

به نام خداوند بخشنده مهربان

احیای قلبی ریوی نوزادان

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فوق تخصص بیماریهای نوزادان

Welcome to

the Neonatal
Resuscitation Program
(NRP)



❖ نوزادی که سیستم فیزیولوژیک بدن وی نتوانسته تغییرات مرحله گذار را به نحوی پشت سر بگذارد که پاسخگوی اکسیژن رسانی و یا خونرسانی کافی به بافت ها و اندام ها باشد نیازمند احیاست.

❖ در واقع با انجام احیا در نوزاد کمک می شود تا جنینی که از نظر تغذیه و تنفس جزئی از مادر تلقی می شود بتواند در عرض چند دقیقه زندگی مستقل خودش را در دنیای واقعی شروع کند.

❖ مراقبتهای اولیه و احیای صحیح نوزاد در بازه زمان طلایی، که فقط چند دقیقه است ارتباط مستقیمی با پیشگیری از بروز عوارض مغزی، قلبی و کلیوی ناشی از کمبود اکسیژن و همچنین حیات نوزادان دارد.

❖ پس از تولد تقریباً ۴-۱۰ درصد نوزادان ترم و نزدیک به ترم، نیاز به تهویه با فشار مثبت خواهند داشت و از هر هزار تولد فقط یک تا سه نوزاد نیازمند فشردن قفسه سینه یا تجویز دارو می گردند.

❖ اکثر نوزادانی که نیاز به حمایت جدي پیدا می کنند در دوران جنینی یا در طول مدت زایمان تحت دیسترس و اختلال در اکسیژناسیون بافتی قرار گرفته اند. ابتلا به ناهنجاری های مادرزادی، چند قلوبی، نارسى، وزن بسیار کم هنگام تولد، عفونت خون از عوامل زمینه ساز نیاز به **احیای پیشرفته** در بدو تولد می باشد.

تَمرکز احیای نوزاد بر تهویه
موثر ریه های نوزاد است.

❖ نشست گروه پیش از احیا

❖ شایع ترین علت ریشه ای مرگ های بالقوه قابل پیشگیری در اتاق زایمان کار گروهی غیر موثر و نا توانی در برقراری ارتباط می باشد.

❖ در هر گروه نقش هر کسی در احیا باید مشخص باشد. (چک لیست خلبان پیش از پرواز)
هر گروه احیا نیاز به یک رهبر دارد.

❖ تعیین عوامل خطر پیش از تولد، تعیین مسوولیت هر فرد، تعیین فرد مسوول ثبت وقایع،
امتحان تجهیزات و وسایل و چگونگی فراخوان نیروی کمکی

NRP Key Behavioral Skills

- Know your environment.
- Use available information.
- Anticipate and plan.
- Clearly identify a team leader.
- Communicate effectively.
- Delegate the workload optimally.
- Allocate attention wisely.
- Use available resources.
- Call for additional help when needed.
- Maintain professional behavior.



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

1. Before birth, the alveoli in the fetal lungs are filled with fluid.

2. Before birth, oxygen is supplied to the fetus by the placenta.
3. Before birth, most fetal blood bypasses the fetal lungs.
4. After birth, air in the alveoli causes vessels in the baby's lungs to relax.

Clinical Finding of Abnormal Transition

- Irregular breathing, absent breathing (apnea), or rapid breathing (tachypnea)
- Slow heart rate (bradycardia) or rapid heart rate (tachycardia)
- Decreased muscle tone
- Pale skin (pallor) or blue skin (cyanosis)
- Low oxygen saturation
- Low blood pressure

❖ در هر تولد **نوزاد بدون وجود عوامل خطر**، باید حداقل یک فرد واجد شرایط با مهارت‌های مرتبط با گام‌های نخستین حمایت از نوزاد و تهویه با فشار مثبت حضور داشته باشد.

❖ در صورت احساس **احتمال نیاز به یک احیای پیشرفته**، باید گروه احیا پیش از تولد در محل حضور داشته باشد.

❖ تعداد افراد تیم احیای پیشرفته باید حداقل ۴ نفر باشد.

N R P Quick Equipment Checklist

Warm	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Bulb syringe • 10F or 12F suction catheter attached to wall suction, set at 80 to 100 mm Hg • Tracheal aspirator
Auscultate	<ul style="list-style-type: none"> • Stethoscope
Ventilate	<ul style="list-style-type: none"> • 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 orogastric tube and 20-ml syringe • Laryngeal mask (size 1) and 5-ml syringe (if needed for inflation) • 5F or 6F orogastric tube if insertion port is present on laryngeal mask • Cardiac monitor and leads
Oxygenate	<ul style="list-style-type: none"> • 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 (CO₂) detector
- Measuring tape and/or endotracheal tube insertion depth table
- Waterproof tape or tube-securing device
- Scissors

Medicate

Access to

- Epinephrine (0.1 mg/ml = 1 mg/10 ml)
- Normal saline (100-ml or 250-ml bag, or prefilled syringes)
- Supplies for placing emergency umbilical venous catheter and administering medications
- Table of pre-calculated emergency medication dosages for babies weighing 0.5 to 4 kg

Other potential items to check.

