Student Objectives

After completing this section the student will be able to:

1. Identify three physiologic and/or anatomic features unique to the newborn
2. List three perinatal factors key to assessment and treatment of the newborn
3. State how to use the Pediatric Assessment Triangle for newborn evaluation.
4. List three methods of minimizing heat loss

Student Objectives continued

5. List two indications and two contraindications for vascular access
6. List two complications of the immediate postnatal period and outline their management
7. Demonstrate newborn delivery
8. Demonstrate depressed newborn resuscitation

Care of the Neonate

Introduction

– Newborn deliveries cause high anxiety for paramedics.
– Most are uncomplicated, but the abnormal fetal presentation or the depressed newborn present major challenges in the field.
– Airway maintenance, oxygenation/ventilation, and avoiding heat loss are the most important prehospital skills.
– Precipitous deliveries by women who have had no prenatal care are the highest risk situations and result in significant newborn morbidity and mortality.
Care of the Neonate

Respiratory System

– The birth of a child results in major adaptive changes for nearly every organ system.
– Fetal lung fluid is removed from the alveoli during the birth process as the chest is squeezed while the infant passes through the birth canal.
– Most infants have no difficulty taking their first few breaths, and the initial cyanotic color dissipates rapidly (although a dusky color of the hands and feet, acrocyanosis, can remain for days).

– The infant's heart rate will drop if the lungs do not receive enough oxygen.
– If hypoxia persists, the heart rate continues to drop and blood pressure eventually falls.
– The longer the child is apneic, the greater the resuscitation effort needed to restore spontaneous respirations.
– A newborn with apnea requires immediate assisted ventilation.

Acrocyanosis vs Central Cyanosis

Care of the Neonate

Respiratory System continued

Circulatory changes of NB effects on respiratory system
Care of the Neonate

Respiratory System continued

– Newborns are obligate nose-breathers, and if the nasal canal is blocked at birth, the newborn may have signs of respiratory distress. Bulb syringe suctioning can usually remove nasal secretions which may cause respiratory distress.

– The tongue is proportionately larger than that of an adult, and can potentially obstruct the airway. Proper positioning of the infant will relieve this obstruction.

– Gastric distention can interfere with respiratory effort by impeding diaphragmatic movement.

Care of the Neonate

• Respiratory System continued
• Special considerations

• Pierre-Robin syndrome
• Coanal atresia
• Diaphragmatic hernia

Pierre-Robin Syndrome

Thermoregulation

– The newborn's body surface area is much greater and the infant's head is proportionately larger than an adult's.
– Both of these factors increase the child's risk of hypothermia due to heat loss.
Care of the Neonate

Important points in the initial history include:
- baby's due date,
- possibility of multiple births
- mother's illnesses such as diabetes or high blood pressure, presence of fever
- vaginal bleeding or passage of green fluid (meconium) from the vagina.

Care of the Neonate

Prenatal risk factors for birth of a depressed baby include:
- inadequate or no prenatal care
- maternal diabetes
- hypertension
- age less than 16 years or greater than 35 years
- maternal drug abuse

Care of the Neonate

Other risk factors include:
- premature rupture of membranes
- prolapsed cord
- abnormal presentation of the infant (e.g., feet first rather than head first)
- premature labor

Care of the Neonate

The Triangle and Newborn Evaluation
- Initial assessment of the newborn is based on the Pediatric Assessment Triangle.
- The Apgar Score is used in some EMS regions. However, the Triangle itself is adequate for evaluation of overall cardiopulmonary status.
- The only adjustment is in the evaluation of newborn appearance.
- Because the newborn has no developed interactive behavior, the important components of appearance are: cry, spontaneous motor activity and tone, and color.
Care of the Neonate

• After assessing appearance, evaluate work of breathing by listening for audible abnormal breath sounds, looking for retractions and inspecting for flaring.
• Then, assess circulation to skin by feeling for skin temperature, palpating the pulse at the umbilical stump, and judging CRT.
• Assure the child is being warmed, positioned and stimulated to establish accuracy of assessment.

