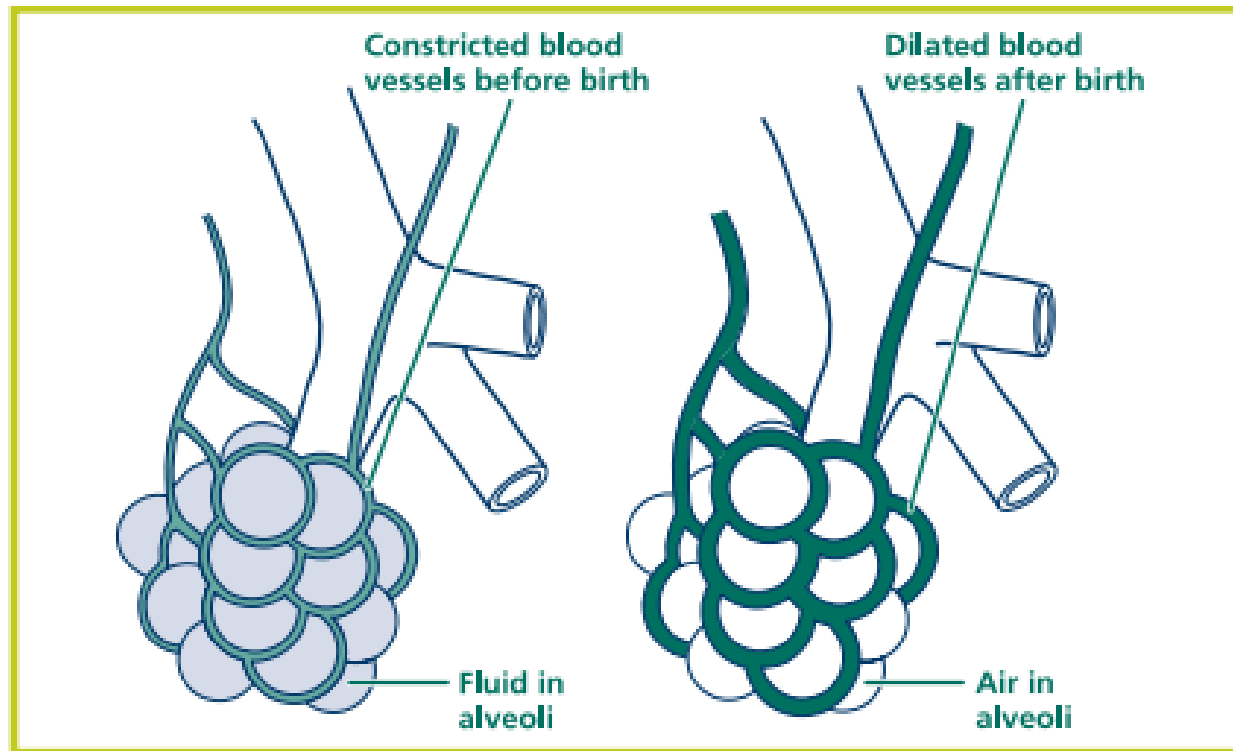
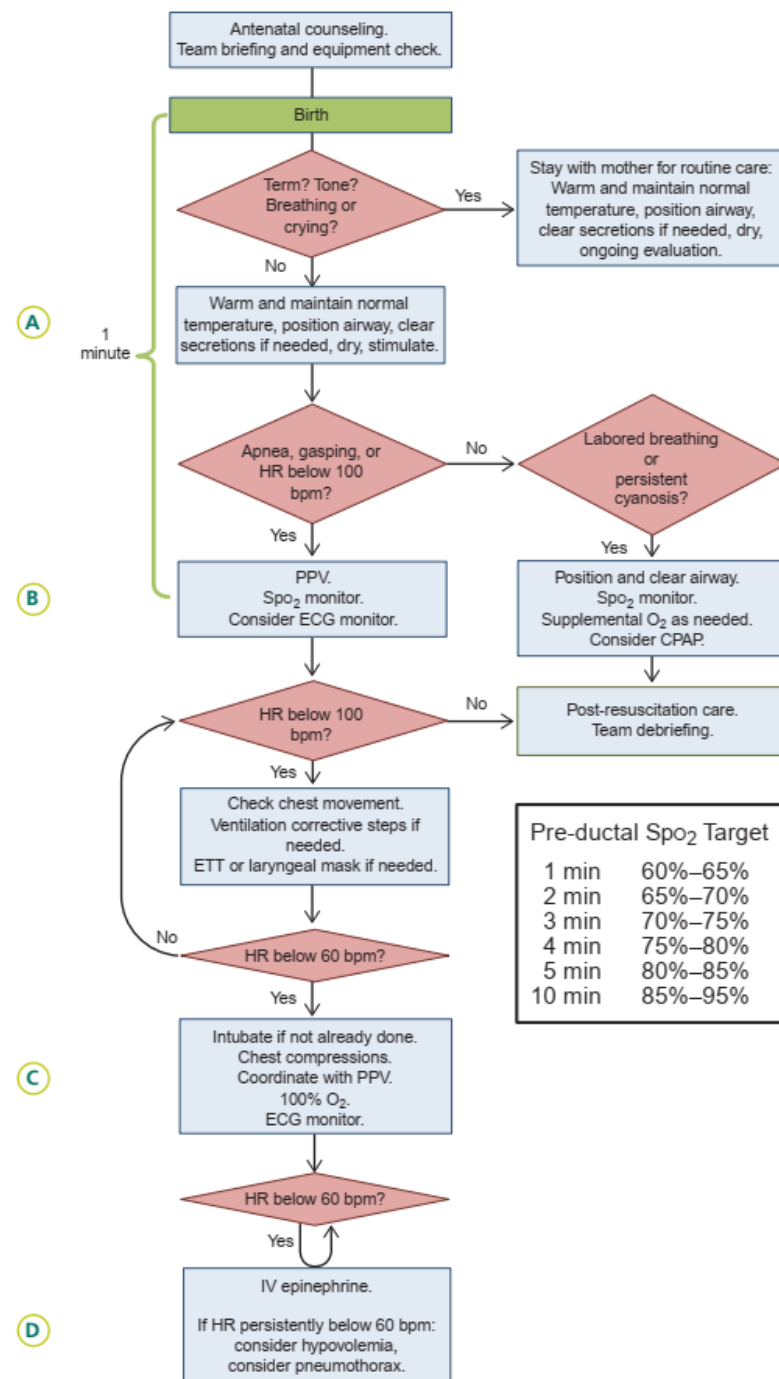


Figure 1.2B. Pulmonary blood vessels dilate.

- گاهی جذب مایع الوئلی تا ساعت ها
- بسته شدن مجرای شریانی تا چند روز
- شل شدن عروق ریوی تا چند ماه
- تاخیر دارد

علايم فاز گذر غير طبيعي

- تنفس نامنظم ، تنفس سريع يا اينه
- كم يا زياد بودن تعداد ضربان قلب
- کاهش تون عضلانی
- پايين بودن درصد اشباع اكسيژن
- فشار خون پايين



امادگی قبل از احیا



Figure 1.3. Neonatal resuscitation team briefing

- Briefing قبل از شروع احیا
- تعیین رهبر تیم
- ارتباط موثر اعضای تیم
- مستند سازی
- Debriefing بعد از احیا

شناخت ریسک فاکتورها

Table 2-1. Perinatal Risk Factors Increasing the Likelihood of Neonatal Resuscitation

Antepartum Risk Factors	
Gestational age less than 36 0/7 weeks Gestational age greater than or equal to 41 0/7 weeks Preeclampsia or eclampsia Maternal hypertension Multiple gestation Fetal anemia Polyhydramnios	Oligohydramnios Fetal hydrops Fetal macrosomia Intrauterine growth restriction Significant fetal malformations or anomalies No prenatal care
Intrapartum Risk Factors	
Emergency cesarean delivery Forceps or vacuum-assisted delivery Breech or other abnormal presentation Category II or III fetal heart rate pattern* Maternal general anesthesia Maternal magnesium therapy Placental abruption	Intrapartum bleeding Chorioamnionitis Narcotics administered to mother within 4 hours of delivery Shoulder dystocia Meconium-stained amniotic fluid Prolapsed umbilical cord