- Temperature in resuscitation location (23°C to 25°C [74°F - 77°F] if < 32 weeks' gestation)
- Oxygen and air tanks
- Access to intraosseous needle and insertion supplies
- Access to surfactant (preterm birth)
- Transport incubator for transfer to nursery or NICU

A

B

C

D

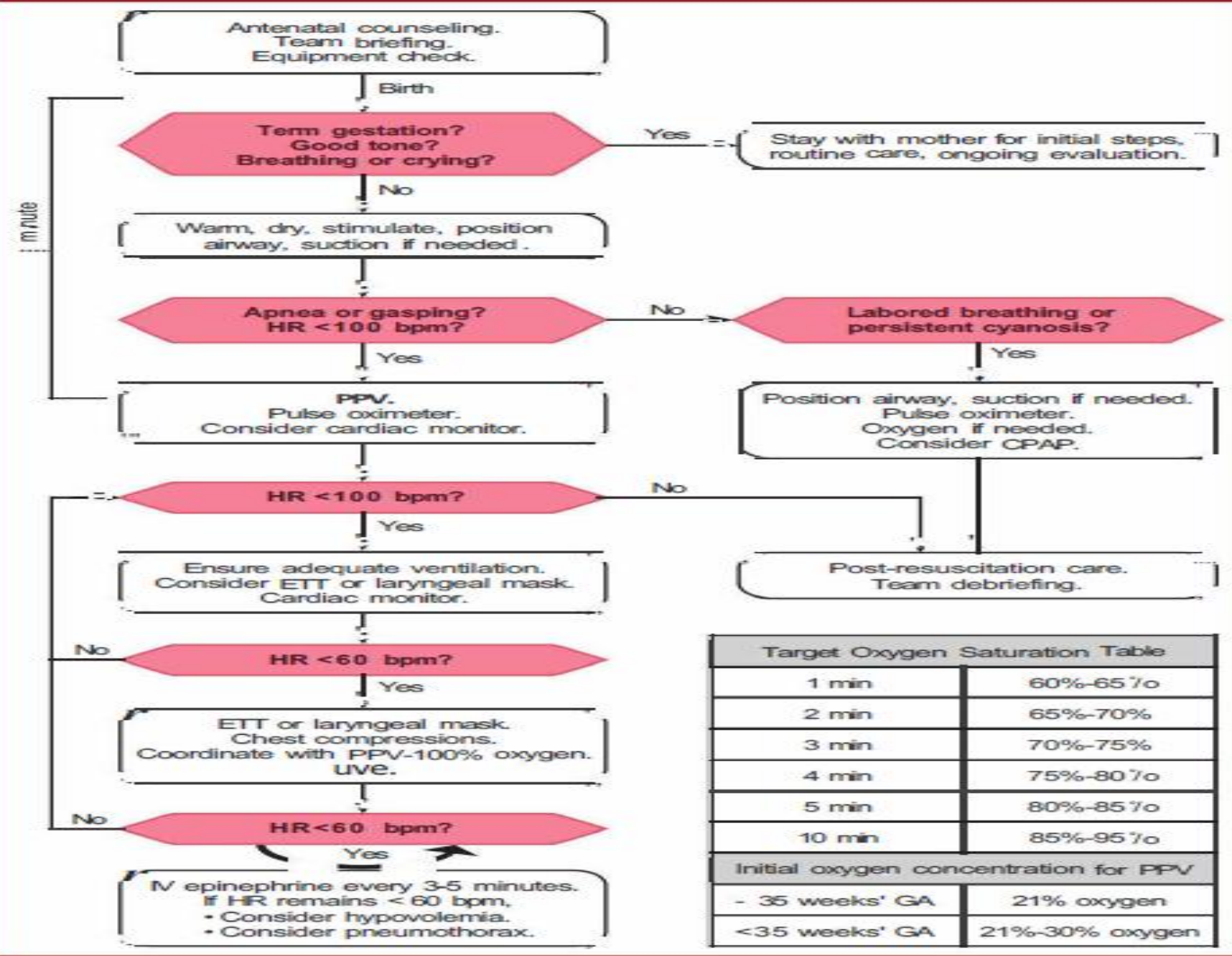


Figure 1.5. Neonatal Resuscitation Program Algorithm

گامهای نخستین احیا در نوزادان

وقتی نوزاد بدنیا آمد

سه سوال مهم:

❖ آیا نوزاد ترم است؟

❖ آیا نفس می کشد یا گریه می کند؟

❖ آیا تون عضلانی نوزاد خوب است (فعال و با اندامهای جمع شده)؟

❖ For most vigorous term and preterm newborns, **clamping the umbilical cord** should be delayed **for at least 30 to 60 seconds**.

❖ During this time, the baby may be placed skin-to-skin on the mother's chest or abdomen, or held securely in a warm, dry towel or blanket.