Newborn delivery

Prepare the environment
- Newborns have limited ability to maintain their body temperature, thus, prepare a warm environment by turning up the heat in the area where the delivery will occur.
- Obtain towels for use in drying and warming the newborn. Have a small knit cap available to place on the infant’s head, and have a warming blanket available. Warm the ambulance prior to transport.
- Prepare all necessary equipment for delivery and resuscitation and, if more than one infant is expected, have a second set of resuscitation items available.

Depressed newborn resuscitation

Drying, warming, positioning
Suction, tactile stimulation
Oxygen
Bag-valve-mask ventilation
Chest compression
Intubation
Drug

APGAR Scoring

<table>
<thead>
<tr>
<th>Parameter</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A = Appearance (color)</td>
<td>blue or pale</td>
<td>pink with blue extremities</td>
<td>completely pink</td>
</tr>
<tr>
<td>P = Pulse (heart rate)</td>
<td>absent</td>
<td>&lt; 100</td>
<td>&gt; 100</td>
</tr>
<tr>
<td>G = Grimace (muscle tone)</td>
<td>limp</td>
<td>some flexion</td>
<td>Active motion</td>
</tr>
<tr>
<td>A = Activity (respiratory effort)</td>
<td>absent</td>
<td>slow, irregular</td>
<td>good, crying</td>
</tr>
<tr>
<td>R = Reflexes (irritability)</td>
<td>no response</td>
<td>grimace</td>
<td>cough or sneeze</td>
</tr>
</tbody>
</table>
Care of the Neonate

Vascular Access
- IV access is not usually needed
- Airway and breathing management are usually sufficient, even in the depressed baby.
- Potential access IV sites include the peripheral veins in the antecubital fossa, and the saphenous vein just anterior to the medial malleolus at the ankle.

Care of the Neonate

Vascular Access continued
- Attain vascular access only if needed for fluid administration or essential medications
- If access is needed because of hemorrhage, transport immediately and attempt IV access en route to the hospital
- Treat like a trauma patient, with acute blood loss, who needs blood products in the hospital.
- IO per protocol

Care of the Neonate

Vascular Access continued
- Epinephrine and naloxone may be administered via the endotracheal tube
  - *The ET dose of epinephrine is 0.03 mg/kg, not the dose of 0.1 mg/kg ET recommended for non-newborns*. (This dose is to be confirmed by OLMC)
  - *NRP – 0.1cc/kg of 1:10,000 IV/IO
    0.1cc/kg of 1:1000 ET*
  - Never give dextrose via an endotracheal route

Care of the Neonate

Meconium Aspiration
- A child distressed in utero by hypoxia, infection or other insult may lose rectal tone and expel sterile bowel contents (*meconium*) into the amniotic fluid
- Amniotic fluid stained by the green-black meconium signals possible fetal distress and possible aspiration risk for the newborn
- Meconium aspiration may be associated with hypoxia, pneumothorax or pneumonia
Care of the Neonate

Meconium Aspiration

- A child born with **thick meconium**, or who **has respiratory distress with thin or thick meconium** requires **copious suctioning** of the **mouth** and **nose**, to limit aspiration of tenacious meconium.
- However, focus on appropriate oxygenation and ventilation of the child do not get lost or excessively distracted into efforts at suctioning of meconium when respiratory distress or failure is present.

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**Case 1**

- You are called to the scene of an imminent delivery by a 15 y/o female
- This is her first pregnancy
- She received no prenatal care
- It is 40 minutes to the nearest hospital
- Quick evaluation shows the baby's head is crowning
- There is no meconium noted
Care of the Neonate

Case 1 questions

1. What is the important historical information that affects preparation?

2. Describe any special precautions or needs for the management of this case.

Care of the Neonate

Case 1 Answer

There are significant maternal risk factors:

- Age
- Lack of prenatal care
- Precipitous delivery

Be prepared for a depressed newborn that will need some extra work and possible full-blown resuscitation.