- حضور حداقل یک نفر ورزیده در احیای نوزاد و آشنا با گامهای نخستین احیا و تهویه با فشار مثبت در هر زایمانی
- حضور حداقل ۲ نفر مسئول احیا در حاملگی های پرخطر
- حضور یک تیم احیای ورزیده شامل ۳ یا ۴ نفر در مواردی که احیای پیشرفته مورد انتظار است

وسایل مورد نیاز

قبل از زایمان

- سن حاملگی احتمالی
- تمیز بودن مایع آمنیوتیک
- تعداد نوزادان
- ریسک فاکتور ها

Warm	• Preheated warmer
	• Warm towels or blankets
	• Temperature sensor and sensor cover for prolonged resuscitation
	• Hat
	• Plastic bag or plastic wrap (<32 weeks' gestation)
	• Thermal mattress (<32 weeks' gestation)
Clear airway	• Bulb syringe
	• 10F or 12F suction catheter attached to wall suction, set at 80 to 100 mm Hg
	• Meconium aspirator
Auscultate	• Stethoscope
Ventilate	• Flowmeter set to 10 L/min
	• Oxygen blender set to 21% (21%-30% if <35 weeks' gestation)
	• Positive-pressure ventilation (PPV) device
	• Term- and preterm-sized masks
	• 8F feeding tube and large syringe
Oxygenate	• Equipment to give free-flow oxygen
	• Pulse oximeter with sensor and cover
	• Target oxygen saturation table
Intubate	• Laryngoscope with size-0 and size-1 straight blades (size 00, optional)
	• Stylet (optional)
	• Endotracheal tubes (sizes 2.5, 3.0, 3.5)
	• Carbon dioxide (CO ₂) detector
	• Measuring tape and/or endotracheal tube insertion depth table
	• Waterproof tape or tube-securing device
	• Scissors
	• Laryngeal mask (size 1) and 5-mL syringe
Medicate	Access to
	• 1:10,000 (0.1 mg/mL) epinephrine
	• Normal saline
	• Supplies for placing emergency umbilical venous catheter and administering medications
	• Electronic cardiac (ECG) monitor leads and ECG monitor

- کلامپ تاخیری بند ناف در زایمان غیر کومپلیکه
- ۳۰ تا ۶۰ پانیه بعد از تولد و گاهی بیشتر
- در نوزادی که نیازمند احیا است کلامپ تاخیری تایید شده نیست
- باعث کاهش مورتالیتته
- افزایش فشار خون و حجم خون
- کاهش خونریزی مغزی و انتروکولیت نکروزان

- احتمال

- تاخیر در احیا

- پلی سیتی

- ایکتر

- ممنوعیت در

- چند قلوپی

- تاخیر رشد داخل رحمی

- انومالی جفت و شریان نافی

ارزیابی اولیه سریع

- تون عضلانی دارد؟
- تنفس یا گریه دارد؟
- ترم است؟

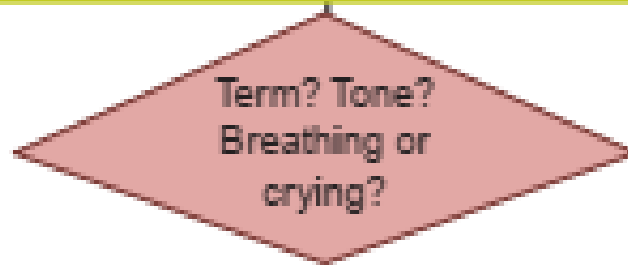


Figure 3.1. Low-risk newborn: full-term, good tone, crying.



Figure 3.2. High-risk newborn: preterm, poor tone, not crying

Birth



Yes

Stay with mother for routine care:
Warm and maintain normal
temperature, position airway,
clear secretions if needed, dry,
ongoing evaluation.

گامهای نخستین احیا

- تامین گرما
- دادن پوزیشن به سر و گردن
- ساکشن کردن ترشحات (در صورت نیاز)
- خشک کردن
- تحریک پوستی

يوزيشن



Figure 3.5. CORRECT: "sniffing" position



Figure 3.6. INCORRECT: Hyperextension



Figure 3.8. Optional shoulder roll for maintaining the "sniffing" position



Figure 3.7. INCORRECT: Flexion

نیاز به رول زیر شانه

- بزرگی سر
- وجود مولدینگ
- ادم
- ناریسی



Figure 4.10. Shoulder roll used to position the head and neck

ساکشن



Figure 3.9. Suction the mouth then nose: "M" before "N".

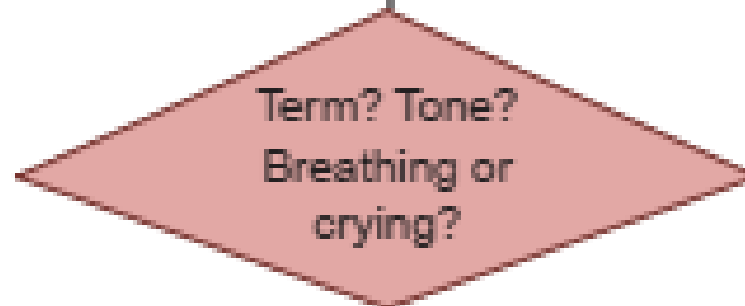
خشک کردن



Figure 3.11. Dry the baby and remove wet linen to prevent heat loss and stimulate breathing. Gentle tactile stimulation may also initiate breathing.

- عدم نیاز به خشک کردن در نوزادان نارس زیر ۳۲ هفته
- استفاده از کیسه پلاستیکی

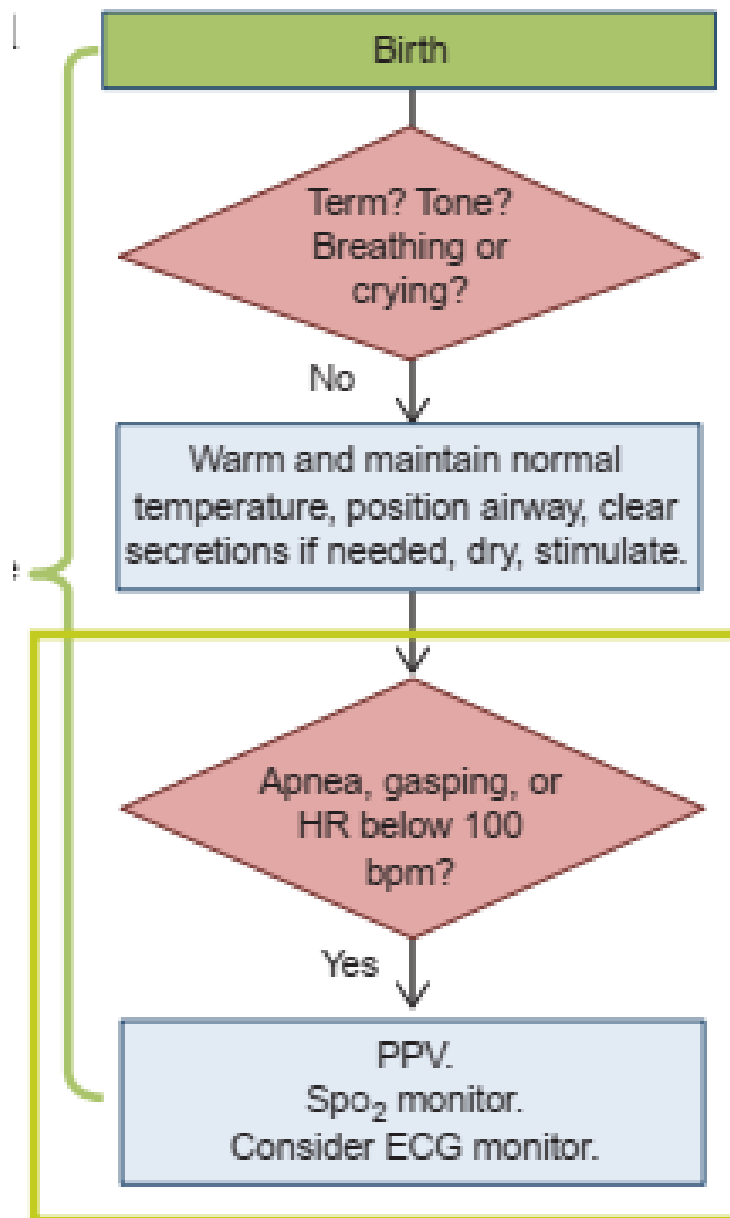
Birth



No

Warm and maintain normal
temperature, position airway, clear
secretions if needed, dry, stimulate.