❖ **Very preterm newborns**, less than 32 weeks' gestation, may be wrapped in a warm blanket or polyethylene plastic to help maintain their Temperature.

❖ During the interval between birth and umbilical cord clamping, the obstetric provider and neonatal team should evaluate the baby's tone and breathing effort and continue the initial steps of newborn care.

How do you provide the initial steps for vigorous, term newborns?

Initial Steps of Newborn Care

- Provide warmth.
- Dry.
- Stimulate.
- Position the head and neck.
- Clear secretions if needed.



How do you provide the initial steps for vigorous, term newborns?

- ❖ If the answers to all 3 rapid evaluation questions are **"Yes,"** *the baby can* remain with the mother and have the initial steps performed **on the mother's chest or abdomen.**
- ❖ Warmth is maintained by **direct skin-to-skin contact and covering the baby with a warm towel or blanket.**
- ❖ Dry the baby with the towel or blanket and gently stimulate the baby.
- ❖ Position the baby on the mother's chest or abdomen to ensure the airway is open.

-
- ❖ If necessary, secretions in the upper airway can be cleared by wiping the baby's mouth and nose with a cloth.
 - ❖ Gentle suction with a bulb syringe should be reserved for babies who are having difficulty clearing their secretions.
 - ❖ After the initial steps are completed, continue monitoring the newborn's breathing, tone, activity, color, and temperature to determine if additional interventions are required.

How do you provide the initial steps for **non-vigorous** and preterm newborns?

❖ If the answer to any of the initial evaluation questions is "**No**," bring the baby to a radiant warmer because additional interventions may be required.

Provide warmth

- ❖ If you anticipate that the baby will remain under the warmer for more than a few minutes, apply a servo-controlled temperature sensor to the baby's skin to monitor and control the baby's body temperature. Avoid both hypothermia and overheating.
- ❖ **During resuscitation and stabilization**, the baby's body temperature should be maintained **between 36.5° C and 37.5°C**.

Dry

- ❖ Place the baby on a warm towel or blanket and gently dry any fluid.
- ❖ If the first towel or blanket becomes wet, discard it and use fresh, warm towels or blankets for continued drying.
- ❖ **Drying is not necessary for very preterm babies less than 32 weeks' gestation** because they should be covered immediately **in polyethylene plastic**, which reduces evaporative heat loss.

