Neonatal/Pediatric Cardiopulmonary Care

Resuscitation

When To Resuscitate

- Need usually related
- Combination of
- Can occur in

Causes of Fetal Asphyxia

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S1c Resuscitation

Apnea

- Hypoxia
- Hypovolemic
- Hypoxemic
- Acidosis
- Asphyxia

Primary Apnea

- Ventilations cease
- HR drops
- BP drops
- Tissue begins rapid respirations
- Alveoli work

Secondary Apnea

- No further attempt to breathe

Effect of Asphyxia on Lungs

- Initial adaption to extra-uterine life requires 2 steps:
  - Negative pressure not generated to open Alveoli to push fluid out
  - PaO₂ ↓, PaCO₂ ↑, pH ↓
  - Pulmonary vasoconstriction
  - Pulmonary hypertension
  - Blood flow continues through d.a. & f.o. (by-passing lungs)

Effect of Asphyxia on Lungs

Asphyxia

- Apneic or ineffective respirations

...
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 HCO$_3^-$ to
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Effect of Asphyxia on Lungs

• NOTE:

**Adequate ventilation must be maintained when bicarb given!!!**

Why??

Consult Chapter 5 of the textbook for more detailed information.
Effect of Asphyxia on Lungs

Preparation For Resuscitation
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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

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Cold Stress

Steps in Resuscitation

Next Step = Open airway

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-
**Steps in Resuscitation**

- Evaluate Respiratory Effort
  - None or gasping:
    - PPV with 100% O2
    - Below 100: Evaluate heart rate
  - Spontaneous:
    - Below 100: Evaluate heart rate

**Evaluate Heart Rate**

- Above 100:
  - Evaluate color
    - Blue:
      - Provide oxygen
    - Pink or peripheral cyanosis:
      - Observe and monitor
Indications for PPV

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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

- Below 100:
  - Continue ventilation
  - Continue chest compressions
- 60-100:
  - HR not increasing:
    - Continue ventilation
    - Chest compressions if HR < 100
  - HR increasing:
    - Continue ventilation
- Above 100:
  - Watch for spontaneous respiration
  - Then discontinue ventilation

Immediate resuscitation if HR is below 80 after 30 sec. PPV with 100% oxygen and chest compressions.

Chest Compressions

- 2 fingers or thumbs
- Lower 1/3 of sternum
- Sternum depressed 1/2-3/4 inches
- 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>
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<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>34-36 weeks</td>
</tr>
<tr>
<td>4.0</td>
<td>&gt;3000 g</td>
<td>&gt;38 weeks</td>
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</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 -
Medications - Uses

- ...
- ...
- ...

Medications - Routes

- ...
- ...
- ...
- ...

Instillation Into ETT

N
A
V
E
L
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

Dopamine
APGAR Scoring

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APGAR Scoring

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Totally cyanotic</td>
<td>Pink body, blue extremities</td>
<td>Totally pink</td>
</tr>
<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>Crying, sneeze or cough</td>
</tr>
<tr>
<td>Activity</td>
<td>Flaccid, limp</td>
<td>Spasmodic flexion of extremities</td>
<td>Active flexion, good motion</td>
</tr>
<tr>
<td>Respiration</td>
<td>Absent</td>
<td>Irregular, weak, gasping</td>
<td>Crying, vigorous sucking</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
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- Triglycerides (brown fat)
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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 - 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
  - 
  - 
  - 
  - 

UVC
- Tip lies in IVC (through ductus venosus) at
- Should be removed
Umbilical Artery Catheter (UAC)

**Indications**

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

**Placement**
UAC

- High placement
- Low placement
- Each has own set of complications

UAC

Umbilical Artery Catheter

*Complications*

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Umbilical Artery Catheter

*Sampling Technique*

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