- دقیقه طلایی



پالس اکسی متری



- پیش بینی نیاز به احیا
- تأیید سیانوز
- نیاز به تجویز اکسیژن
- نیاز به تهویه با فشار مثبت

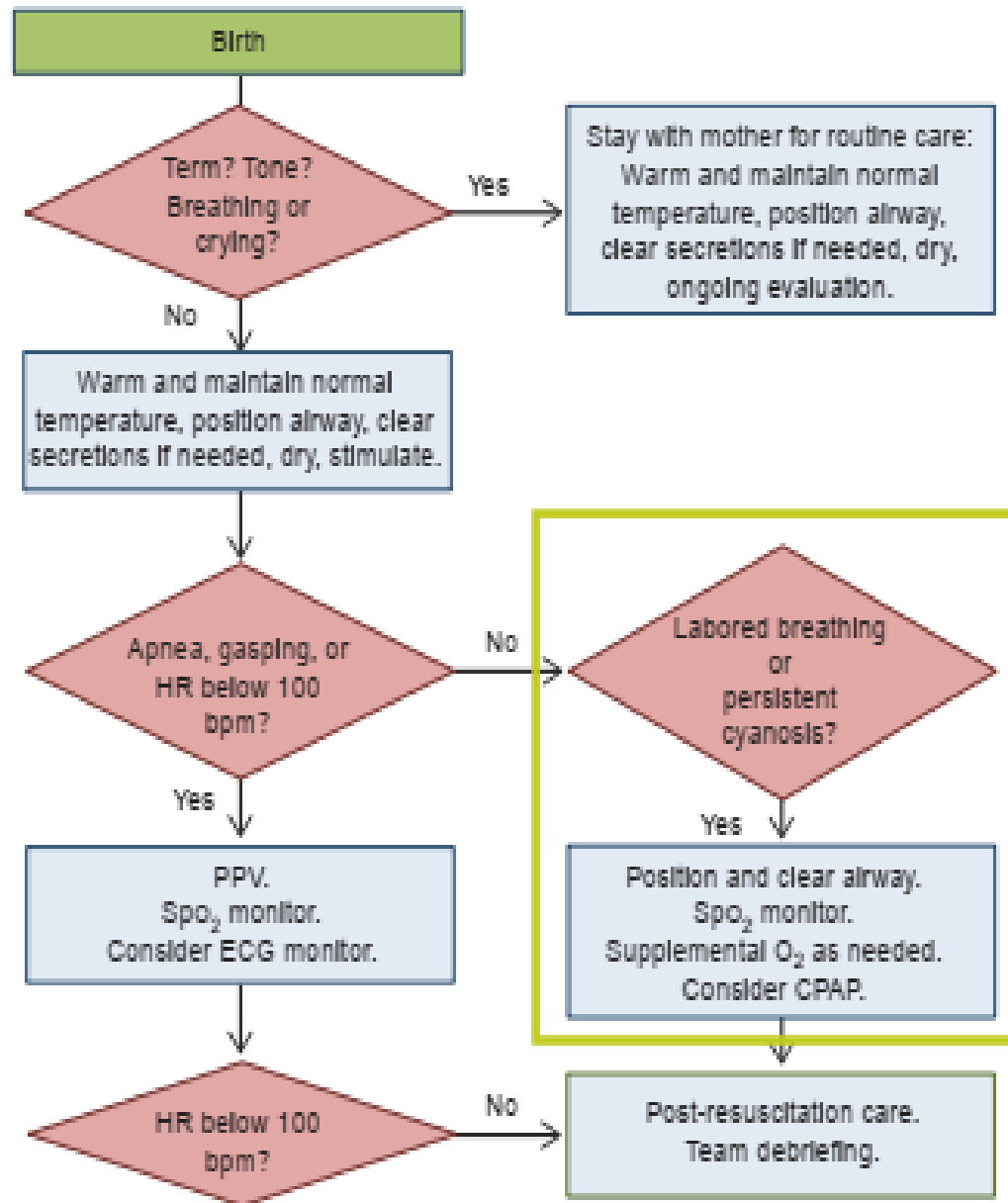
پالس اکسی متری

Table 3-1. Target Pre-ductal SpO₂
After Birth

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

- اندام فوقانی راست
- در نوزادان حاصل سزارین مختصر
پایین تر
- در صورت تعداد ضربان قلب پایین
یا پرفوزیون ضعیف ممکن است نشان
ندهد

not effective if the baby



اکسیژن با جریان آزاد



A



B



C

Figure 3.18. Free-flow oxygen given by a flow-inflating bag (A), a T-piece resuscitator (B), and the tail of a self-inflating bag with an open reservoir (C)

بلندر



Figure 3.19. Adjust the oxygen concentration with compressed air (inflow from yellow hose), compressed oxygen (inflow from green hose), an oxygen blender, a flowmeter, and patient tubing (outflow from clear tubing). This image shows 2 flowmeters attached to the oxygen blender. Your system may only have 1 flowmeter.

CPAP



A



B

Figure 3.20. Administering CPAP using a flow-inflating bag (A) or a T-piece resuscitator (B).
Note: For CPAP, the mask is held tightly against the face to create a seal.



A



B

- ① Gas tubing
- ② Gas inlet
- ③ Maximum pressure-relief control
- ④ Manometer
- ⑤ Inspiratory pressure control
- ⑥ Gas outlet (proximal)
- ⑦ T-piece gas outlet (patient)
- ⑧ T-piece PEEP adjustment dial
- ⑨ Opening on T-piece cap