Dry, Stimulate to Breathe, Reposition

Dry thoroughly



Remove wet linen



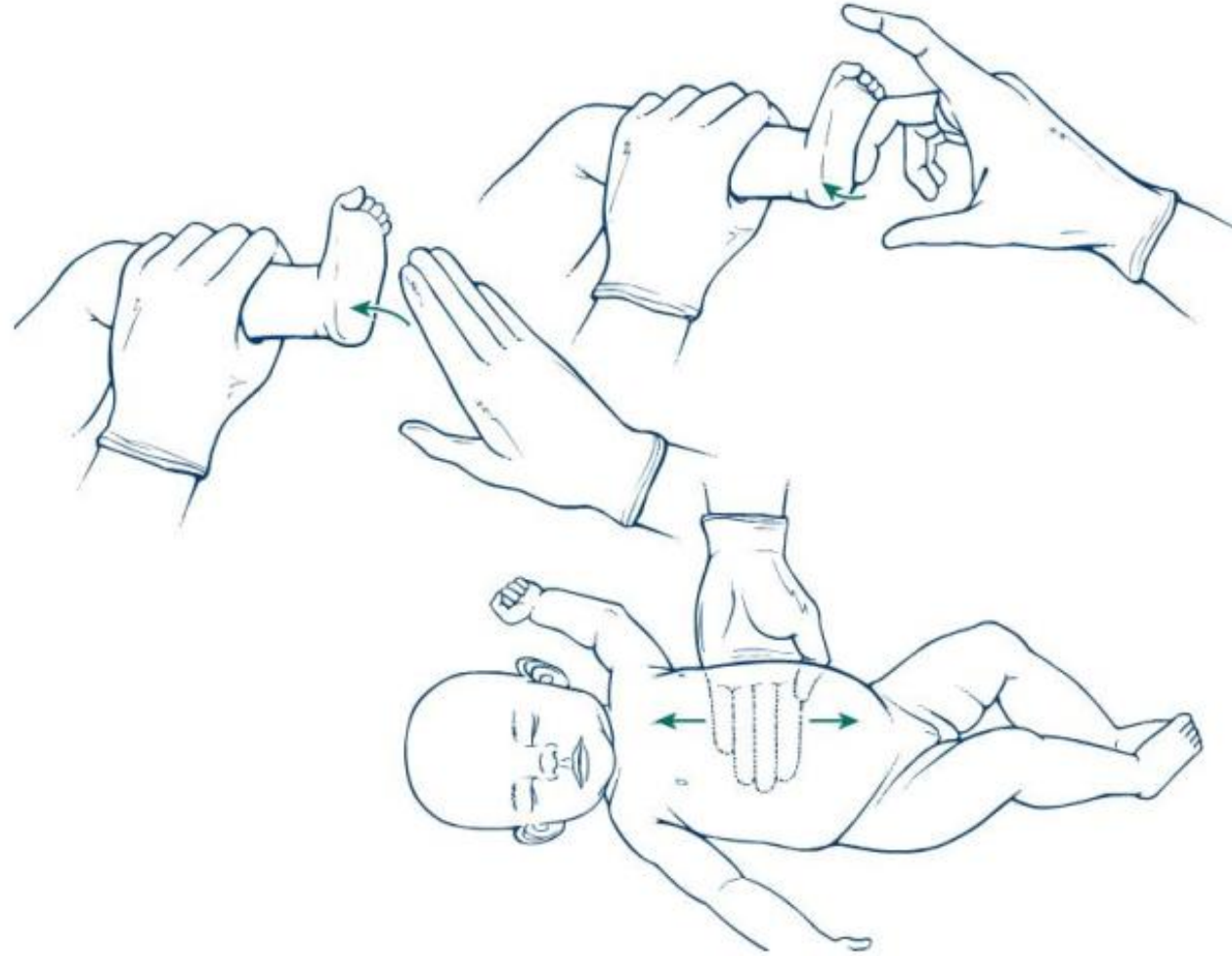
Reposition the head



Stimulate

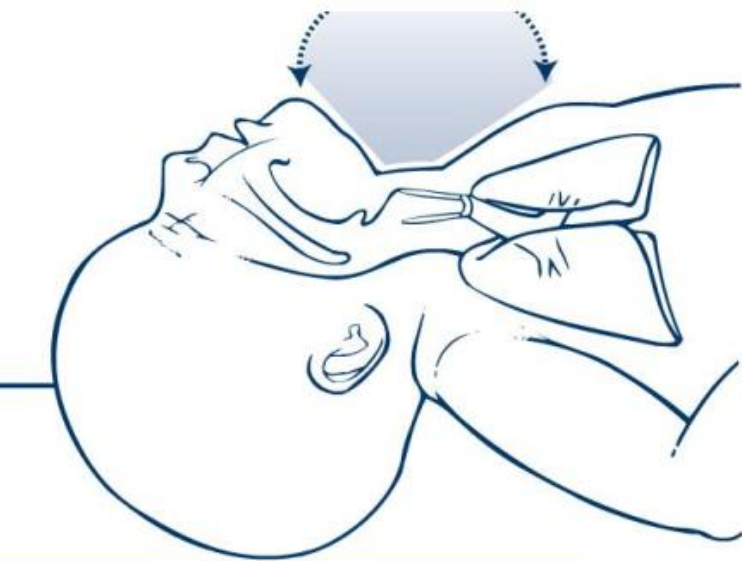
- ❖ Drying the baby will frequently provide enough stimulation to initiate breathing. If the newborn does not have adequate respirations, brief additional tactile stimulation may stimulate breathing.
- ❖ Gently rub the newborn's back, trunk, or extremities.
- ❖ Overly vigorous stimulation is not helpful and can cause injury.
- ❖ **Never shake a baby.**