Care of the Neonate

- If the child is small and/or premature, this factor will add to the probability that there will be a depressed baby.
- Since there is no observed meconium, that means that there is less chance that the child had a major acute intrapartum event, such as hypoxia or ischemia, which would have greatly increased the possibility of severe depression.

Care of the Neonate

- It is important to control the delivery of the head and body of the baby. Then, assure that the basics are accomplished:
  - Cutting the cord at the perineum
  - Drying
  - Warming
  - Positioning
  - Suctioning
  - Tactile stimulation

- This is probably all that will be needed, but have equipment ready for further care.
Care of the Neonate

• If the child does not respond to simple measures and has abnormal elements in the Pediatric Assessment Triangle, immediately:
  ▪ apply oxygen  
  ▪ begin BVM ventilation  

• Rarely is further care with CPR, intubation or medication necessary.

Care of the Neonate

• However, if heart rate falls below 80/min, and does not respond to BVM, begin CPR at once, because the newborn is primarily dependent on heart rate to maintain perfusion of core organs.

  ▪ Most bradycardia in newborns will resolve with adequate oxygenation and ventilation.

Care of the Neonate

Case 2

  ▪ You respond to the scene of a 24 y/o female in active labor  
  ▪ This is her first child  
  ▪ she did receive prenatal care  
  ▪ but the baby was not due for 4 weeks  
  ▪ The pregnancy was uneventful  
  ▪ she does not expect multiple births.  
  ▪ On exam, you note that the infant is crowning  
  ▪ amniotic fluid is greenish and thick

Care of the Neonate

Case 2 questions

1. Identify important historical information.

2. Describe how you would treat expected complications?
Care of the Neonate

Case 2 Answer

- The most evident factor predicting a depressed baby is meconium-staining of the amniotic fluid.
- If the meconium is thick and particulate, this poses a special risk of aspiration with resultant pneumonitis and respiratory failure.
- Also, the presence of meconium suggests that a significant insult has occurred with the child.
- The early delivery is an additional red flag.

Care of the Neonate

- The key intervention here is:
  - suctioning of the meconium
  - airway/ventilation support
  - Since the child has not yet breathed,
  - copious suctioning,
  - proper positioning,
  - and oxygen are imperative.

Care of the Neonate

- If the child has no evidence of respiratory depression (good color, strong tone and reactivity, no retractions), apply oxygen and transport.
- However, if the child has already aspirated, or if significant respiratory distress occurs despite appropriate interventions:
  - continue vigorous suctioning of mouth and nose.

Care of the Neonate

- Do not forget to manage respiratory distress with BVM ventilation and intubation if needed.
- Transport as soon as airway and breathing are stabilized.
- IV or IO access should only be attempted en route if the infant has evidence of shock.
Care of the Neonate

Case 3
- You are called to the scene of a 21y/o female
- She just delivered a baby
- This was her third pregnancy
- She has received appropriate prenatal care.
- The mother has been holding the child on her breast since delivery, with the cord still attached.
- Assessment of the child shows poor color, tone, and reactivity.
- The respiratory rate is only 30/min, and the skin is cool with poor CRT and umbilical pulses.
- Cardiac monitor shows a rate of 80/min.

Case 3 questions
1. What are the key interventions?
2. When is transport appropriate?

Care of the Neonate

Case 3 Answer
The child is quite depressed
- The key interventions are:
  - placing the child at the perineum and cutting the cord
  - drying
  - warming and positioning
  - oxygen delivery with BVM and chest compressions

- If the HR slows further or fails to improve despite the interventions:
  - intubate the infant
  - Administer endotracheal epinephrine if the HR continues to be < 80/min. despite effective ventilation.
Care of the Neonate

- An important factor is the holding of the child above the perineum by the mother with the probable loss of blood into the placenta.
  - The child is in shock, and needs blood products immediately.
  - After intubation, transport and insert an IO needle to begin volume administration with 20 ml/kg of NS or LR initially
- However, since blood products are needed, manage fluids like a major trauma patient and expedite hospital transport