Neonatal/Pediatric Cardiopulmonary Care

When To Resuscitate

- Need usually related
- Combination of
- Can occur in

Causes of Fetal Asphyxia

- 
- 
- 
-
Apnea

Primary Apnea
- Hypoxia
- Hypertonicity
- Acidosis
- Asphyxia

Secondary Apnea
- No further attempt to breathe
- Efforts weaken & cease
- Efforts become weak (weak, gasping)
- Alveoli " fails
-Expiration
- Ventilation cease
- HR drops
- BP drops
- Tissue begins rapid respirations
- Alveoli " fails

Effect of Asphyxia on Lungs

• Initial adaption to extra-uterine life requires 2 steps:
  
• 

Effect of Asphyxia on Lungs

- Blood flow continues through d.a. & f.o. (by-passing lungs)
- Asphyxia
- Apneic or ineffective respirations
- Negative pressure not generated to open Alveol to push fluid out
- PaO2 ↓, PaCO2 ↑, ↓pH
- Pulmonary vasoconstriction
- Pulmonary hypertension
Effect of Asphyxia on Lungs

If asphyxia severe with lactic acidosis

Ventilation alone will not change acid-base imbalance

Effect of Asphyxia on Lungs

• In severe cases - might be beneficial to give HCO₃⁻ to
  •
  •
  •

Effect of Asphyxia on Lungs

• NOTE: *Adequate ventilation must be maintained when bicarb given!!!*

Why??
Effect of Asphyxia on Lungs

Preparation For Resuscitation

•
•
•

Basics of Neonatal Resuscitation

3 steps:
• A -
• B -
• C -
Resuscitation Cycle

Steps in Resuscitation

1st step =

Mechanisms of Heat Loss

- Radiation
  - Loss to
- Conduction
  - Loss to
- Evaporation
  - Loss when
- Convection
  - Loss to
Causes of Heat Loss

•
•
•

Cold Stress

Steps in Resuscitation

Next Step = Open airway

•
•
Steps in Resuscitation

Evaluate Respiratory Effort

Evaluate Heart Rate
Indications for PPV

- 
- 
- 
- 

Positive Pressure Ventilation

- Flow-inflating bag
- Self-inflating bag
- Pressure gauge
- Oxygen flow 5-8 lpm
- Pop-off at 30-40 cmH₂O

PPV Technique

- Slightly extend neck
- Mask held with thumb & forefinger
- Bag squeezed with fingertips
- Initial rate -
- Done for 15-30 sec., then re-evaluate
- May require -
Re-evaluate Heart Rate

<table>
<thead>
<tr>
<th>Below 100</th>
<th>60 - 100</th>
<th>Above 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate resuscitation if HR is below 80 after 30 sec. PPV with 100% oxygen and chest compressions</td>
<td>HR not increasing, continue ventilation, chest compressions if HR &lt; 100</td>
<td>HR increasing, continue ventilation</td>
</tr>
</tbody>
</table>

Chest Compressions

- 2 fingers or thumbs
- On nipple line
- Sternum depressed
- 1/3-1/2 chest depth
- 3:1 compression-to-ventilation ratio
- Continue for 30 sec., stop for 6 sec. to re-evaluate HR
- DC’d when HR > 80, then re-evaluate RR

Indications for Intubation

- Bag/mask ventilation is difficult or ineffective
- Prolonged PPV is required
- Thick meconium is present in amniotic fluid
- Suspicion of diaphragmatic hernia
ETT Sizes

<table>
<thead>
<tr>
<th>TUBE SIZE (MM)</th>
<th>WEIGHT</th>
<th>GESTATIONAL AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>&lt;1000 g</td>
<td>&lt;28 weeks</td>
</tr>
<tr>
<td>3.0</td>
<td>1000-2000 g</td>
<td>28-34 weeks</td>
</tr>
<tr>
<td>3.5</td>
<td>2000-3000 g</td>
<td>34-38 weeks</td>
</tr>
<tr>
<td>4.0</td>
<td>&gt;3000 g</td>
<td>&gt;38 weeks</td>
</tr>
</tbody>
</table>

Laryngoscope Blades

- Size 1 for
- Size 0 for

Intubation Technique

- Same as adult
- Limit attempts to -
- Provide blow-by oxygen at -
- ETT tip midway between carina & clavicles
- Cut ETT to leave -
Position of ETT

Medications - Uses

Medications - Routes
Instillation Into ETT

L
A
N
E
O₂

Medications - Indications

• HR < 80 despite PPV and chest compressions for at least 30 sec.