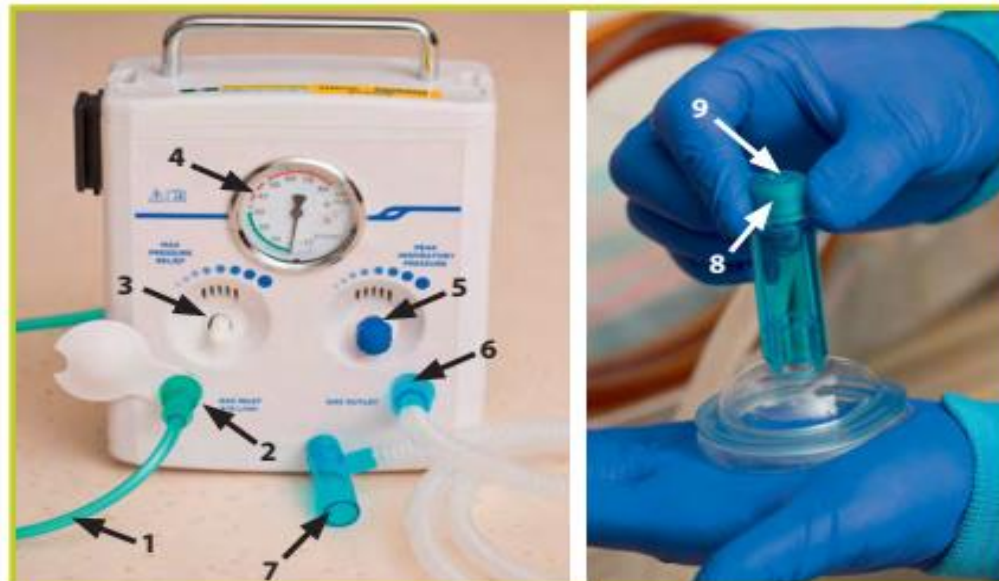


Figure 4A.8. Parts of a T-piece resuscitator



C



D



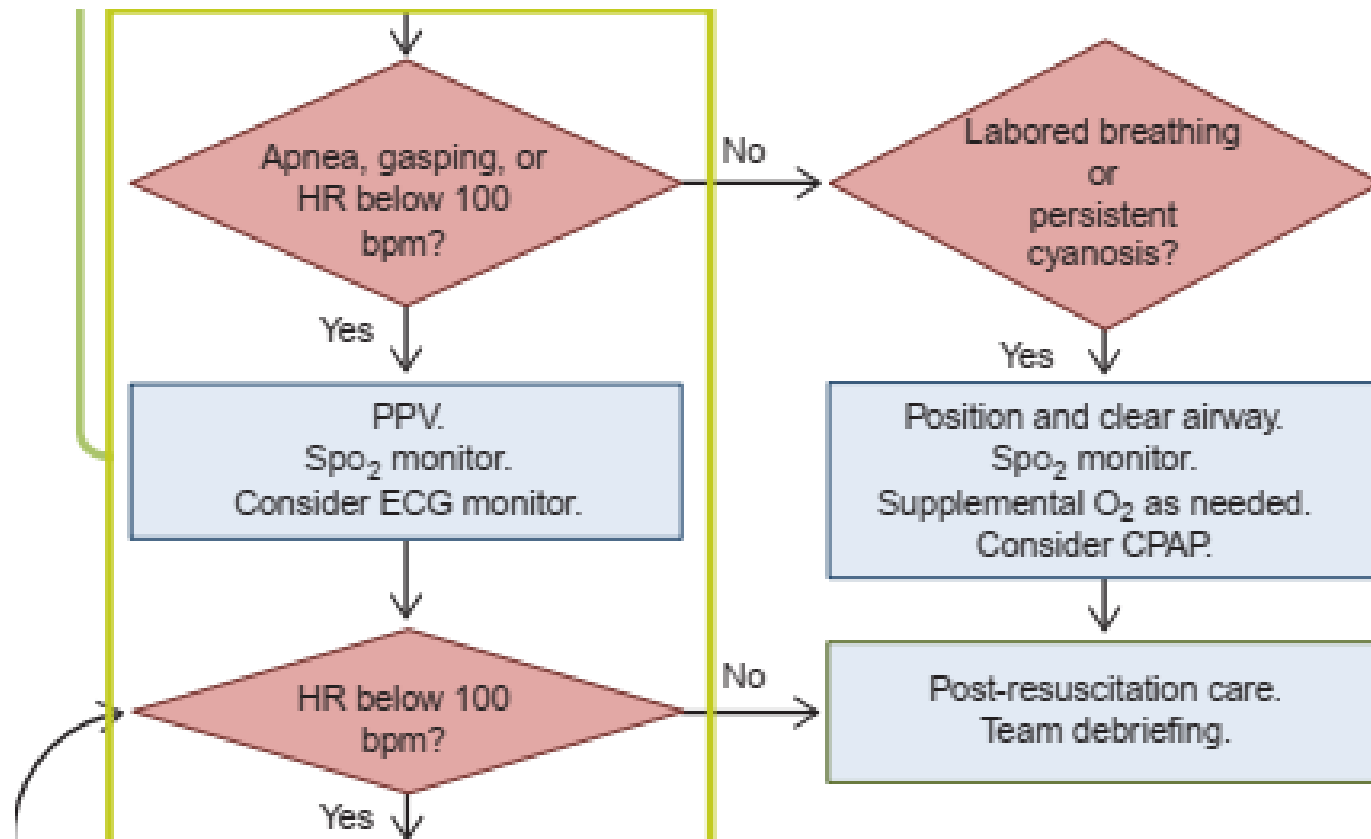
Figure 4.22. CPAP administered to a preterm newborn with nasal prongs.

تعبیه سوند معده در CPAP



Figure 4.24. Measuring the correct insertion depth for an orogastric tube. In this example, the tube should be inserted 28 cm.

- شمارش ضربان قلب در ۶ ثانیه و ضرب کردن در ۱۰
- Gasping مشابه آینه در نظر گرفته می شود
- در صورتی که ضربان قلب با گوشی قابل تعیین نباشد استفاده از ECG
- عدم امکان تجویز اکسیژن با جریان آزاد از طریق بگ خود متسع شوند
- مقدار اکسیژن ۲ تا ۱۰ لیتر در دقیقه
- در نوزاد ترم سالم ۱۰ دقیقه طول می کشد تا ساچوراسیون به بالای ۹۰ درصد برسد



تهویه با فشار مثبت



Figure 4.2. Self-inflating bag. Fills spontaneously. Does not need compressed gas or a tight seal to fill.

- تمیز کردن راه هوایی نوزاد
- استادن بالای سر نوزاد
- اصلاح پوزیشن نوزاد
- انتخاب ماسک مناسب



Figure 4.3. Flow-inflating bag. Requires compressed gas and a tight seal to fill.



Figure 4.4. T-piece resuscitator. Requires compressed gas to function. Pressures are set by mechanical controls on the device.

ماسک



Figure 4.11. Round (top) and anatomic (bottom) face masks



Correct size anatomic



Incorrect (small) anatomic



Incorrect (large) anatomic



Incorrect (upside down) anatomic



Correct size round



Incorrect (small) round



Incorrect (large) round

Figure 4.12. Correct and incorrect-sized anatomic and round face masks. The first mask in each row is correct. The remaining masks are incorrect. They are too small, too large, or upside down.

گذاشتن ماسک روی صورت

● یک دستی



A

B

Figure 4.13. (A) Cup the chin in the mask. (B) Bring the mask over the mouth and nose.

● دو دستی



A

B

Figure 4.15. Two-hand technique with jaw thrust

- اکسیژن ۲۱ درصد در نوزادان ۳۵ هفته و بالاتر
- اکسیژن ۲۱ تا ۳۰ درصد در نوزادان زیر ۳۵ هفته
- اکسیژن ۱۰ لیتر در دقیقه
- پالس اکسی متری دست راست

بگ خود متسع شونده



A



B

Figure 4.5. Self-inflating bags with a closed reservoir (A) and an open "tail" reservoir (B). Both bags reinflate automatically without compressed gas.

بگ وابسته به جریان



A



B

Figure 4.6. Flow-inflating bag inflated with compressed gas and a tight seal against the baby's face (A). If compressed gas is not flowing into the bag or the outlet is not sealed, the bag collapses (B).