Tactile Stimulation

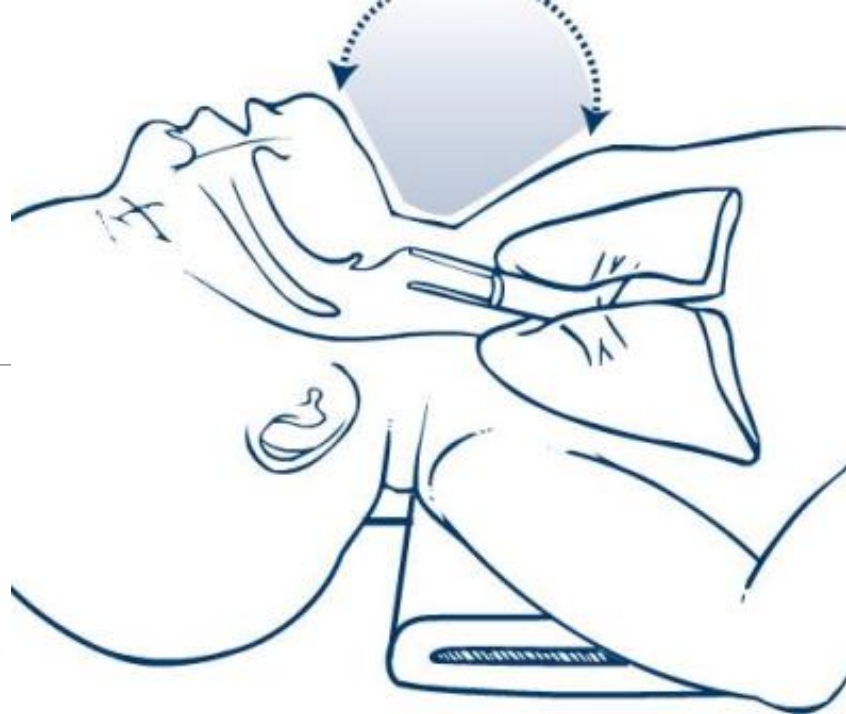


Position the head and neck to open the airway

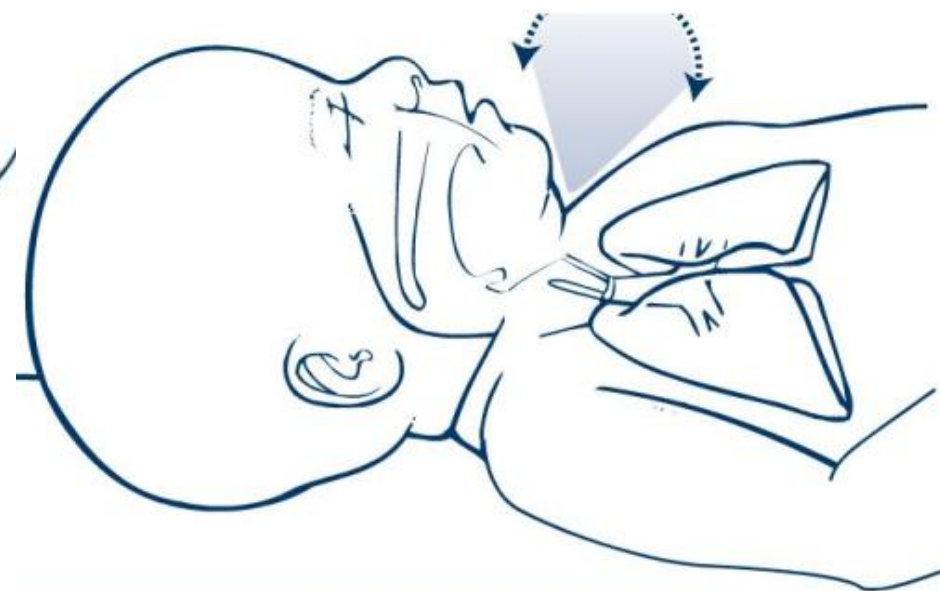
- ❖ Position the baby on the back (**supine**) with the head and neck neutral or slightly extended and the **eyes directed straight upward** toward the ceiling in the «**sniffing** the morning air" position.
- ❖ This position opens the airway and allows unrestricted air entry.



Incorrect
(hyperextension)



Correct



Incorrect
(flexion)

Clear secretions from the airway

- ❖ **Routine suction for a crying, vigorous baby is not indicated.**

- ❖ Clear secretions from the airway if the baby is not breathing, if the baby is **gasping**, if the baby has **poor tone**, if **secretions are obstructing the airway (like meconium)**, if the baby is having **difficulty clearing their secretions**, or if you **anticipate starting PPV**.

- ❖ Secretions may be removed from the upper airway by suctioning gently with a bulb syringe.

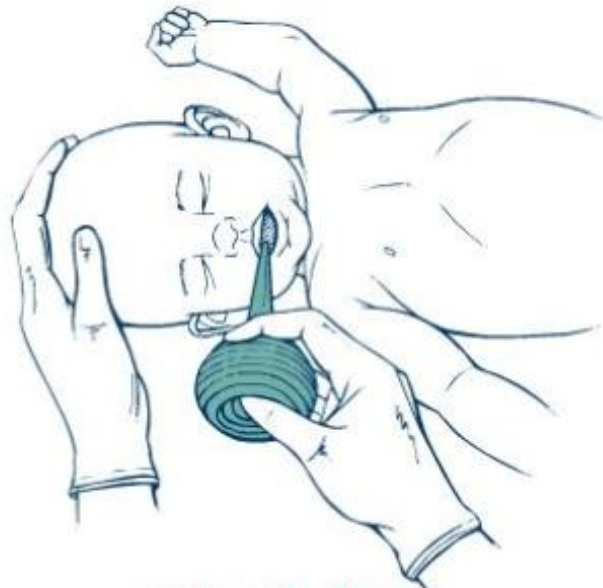
- ❖ Newborn has copious secretions coming from the mouth, turn the head to the side. This will allow secretions to collect in the cheek where they can be removed.

- ❖ *Be careful not to suction vigorously or deeply. Vigorous suction may injure tissues.*

- ❖ Stimulation of the posterior pharynx during the first minutes after birth can produce a **vagal response** leading to bradycardia or apnea.

- ❖ If using a suction catheter, the suction control should be set so that the negative pressure reads approximately 80 to 100 mm Hg when the tubing is occluded.

Clear Airway



Mouth first...



then nose





A



B

How do you evaluate the newborn's response to the initial steps?

- ❖ Assess the newborn's respirations to determine if the baby is responding to the initial steps.
- ❖ This should take no more than an additional 30 seconds.

