Neonatal Resuscitation & Special Considerations

EMC 420: Maternal & Child Emergency Care

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This presentation [L04] on neonatal resuscitation and special considerations will be adapted, with changes* , from material originating from:

American Academy of Pediatrics
American Heart Association
Neonatal Resuscitation Program

•Changes are in no way approved by the AHA or AAP, but rather are meant to fashioned to meet your EMC curriculum.

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Objectives

Lesson 6 : Medications; indications and technique
- **Epinephrine administration via**
  - **Endotracheal tube**

Lesson 7 : Problems that can complicate resuscitation
- **Discontinuance of CPR in the delivery room**
- **Use of Naloxone in the newborn**
- **Diaphragmatic hernia, choanal atresia and Robin syndrome**
- **Post resuscitation problems: seizures, hypotension, renal failure**

Other non-NRP discussion of epidemiology of newborn risk factors

Epinephrine: Indications

Heart rate less than 60 after

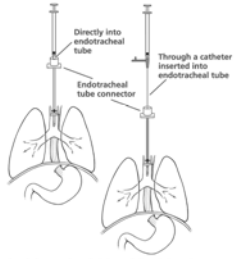
- **30 seconds of assisted ventilation and**
- **30 seconds of compressions and assisted ventilation**

Total 60 seconds

Note: Epinephrine *not* indicated before adequate ventilation established

Epinephrine: Administration Via Endotracheal Tube

- **Give directly into endotracheal tube[1]**
- **May use 5F feeding tube**
- **Dilution vs flush[1]**
- **After instillation, give positive-pressure ventilation**
- **[1] <u>not</u> evidence-based**

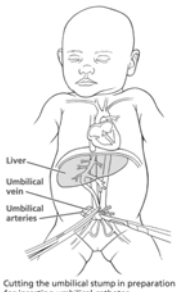


Epinephrine may be administered directly into the endotracheal tube (left) or through a catheter inserted into the endotracheal tube (right).

Epinephrine: Administration Via Umbilical Vein

Placing catheter in umbilical vein

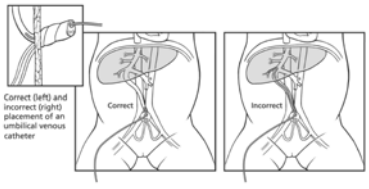
- **Preferred route**
- **3.5F or 5F end-hole catheter**
- **Sterile technique**



Cutting the umbilical stump in preparation for inserting umbilical catheter

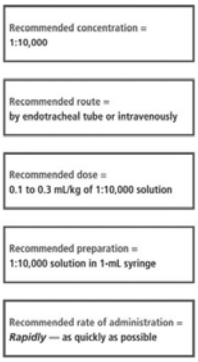
Epinephrine: Administration Via Umbilical Vein

- **Insert 2 to 4 cm**
- **Free flow of blood when aspirated**
- **Less depth in preterm newborns**
- **Insertion in liver may cause damage**



Correct (left) and incorrect (right) placement of an umbilical venous catheter

Epinephrine



Epinephrine: Poor Response (Heart Rate <60 bpm)

Recheck effectiveness of:

- **Ventilation**
- **Chest compressions**
- **Endotracheal intubation**
- **Epinephrine delivery**

Consider possibility of:

- **Hypovolemia**
- **Severe metabolic acidosis**

Poor Response to Epinephrine: Hypovolemia

Signs of Hypovolemia

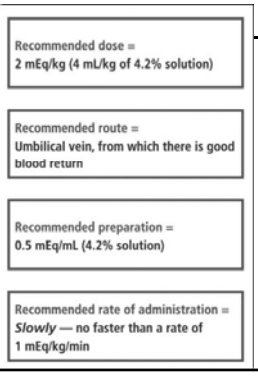
- **Pallor after oxygenation**
- **Weak pulses (high or low heart rate)**
- **Poor response to resuscitation**
- **Low blood pressure/poor perfusion**

Blood Volume Expansion: Acceptable Solutions

- **Normal Saline**
- **Ringer's lactate**
- **O-negative blood**

Blood Volume Expansion: Dose and Administration

Medications: Sodium Bicarbonate



Lesson 6: Medication Given: No Improvement

Recheck effectiveness of
- **Ventilation**
- **Chest compressions**
- **Endotracheal intubation**
- **Epinephrine delivery**

Consider possibility of
- **Hypovolemia**
- **Severe metabolic acidosis**

HR <60 → **Consider conditions such as**
- **Pneumothorax**
- **Diaphragmatic hernia**
- **Congenital Heart Disease**

or absent → **Consider discontinuing resuscitation**

Lesson 7: No Improvement After Resuscitation: Categories

- **Failure to begin spontaneous respirations**
- **Inadequate ventilation with positive-pressure ventilation**
- **Baby remains cyanotic or bradycardic despite good ventilation**

Failure to Initiate Spontaneous Respirations

- **Brain injury (hypoxic ischemic encephalopathy)**
- **Sedation secondary to maternal drugs**

Narcotic Antagonist: Naloxone Hydrochloride

Naloxone Hydrochloride

Recommended concentration =
1.0 mg/mL solution

Recommended route =
Endotracheal or intravenous preferred;
intramuscular or subcutaneous
acceptable but delayed onset of action