نئوپاف

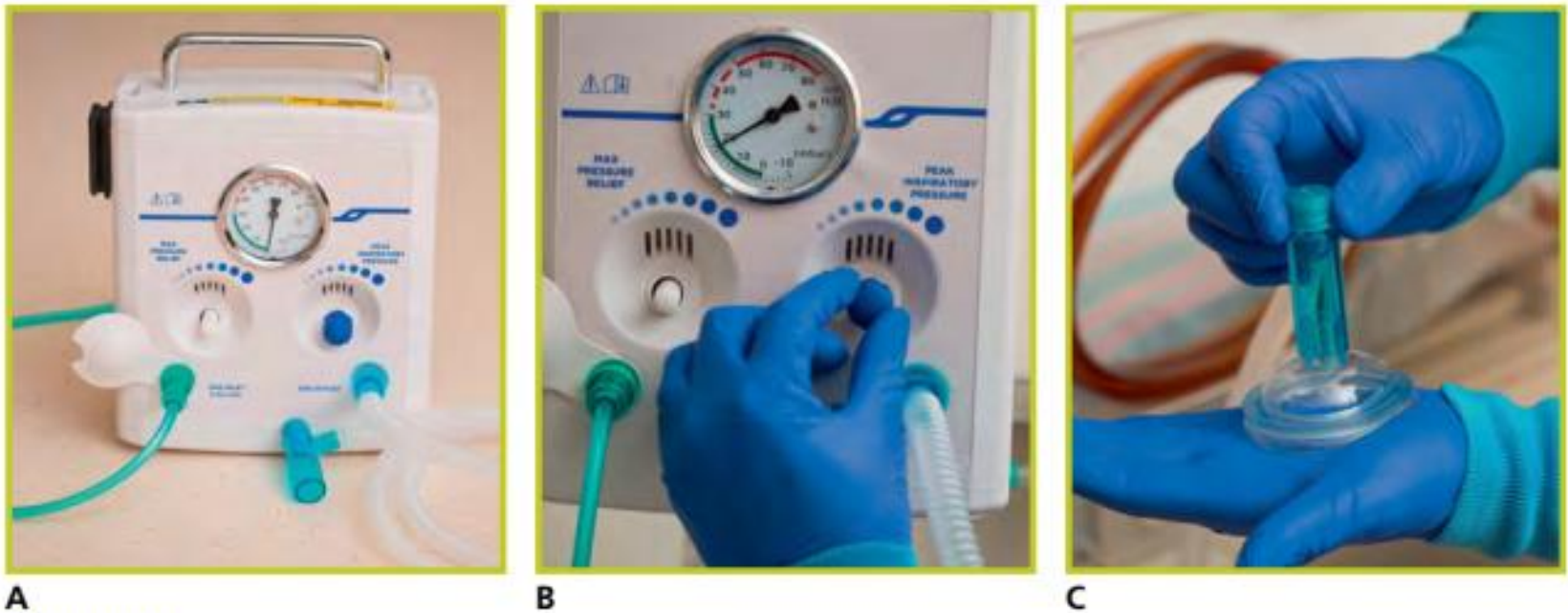
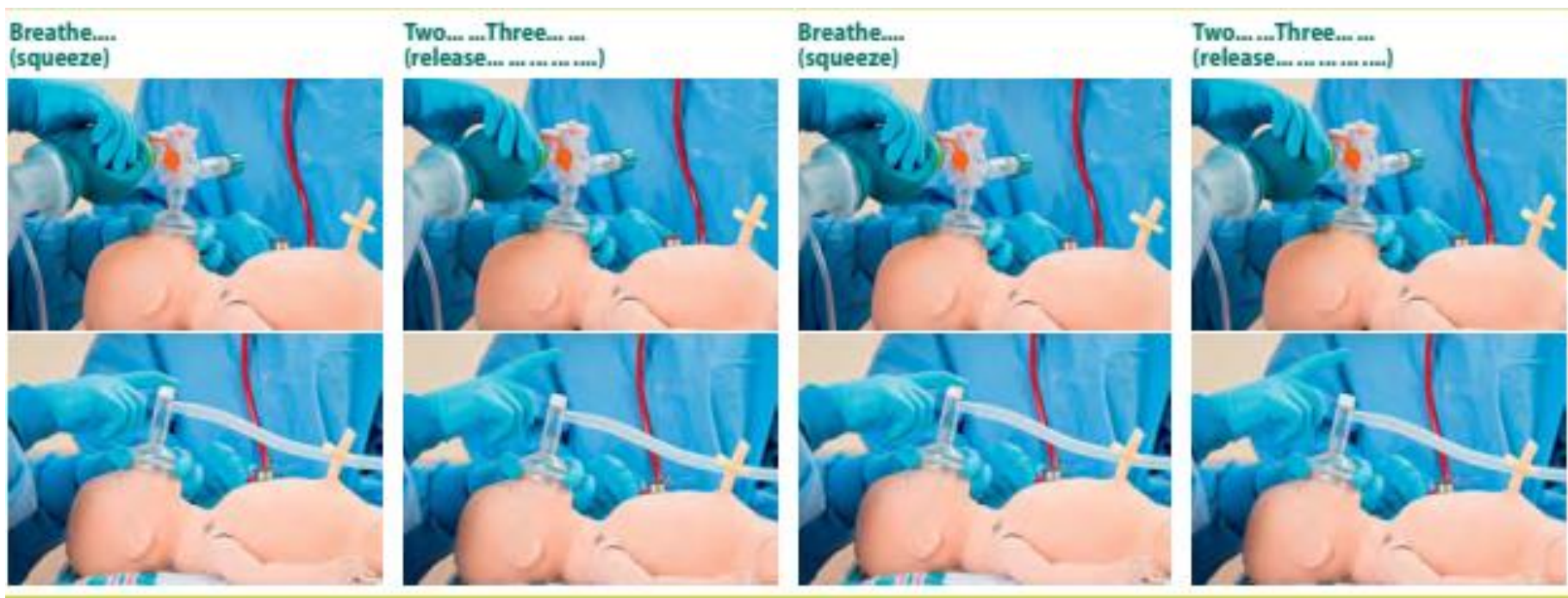


Figure 4.7. A T-piece resuscitator (A). The T-piece resuscitator's pressure is controlled by adjustable valves. Inspiratory pressure is adjusted by a dial on the machine (B) and PEEP is controlled by a dial on the T-piece cap (C).

تنفس ۴۰ تا ۶۰ بار در دقیقه

● نفس... دو... سه...



اقدامات اصلاحی

Table 4-2. The 6 Ventilation Corrective Steps: MR. SOPA

	Corrective Steps	Actions
M	Mask adjustment.	Reapply the mask. Consider the 2-hand technique.
R.	Reposition airway.	Place head neutral or slightly extended.
<i>Try PPV and reassess chest movement.</i>		
S	Suction mouth and nose.	Use a bulb syringe or suction catheter.
O	Open mouth.	Open the mouth and lift the jaw forward.
<i>Try PPV and reassess chest movement.</i>		
P	Pressure increase.	Increase pressure in 5 to 10 cm H ₂ O increments, maximum 40 cm H ₂ O.
<i>Try PPV and reassess chest movement.</i>		
A	Alternative Airway	Place an endotracheal tube or laryngeal mask.
<i>Try PPV and assess chest movement and breath sounds.</i>		

**First Assessment
Heart Rate After 15 Seconds of PPV**

Increasing

- Announce *"Heart rate is increasing."*
- Continue PPV.
- Second HR assessment after another 15 seconds of PPV.

**Not Increasing
Chest IS Moving**

- Announce *"Heart rate NOT increasing, chest IS moving."*
- Continue PPV that moves the chest.
- Second HR assessment after another 15 seconds of PPV that moves the chest.

**Not Increasing
Chest NOT Moving**

- Announce *"Heart rate NOT increasing, chest is NOT moving."*
- Ventilation corrective steps until chest movement with PPV.
 - Intubate or laryngeal mask if necessary.
- Announce when chest is moving.
- Continue PPV that moves the chest.
- Second HR assessment after 30 seconds of PPV that moves the chest.

Second Assessment
Heart Rate After 30 Seconds of PPV That Moves the Chest

**At least
100 beats per minute (bpm)**

- Continue PPV 40–60 breaths/min until spontaneous effort.

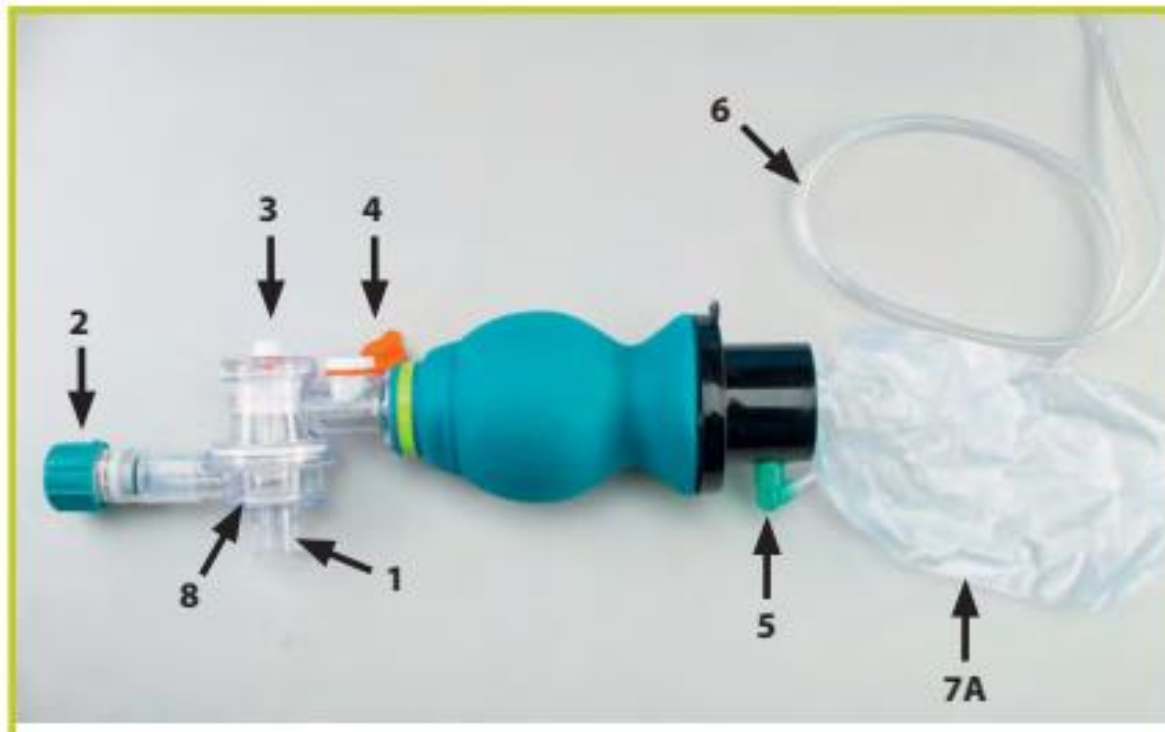
60–99 bpm

- Reassess ventilation.
- Ventilation corrective steps if necessary.