Evaluation

Evaluation occurs after initiation of each action and is based on primarily the following 3 signs:

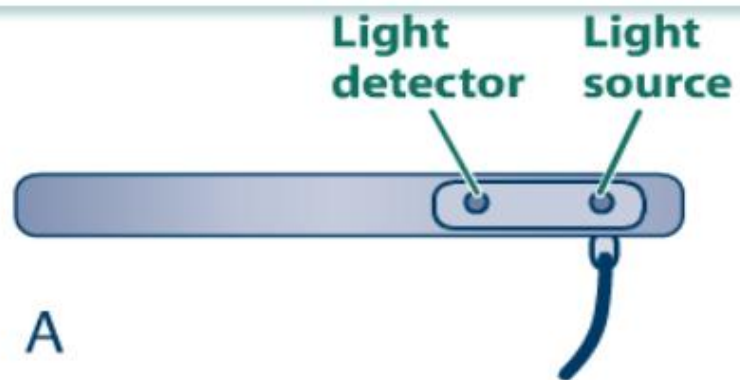
- **Respirations**
- **Heart rate**
- **Assessment of oxygenation (color or, preferably, **oximetry** reading).**

- ❖ If the baby is apneic, or has gasping respirations after initial steps, **proceed directly to PPV**. Gasping respirations are ineffective and are treated the same as apnea.
- ❖ If the baby has not responded to the initial steps within the first minute of life, it is not appropriate to continue to provide only tactile stimulation.
- ❖ For babies who remain apneic or bradycardic, **delaying the start of PPV** beyond the first minute of life worsens outcomes.
- ❖ **Ventilation of the baby's lungs is the most important and effective step during neonatal resuscitation.**
- ❖ If the baby is breathing effectively, the heart rate should be at least 100 bpm.
- ❖ If the heart rate is less than 100 bpm, **start PPV even if the baby is breathing.**

What do you do if the baby is breathing and the heart rate is at least 100 bpm, but the baby appears persistently cyanotic?

- ❖ Healthy babies may have central cyanosis for several minutes after birth.
- ❖ Visual assessment of cyanosis is not a reliable indicator of the baby's oxygen saturation and should not be used to guide oxygen therapy.
- ❖ If persistent central cyanosis is suspected, a pulse oximeter placed on the right hand or wrist should be used to assess the baby's oxygenation.

- ❖ **Pulse oximetry may not function if the baby's heart rate is low or if the baby has poor perfusion.**
- ❖ In this case, determining the heart rate with a **cardiac monitor (ECG)** is the preferred method.
- ❖ In unusual circumstances, a cardiac monitor may show an electrical signal, but the heart is not actually pumping blood. This is called **pulse-less electrical activity (PEA)**.
- ❖ In the newborn, PEA should be treated the same as an absent heart rate (**asystole**).



