Unexpected Delivery

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Unexpected deliveries are rare, albeit stressful, emergency department events for which clinicians must always be prepared. Although the vast majority of newborns (90%) require minimal interventions (eg, warming, drying, or stimulation) as they transition to the extraterrestrial environment, emergency physicians must recognize when and how to resuscitate the remaining 10%.

In November 2015, the American Heart Association (AHA) published new guidelines that highlight important factors that must be addressed in the initial management of newborns, including the infant's gestational age, tone, and respiratory effort. If these three components are reassuring (ie, the patient is a full-term, crying newborn with good tone), the neonate can likely be placed with the mother and routine care may be continued. However, if these elements are concerning or cannot be adequately addressed, further investigation and intervention are appropriate (Figure 1).

As with any resuscitation, it is paramount to effectively manage the neonate's airway, breathing, and circulation.

Airway

Deep suctioning of the nasopharynx should generally be avoided given the potential risk of bradycardia or a vagal response. In addition, the updated guidelines discourage routine tracheal intubation for depressed newborns with meconium-stained amniotic fluid. The recommendations emphasize the importance of augmenting the patient's respiratory effort with positive-pressure ventilation (PPV). Intubation can be considered if there is no improvement.

Breathing

Clinicians should evaluate the patient's heart rate and supplement with PPV when indicated. Specifically, PPV with a bag-valve-mask (BVM) should be initiated if the heart rate falls below 100 bpm or the patient's respiratory effort is inadequate. Preadult oxygen monitoring, which provides up-to-date oxygen saturation levels, can be achieved by placing a pulse oximetry probe on the right upper extremity. If the infant's heart rate remains low and/or saturations do not improve, it may be appropriate to place an advanced airway using an endotracheal tube (ETT) or laryngeal mask airway.

Circulation

Careful circulatory monitoring is a critical component of newborn resuscitation. The patient's heart rate should be monitored with a three-lead ECG. If the heart rate remains below 60 bpm despite adequate ventilation...
and the placement of an advanced airway, chest compressions should be initiated (3 compressions to 1 breath). The two-thumb compression technique is preferred. If bradycardia persists, the clinician should evaluate for other reversible causes and prepare for the potential administration of medication.

If peripheral IV access cannot be obtained, an emergent umbilical venous catheter (UVC) or intrathecal needle can be used. Further resuscitation efforts include the administration of epinephrine (IV or ETT), crystalloid solution, and blood (10 mL/kg) if there is concern for hypovolemia.

**Additional Considerations**

Delayed umbilical cord clamping (30-60 seconds after birth) is recommended for uncomplicated deliveries. Although newborn temperatures should typically remain between 36.5°C (97.7°F) and 37.5°C (99.5°F), there may be specific circumstances in which therapeutic hypothermia is indicated (eg, when there is a concern for hypoxic-ischemic encephalopathy).

Glucose monitoring may be especially appropriate for infants with risk factors for glucose dysregulation. Newborns should undergo prenatal laboratory tests and additional standard-of-care treatments, including the administration of vitamin K and erythromycin eye drops; however, these interventions do not need to occur in the emergency department. In addition, Apgar scores should be assessed and documented.

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**KEY POINTS**

- Although 90% of neonates require relatively minimal interventions, emergency clinicians must be prepared to employ additional resuscitation efforts, if needed.
- Management of the patient’s airway, breathing, and circulation remain essential components of newborn resuscitation.
- Monitoring should include the use of a three-lead ECG and oxygen saturation probe (placed on the right upper extremity).
- PPV with a BVM is a cornerstone of neonatal management and should be initiated if the patient’s heart rate drops below 100 bpm.
- Cardiopulmonary resuscitation (3 compressions to 1 breath) should be initiated if the neonate's heart rate drops below 60 bpm.

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**AHA Neonatal Resuscitation Algorithm — 2015 Update**

1. Antenatal counseling
   Team briefing and equipment check
   - Birth
     Team gestation? Good tone? Breathing or crying?
     - YES
     - NO
     Warm infant and maintain normal temperature, position airway, clear secretions if needed, dry. Ongoing evaluation

     - Apnea or gasping? HR below 100 bpm?
     - YES
     - NO
     Labored breathing or persistent cyanosis?

     - YES
     - NO

     - PPV
     - SpO2 monitor
     - Consider ECG monitor

     - Position and clear airway
     - SpO2 monitor
     - Supplementary O2 as needed
     - Consider CPAP

     - HR below 100 bpm?
     - YES
     - NO
     - Postresuscitation care
     - Team debriefing

     - NO
     - Check chest movement
     - Ventilation corrective steps if needed
     - ETT or laryngeal mask if needed

     - HR below 60 bpm?
     - YES
     - Intubate if not already done
     - Chest compressions
     - Coordinate with PPV
     - 100% O2
     - ECG monitor
     - Consider emergency UVC

     - HR below 60 bpm?
     - YES
     - IV epinephrine if HR persistently below 60 bpm
     - Consider hypovolemia
     - Consider pneumothorax

<table>
<thead>
<tr>
<th>Targeted Preductal SpO2 After Birth</th>
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<tbody>
<tr>
<td>1 min 60%-65%</td>
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<tr>
<td>2 min 65%-70%</td>
</tr>
<tr>
<td>3 min 70%-75%</td>
</tr>
<tr>
<td>4 min 75%-80%</td>
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<tr>
<td>5 min 80%-85%</td>
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<td>10 min 85%-95%</td>
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