<60 bpm

- Reassess ventilation.
- Ventilation corrective steps if necessary.
- Insert an alternative airway.
- If no improvement, 100% oxygen and chest compressions.

- | | |
|--------------------------|---|
| ① Gas outlet | ⑤ Gas inlet |
| ② PEEP valve (optional) | ⑥ Gas tubing |
| ③ Manometer | ⑦ (A) Oxygen reservoir (closed type),
(B) Oxygen reservoir (open type) |
| ④ Pressure-release valve | ⑧ Valve assembly |



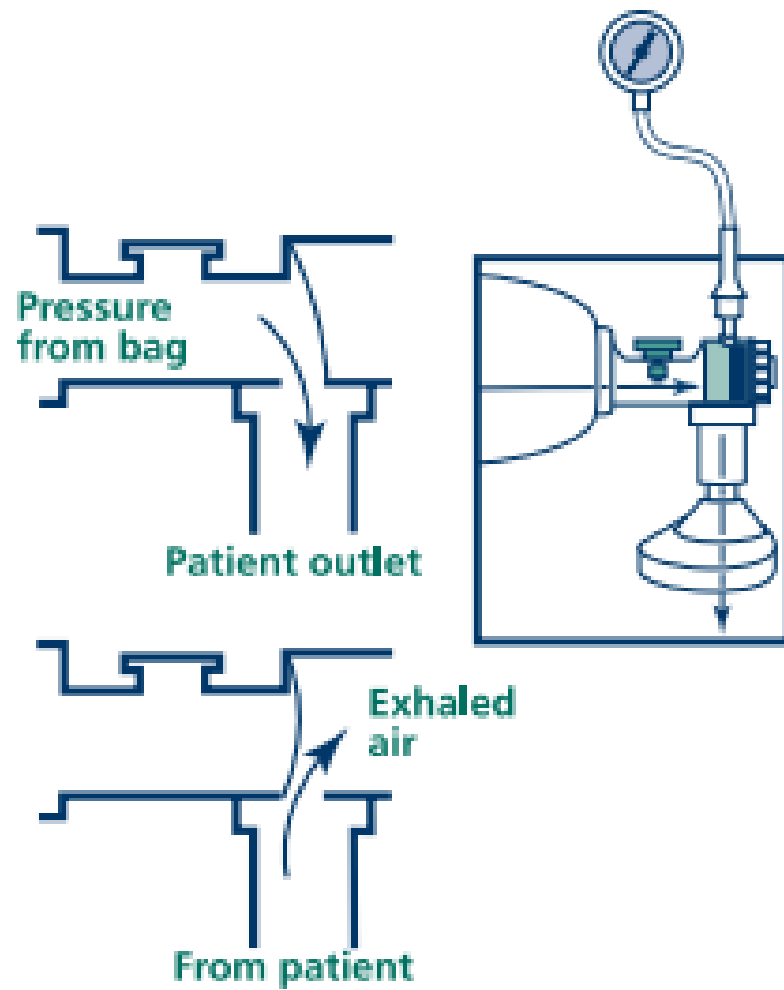


Figure 4A.2. Valve assembly within a self-inflating bag



Figure 4A.3. Testing a self-inflating bag

Testing a self-inflating bag

Block the mask or gas outlet.

- Do you feel pressure against your hand?
- Does the manometer register pressure when you squeeze the bag?
- Does the pressure-release valve open when the manometer registers 30 to 40 cm H₂O pressure?
- Does the bag reinflate quickly when you release your grip?

If no,

- Is there a crack or leak in the bag?
- Is the manometer missing, resulting in an open attachment site?
- Is the pressure-release valve missing or blocked?



Figure 4A.6. Testing a flow-inflating bag

Testing a flow-inflating bag

Block the mask or gas outlet.

- Does the bag fill properly?
- Adjust the flow-control valve to read 5 cm H₂O PEEP.

Squeeze the bag 40 to 60 times per minute.

- Does the bag reinflate quickly when you release your grip?
- Adjust the flow-control valve to read 30 to 40 cm H₂O when squeezed firmly.
- Check to be sure that the pressure still reads 5 cm H₂O when not being squeezed (PEEP).

If the bag does not fill correctly,

- Is there a crack or hole in the bag?
- Is the flow-control valve open too far?
- Is the manometer attached?
- Is the gas tubing connected securely?
- Is the gas outlet sufficiently blocked?

• لوله گذاری تراشه



Figure 5.1. Endotracheal tubes (size 2.5, 3.0, 3.5)



Figure 5.2. Laryngoscope



Figure 5.3. Examples of neonatal laryngeal masks (supraglottic devices)

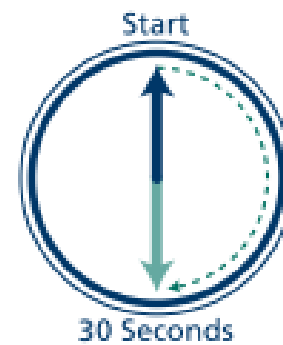


Table 5-1. Endotracheal tube size for babies of various weights and gestational ages

Weight (g)	Gestational Age (wks)	Endotracheal Tube Size (mm ID)
Below 1,000	Below 28	2.5
1,000-2,000	28-34	3.0
Greater than 2,000	Greater than 34	3.5