A



B

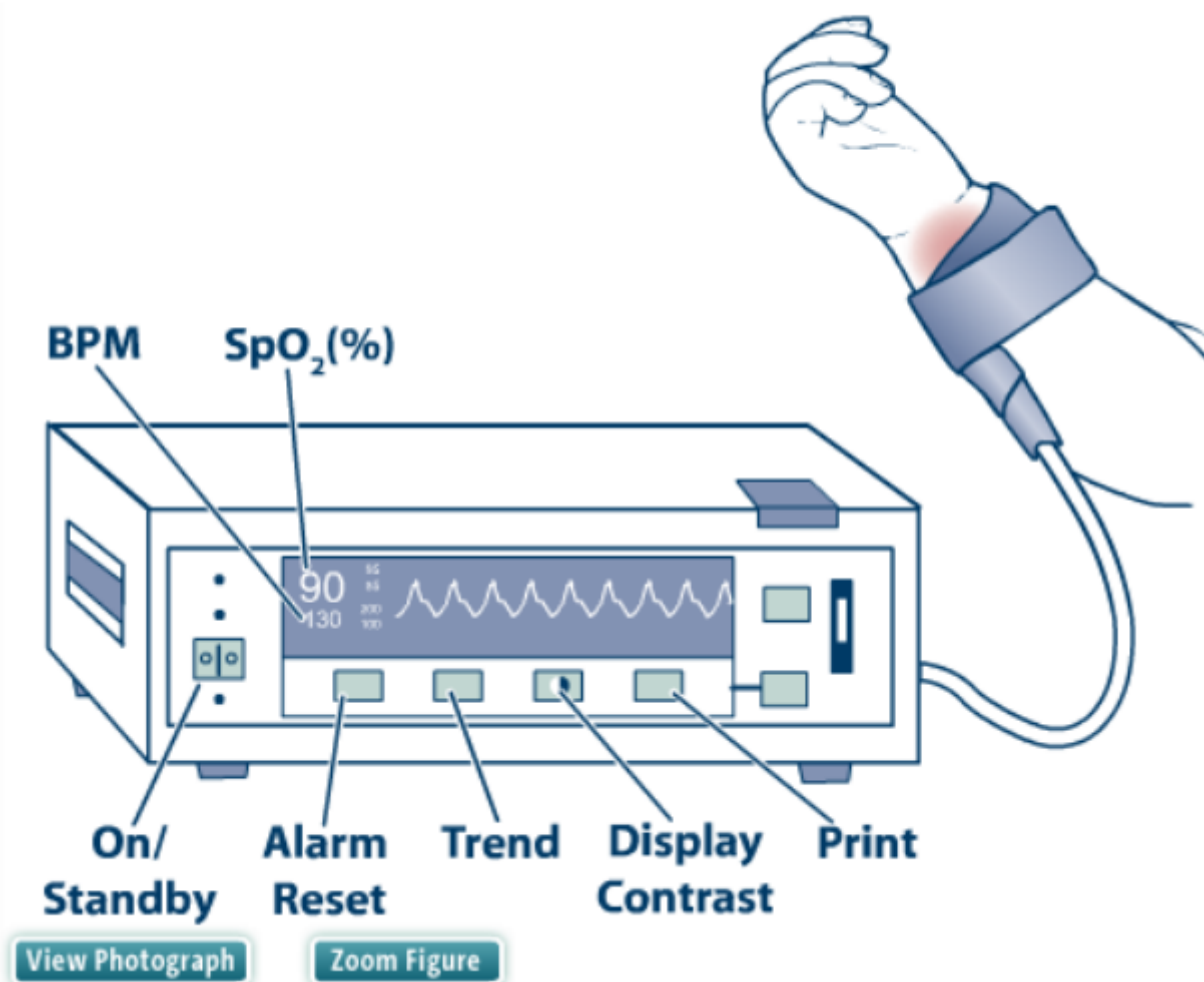


Figure 2.16. Oximeter probe (A) attached to a baby's hand on the hypothenar eminence

Indications for Pulse Oximetry

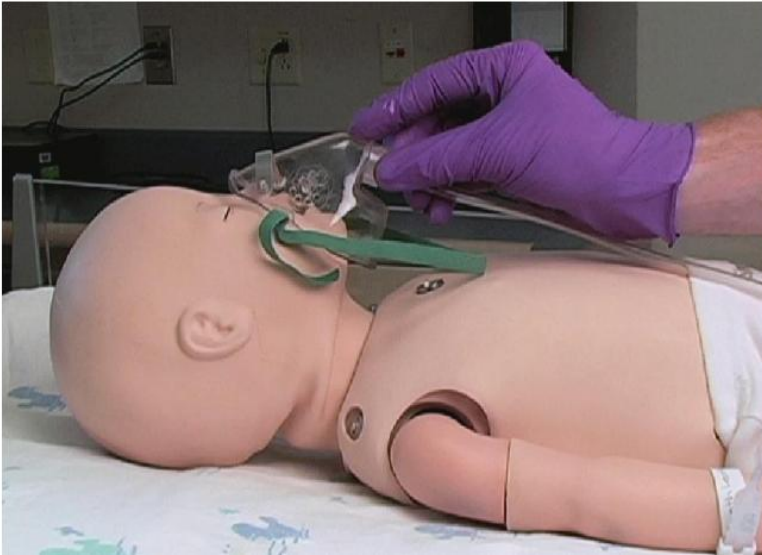
- When resuscitation is anticipated
- To confirm your perception of persistent central cyanosis
- When supplemental oxygen is administered
- When PPV is required

Targeted 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%

- ❖ Free-flow oxygen can be given to a spontaneously breathing baby by holding oxygen tubing close to the baby's mouth and nose. **Free-flow oxygen is not effective if the baby is not breathing.**
- ❖ If you are using a flow-inflating bag or T-piece resuscitator, hold the mask close to the face but not so tight that you make a seal and pressure builds up within the mask.
- ❖ If a flow-inflating bag is used, the bag *should not inflate when used to provide free-flow oxygen.*
- ❖ If a T-piece resuscitator is being used, do not occlude the opening on the T-piece cap. During free-flow oxygen administration, the T-piece pressure manometer should read zero.
- ❖ **Do not attempt to administer free-flow oxygen through the mask of a self-inflating bag** because gas does not reliably flow through the mask unless the bag is being squeezed.