• HR is 0

Epinephrine

• Powerful sympathomimetic
  •
  •
  •
• 1st drug given
• IV or ETT, delivered rapidly
• Repeated q3-5’ until HR -
Volume Expanders

- Given if hypovolemic
  - ↓ BP
  - Pallor with adequate oxygenation
  - HR > 100 with weak pulses
  - Failure to respond to resuscitation
- Whole blood, 5% albumin, plasma expanders, NS
- IV, may be repeated as needed

Sodium Bicarbonate

- Prolonged arrest & not responding
- Alkaline to buffer metabolic acidosis
- Only given when ventilation is adequate
- IV

Narcan (naloxone)

- Reversal of narcotic depression
  - Demerol (meperidine)
  - Morphine sulfate
  - Fentanyl (Sublimaze)
- IV, IM, sub-q, ETT
- Given rapidly
Resuscitation

Dopamine

- 
- 
- 

APGAR Scoring

- 
- 
- 
- 

APGAR Scoring

<table>
<thead>
<tr>
<th>Appearance</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse</td>
<td>Absent</td>
<td>Under 100</td>
<td>Over 100</td>
</tr>
<tr>
<td>Grimace</td>
<td>Unresponsive</td>
<td>Frown or grimace</td>
<td>Cry, sneeze or cough</td>
</tr>
<tr>
<td>Activity</td>
<td>Flaccid, limp</td>
<td>Some fission of extremities</td>
<td>Active fission, good motion</td>
</tr>
<tr>
<td>Respirations</td>
<td>Absent</td>
<td>Irregular, weak, gasping</td>
<td>Crying, vigorous gasping</td>
</tr>
</tbody>
</table>
Serum Glucose

Sources

- Nutritional needs of fetus supplied by Mom & regulated by placenta
- Fetus prepares for postnatal life by ↑ energy stores & developing enzyme-dependant processes for usage of stored energy

Serum Glucose

Energy Storage

- Glycogen
- Triglycerides (brown fat)

Serum Glucose

Post-delivery

At 2 hours -
By 3 days -
Serum Glucose

*Hypoglycemia*

Term -
Preterm -

Hypoglycemia - *Signs*

- Tremors
- Irritability
- ↑ or ↓ Moro reflex
- Apnea/tachypnea
- Cyanosis
- Seizures
- Lethargy
- Hypothermia
- Weak/high-pitched cry
- Poor feeding
- Vomiting
- CV failure

Hypoglycemia

CNS dysfunction
Apnea
Death
Hypoglycemia - Causes

- Hyperinsulinism
- Prematurity
- IUGR
- Starvation
- Sepsis
- Shock
- Asphyxia
- Hypothermia
- Glucogen Storage Disease
- Galactosemia
- Adrenal insufficiency
- Polycythemia
- Congenital heart defects
- Iatrogenic causes

Hyperinsulinism

- Fetus of diabetic Mom
- Rh incompatibility
- Insulin-producing tumors
- Maternal tocolytic therapy (ritodrine, terbutaline)

Glucose Measurement

- Glucose Test Strip “Dextrostik”
- “One Touch”
- Lab sample (blood glucose)
Hypoglycemia Treatment

- Early feeding (oral)
- D₁₀W
  - 200 mg/kg bolus over 1-3 minutes
  - Con’t IV, 4-8 mg/kg/min. until feedings started
- Treat cause

Umbilical Blood Sampling

- Umbilical Vein Catheter (UVC)
  - Usually placed in Delivery Room
  - Uses
    - 
    - 
    - 
    - 

Umbilical Vein Catheter (UVC)
Resuscitation

UVC

- Tip lies in IVC (through ductus venosus) at
- Should be removed

Umbilical Artery Catheter (UAC)

*Indications*

- 
- 
-
Umbilical Artery Catheter (UAC)

Placement

- 5 Fr. catheter (>1250 g), 3.5 Fr. catheter (<1250 g)
- Sterile procedure
- Heparinized, fluid-filled catheter

UAC

- High placement
- Low placement
- Each has own set of complications
Umbilical Artery Catheter

Complications

- 
- 
- 
- 
- 

Sampling Technique

- 
- 
- 
- 
- 

Case Study

After a normal pregnancy, an infant is born by spontaneous vertex delivery. There are no signs of fetal distress during labor. The mother received meperidine 2 hours before delivery. Immediately after delivery the infant is dried and placed under an overhead radiant warmer. At 1 minute after birth the infant has a heart rate of 80 beats per minute, gives irregular gasps, has blue hands and feet but a pink tongue, has some muscle tone but does not respond to stimulation.

- What is the infant's Apgar score at 1 minute?
Case Study

- Does this infant have asphyxia? Give your reasons.

- What is the probable cause of the asphyxia?

Case Study

- What should be the first 2 steps in resuscitating this infant?

Case Study

After being ventilated via bag/mask at 100% oxygen for 1 minute, spontaneous, vigorous breaths were noted and the heart rate was 105/min. Five minutes later, the infant is moving vigorously, respiratory rate is 32 and regular, heart rate is 144/min, coughs when the nasal passages are suctioned, fingers and toes appear to be slightly blue-tinged.

- What is this infant's Apgar score at 5 minutes?
Case Study

- What should be the management of this infant after resuscitation?