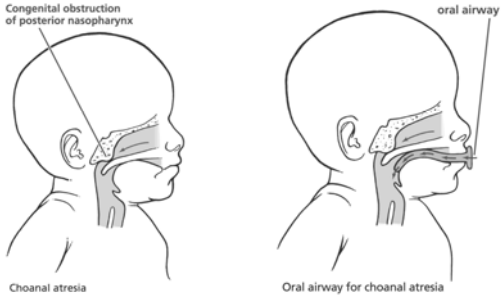
Recommended dose =
0.1 mg/kg

Positive-pressure Ventilation Fails to Produce Adequate Ventilation

Mechanical blockage of airway

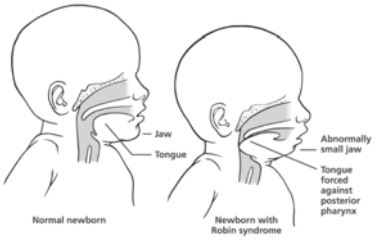
- **Meconium or mucous plug**
- **Choanal atresia**
- **Airway malformation**
- **Other rare conditions**

Mechanical Blockage of Airway: Choanal Atresia



Mechanical Blockage of Airway: Pharyngeal Airway Malformation

Robin syndrome



Normal newborn and newborn with Robin syndrome

Positive-pressure Ventilation Fails to Produce Adequate Ventilation

Impaired lung function

- **Pneumothorax**
- **Pleural effusion**
- **Congenital diaphragmatic hernia**
- **Pulmonary hypoplasia**
- **Extreme prematurity**
- **Congenital pneumonia**

Impaired Lung Function: Congenital Diaphragmatic Hernia

Compromised lung function from presence of a congenital diaphragmatic hernia

Post-resuscitation Problems

- **Pulmonary hypertension**
- **Pneumonia, aspiration, or infection**
- **Hypotension**
- **Fluid management**
- **Seizure, apnea**
- **Hypoglycemia**
- **Feeding problems**
- **Temperature management**

Post-resuscitation Problems: Premature Infants

- **Temperature management**
- **Immature lungs**
- **Intracranial hemorrhage**
- **Hypoglycemia**
- **Necrotizing enterocolitis**
- **Oxygen injury**

Ethical Principles: Starting and Stopping Resuscitation

- **No different than older child or adult**
- **No advantage to delayed, graded, or partial support**
- **Support can be withdrawn after initiation**
- **Base decision on data (may not be available in delivery room)**
- **Communicate with family prior to resuscitation if possible**

Ethical Decisions: Non-initiation of Resuscitation

- **Confirmed gestation < 23 weeks or birthweight < 400 grams**
- **Anencephaly**
- **Confirmed trisomy 13 or 18**

Lesson 7: Ethical Decision: Stopping Resuscitation

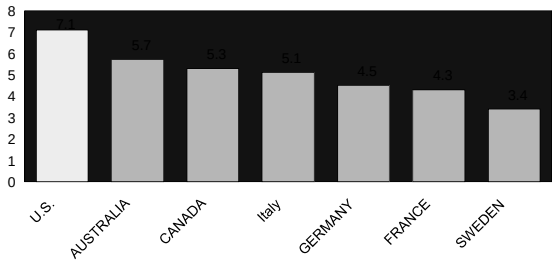
- **Ensure adequate resuscitation efforts**
- **May stop after 15 minutes of asystole**
- **Ongoing evaluation, discussion with parents and team, if prognosis uncertain**

Epidemiology of Infant Mortality

- **Definition:**
  - **Deaths in First Year of Life per 1000 Live Births**
- **Infant mortality in the US compared to other nations**
- **Infant mortality in various populations within the US**

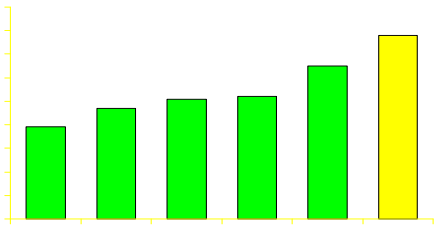
Infant Mortality

Deaths in First Year of Life per 1000 Live Births
1999



Infant Deaths by Income, Canada

Even the Poor Do Better than U.S. Average



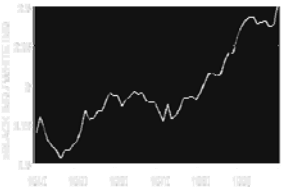
Infant Mortality Disparity

Black deaths/white deaths ratio

- Ratio has steadily worsened since the late 70's

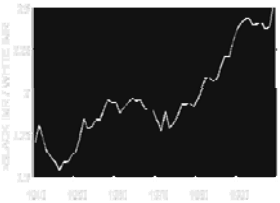
Why the widening disparity

- Could income distribution be associated with increased mortality in the US ?



Economic Disparity and Infant Mortality

- Income distribution in US found to be associated with increased mortality
- A cross sectional ecological study in the US looked at income distribution and mortality.
- Size of the gap between the wealthy and less well off - more than the absolute standard of living of the poor seems to be a significant mortality factor
- Findings suggest that policies that deal with growing inequities in income distribution may have an important impact on the health of the population.
- *Kennedy, Kawachi, Prothrow-Stith, Harvard School of Public Health BMJ 1996;312:1004-1007*



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