Free-flow Oxygen Given Via Oxygen Mask

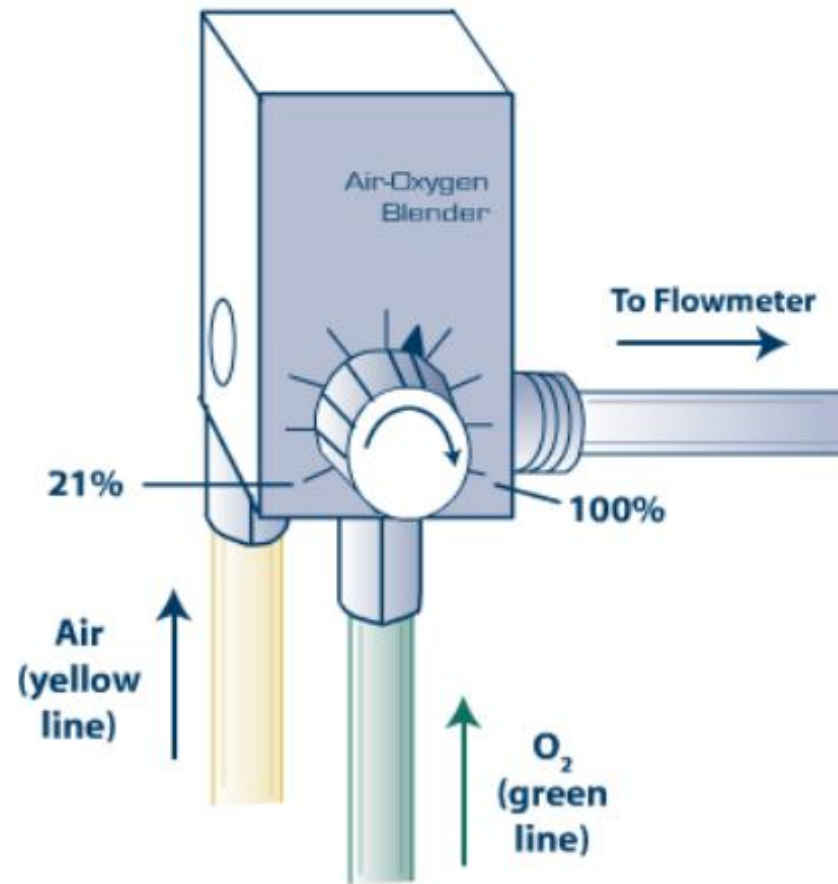




How is the concentration of supplemental oxygen adjusted?

- ❖ If supplemental oxygen is necessary, it is reasonable to **start with 30%**.
- ❖ Then, guided by pulse oximetry, adjust the **FI02** to maintain the baby's oxygensaturation within the target range.
- ❖ **The goal** is to prevent low oxygen saturations without exposing the newborn to the potential risk of additional, unnecessary oxygen.
- ❖ Adjust the concentration and flow of supplemental oxygen using **compressed air and oxygen, a blender, and a flow meter**.

Use a Blender to Give Different Concentrations of Oxygen



Oxygen blender and flowmeter

- ❖ The compressed gases are connected to a blender, which has a dial that adjusts the gas mixture (21 %-100%).
- ❖ The blended gas travels to an adjustable flow meter. Depending on the size of the flowmeter, you can adjust the dial to achieve gas flows **between 0 L/min and 20 L/min**.
- ❖ The blended gas, adjusted to the desired concentration and flow rate, is directed through tubing to the oxygen delivery device.
- ❖ For free-flow supplemental oxygen, **adjust the flowmeter to 10 L/min**.
- ❖ Begin free-flow oxygen supplementation with the blender set to 30% oxygen. Using the blender, adjust the FI_{O2} as needed to achieve the oxygen saturation target.

If an oxygen blender is not available

- ❖ If supplemental free-flow oxygen is necessary and an oxygen blender is not available, such as when resuscitation occurs outside the delivery room, free-flow oxygen may be delivered by using 100% oxygen from your wall or portable oxygen source.
- ❖ As oxygen flows out of the tubing or mask, it mixes with air.
- ❖ **The closer the tubing or mask is to the face, the higher the concentration of oxygen breathed by the baby.**
- ❖ Guided by pulse oximetry, adjust the FI_{O_2} by moving the tubing or mask closer to or farther from the baby's face.

❖ If the baby continues to require supplemental oxygen after the first few minutes, to prevent heat loss, oxygen given to newborns for a prolonged period of time should be **heated and humidified**.

❖ If the baby has labored breathing, or the oxygen saturation cannot be maintained within the target range despite 100% oxygen, you may consider a trial of continuous positive airway pressure (CPAP) or PPV.

❖ If desired, a trial of CPAP in the delivery room can be given by using a **flow-inflating bag or a T-piece resuscitator** attached to a mask that is held tightly to the baby's face .

❖ **CPAP cannot be given using a self-inflating bag.**

Meconium-stained fluid and a vigorous newborn

- ❖ If the baby is vigorous with good respiratory effort and muscle tone, the baby may stay with the mother to receive the initial steps of newborn care.

Meconium-stained fluid and a non-vigorous newborn

- ❖ If a baby is born through meconium-stained amniotic fluid and has depressed respirations or poor muscle tone, bring the baby to the radiant warmer and perform the initial steps of newborn care.
- ❖ You will use a bulb syringe to clear secretions from the mouth and nose.
- ❖ If the baby is not breathing or if the baby is breathing and the heart rate is less than 100 bpm after the initial steps are completed, proceed with PPV.
- ❖ **Routine laryngoscopy with or without intubation for tracheal suction is not suggested.**
- ❖ Intubation and tracheal suction may be necessary if PPV does not inflate the lungs and airway obstruction is suspected.

**If the baby is breathing and the
HR>100 bpm, but:**

- **Respirations are labored,**
- or**
- **The baby has persistent cyanosis**



CPAP by face mask

You should also attach an **oximeter to assess the efficacy of your action and the possible need for **supplemental O₂**.**

Indications of PPV

After completing the initial steps, positive-pressure ventilation (PPV) is indicated :

- ❖ if the baby is not breathing
- ❖ if the baby is gasping
- ❖ if the baby's heart rate is less than 100 beats per minute (bpm).

از توجه شما سپاسگزارم