C. Measuring the NTL

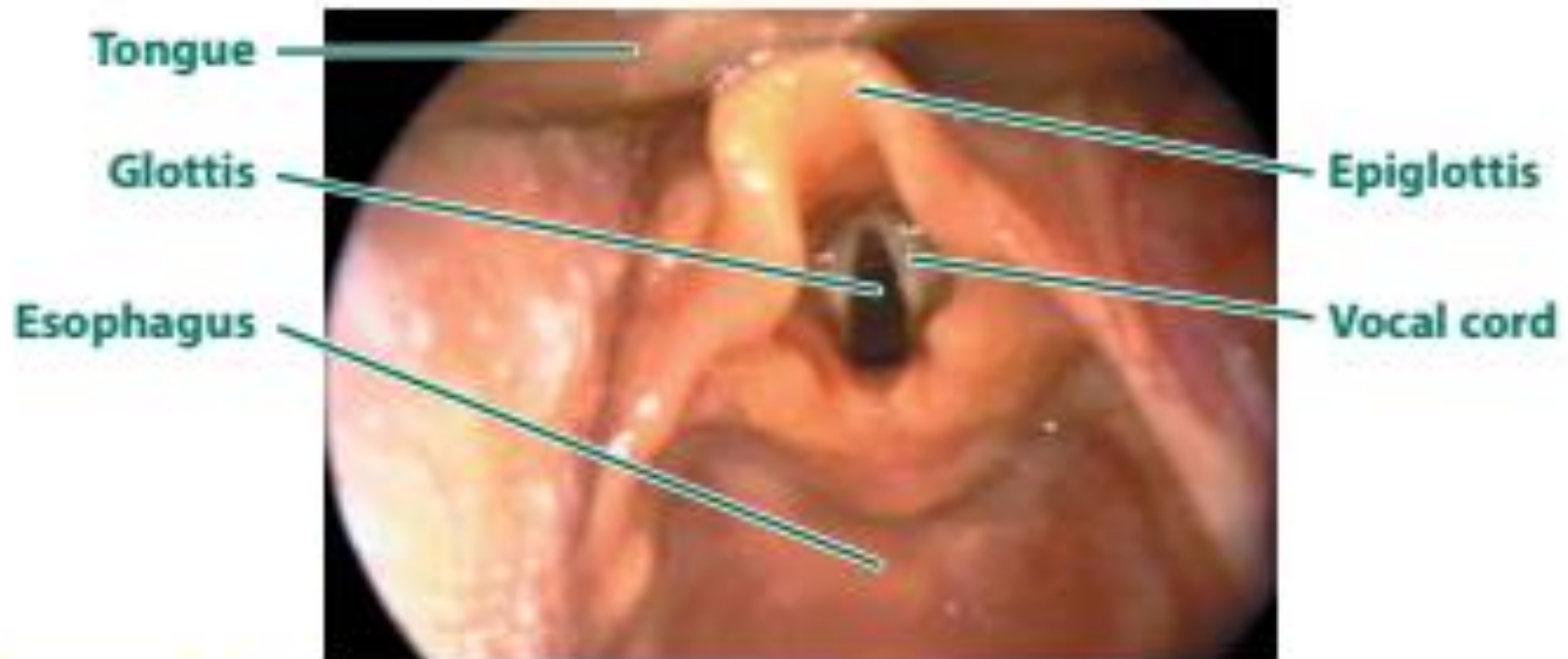


Figure 5.5. Laryngoscopic view of vocal cords and surrounding structures



A

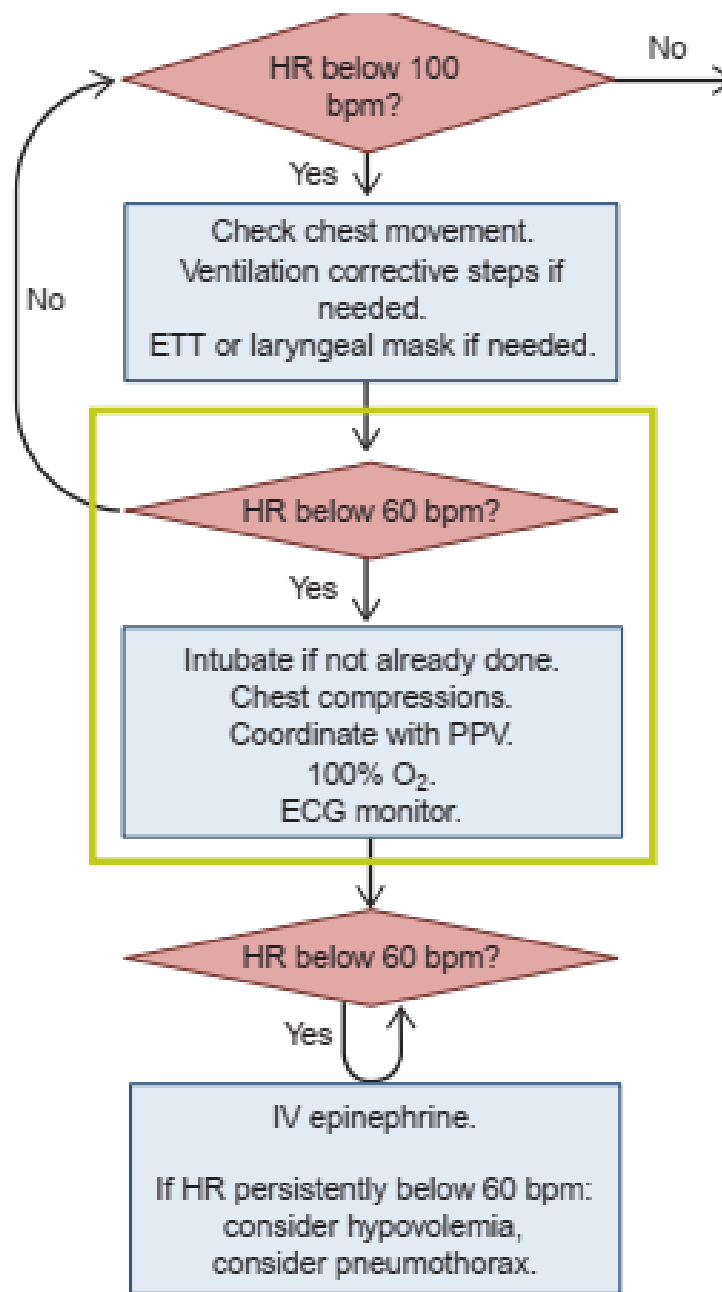


B





Figure 5.35. Preparing for insertion



Indications for Chest Compressions

- Chest compressions are indicated when the heart rate remains **less than 60 bpm** after at least 30 seconds of PPV that inflates the lungs, as evidenced by chest movement with ventilation.
- In most cases, you should have given at least 30 seconds of ventilation through a properly inserted endotracheal tube or laryngeal mask.

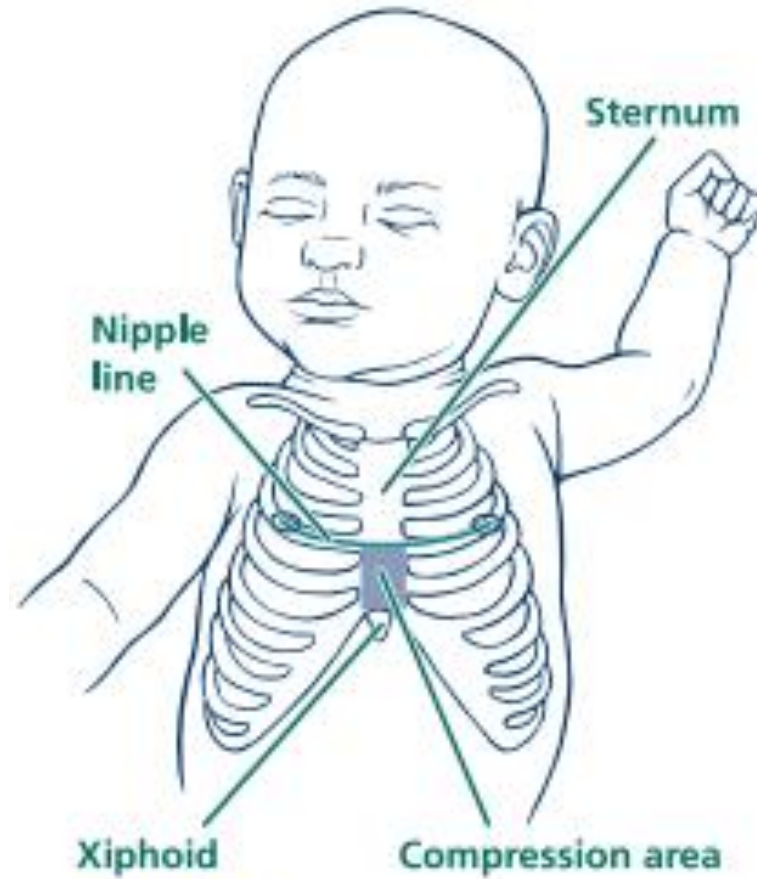


Figure 6.3. Landmarks for chest compressions



A

Coordinated Compressions and Ventilations

3 compressions + 1 ventilation every 2 seconds

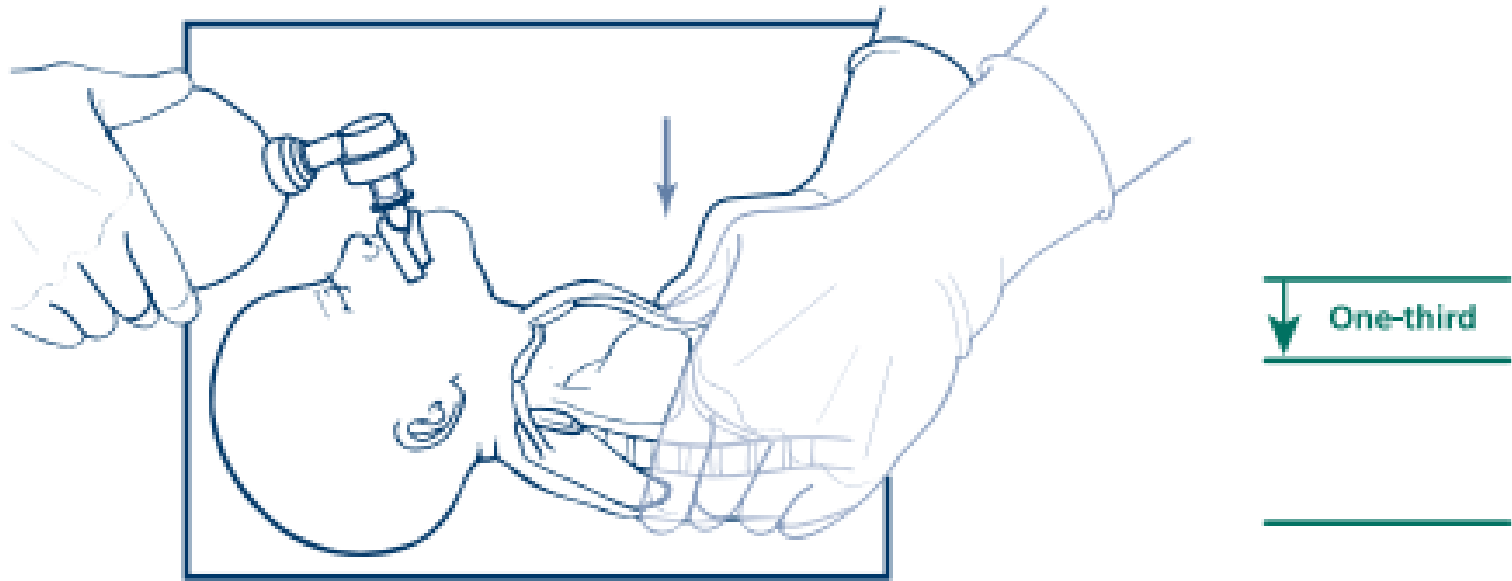


Figure 6.5. Compression depth is approximately one-third of the anterior-posterior diameter of the chest.

- یک و دو و سه و نفس
- ماساژ استراحت ماساژ استراحت ماساژ استراحت نفس

3:1 Compression:Ventilation Rhythm

One-and-Two-and-Three-and-Breathe-and;

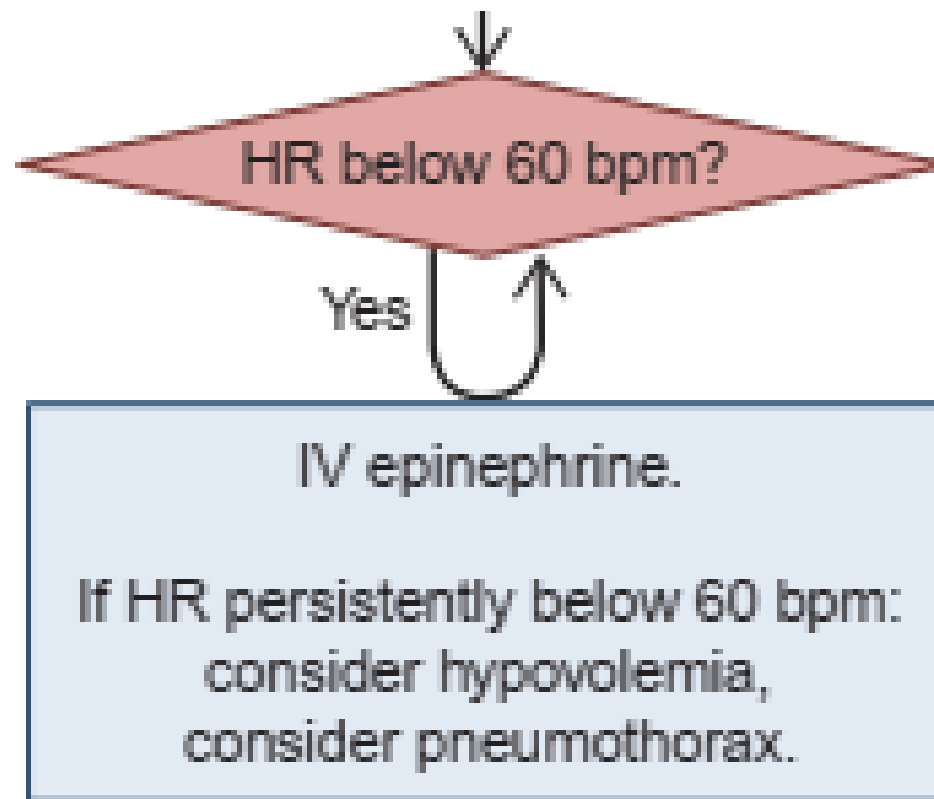
One-and-Two-and-Three-and-Breathe-and;

One-and-Two-and-Three-and-Breathe-and...

- ۶۰ ثانیه بعد ارزیابی ضربان قلب انجام می شود
- توقف ماساژ قلبی در صورت ضربان قلب بالای ۶۰ در دقیقه

در صورت ضربان قلب زیر ۶۰

- Is the chest moving with each breath?
- Are bilateral breath sounds audible?
- Is 100% oxygen being administered through the PPV device?
- Is the depth of compressions adequate (one-third of the AP diameter of the chest)?
- Is the compression rate correct?
- Are chest compressions and ventilations well-coordinated?



When is epinephrine indicated and how should it be administered?

Indication

Epinephrine is indicated if the baby's heart rate remains **below 60 bpm** after

- At least 30 seconds of PPV that inflates the lungs (moves the chest),
and
- Another 60 seconds of chest compressions coordinated with PPV using 100% oxygen.

- اپی نفرین ۱ در ۱۰۰۰۰
- ۰,۱ میلی گرم به ازای کیلوگرم وزن
- ۰,۱ – ۰,۳ سی سی به ازای کیلوگرم وزن وریدی
- ۰,۵ – ۱ سی سی به ازای کیلوگرم وزن داخل تراشه

Epinephrine Summary

Concentration
1:10,000 epinephrine (0.1 mg/mL)
Route
Intravenous (preferred) or Intraosseous <i>Option:</i> Endotracheal only while intravenous or intraosseous access is being obtained
Preparation
Intravenous or Intraosseous = 1-mL syringe labeled "Epinephrine-IV" Endotracheal = 3- to 5-mL syringe labeled "Epinephrine-ET only"
Dose
Intravenous or Intraosseous = 0.1 to 0.3 mL/kg Endotracheal = 0.5 to 1 mL/kg
Administration
<i>Rapidly</i> —as quickly as possible Intravenous or Intraosseous: Flush with 0.5 to 1 mL normal saline Endotracheal: PPV breaths to distribute into lungs Repeat every 3 to 5 minutes if heart rate remains less than 60 bpm.

Emergency volume expansion is indicated if the baby is not responding to the steps of resuscitation AND has signs of shock or a history of acute blood loss.

Volume Expander Summary

Solution

Normal saline (0.9% NaCl)

Suspected anemia: O-negative packed red blood cells

Route

Intravenous or Intraosseous

Preparation

30- to 60-mL syringe (labeled)

Administration

Over 5 to 10 minutes

(Use caution with preterm newborns less than 30 weeks' gestation.)

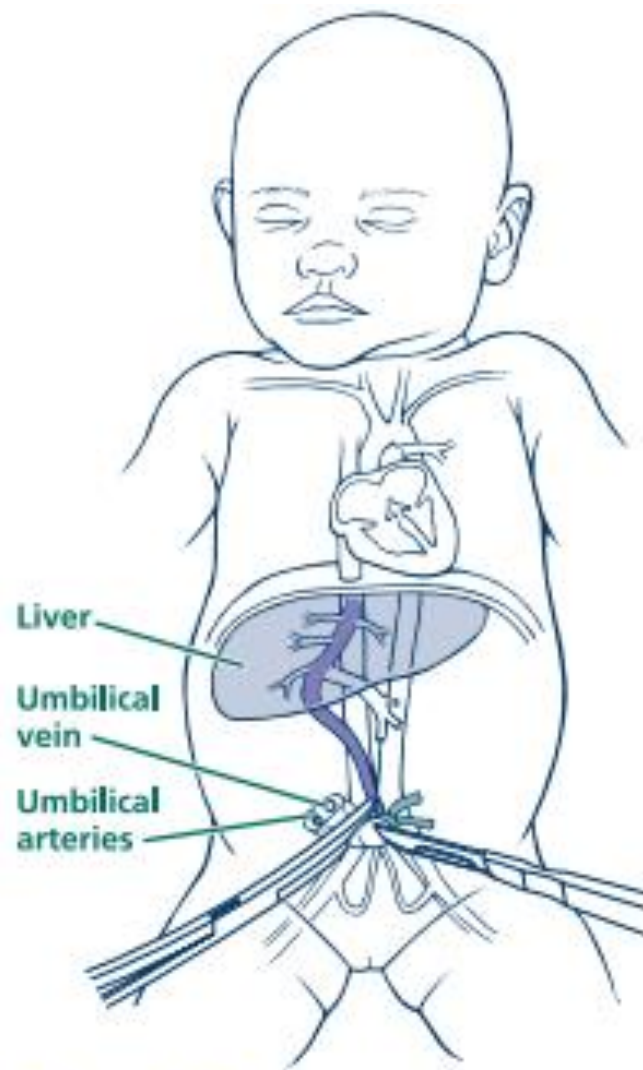


Figure 7.3. The umbilical vein travels through the liver to join the central venous circulation.



Figure 7.15. Needle insertion site along the flat anteromedial surface of the tibia