Neonatal Resuscitation: What you need to know!

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Objectives:

- Recognize which neonates require resuscitation
- Understand the steps to resuscitation (NRP guidelines)
- Understand the subsequent management of a baby that has required resuscitation-clinical case
Physiology

• Difficulties Transitioning
  – Risk factors
    • Maternal conditions (advanced age, diabetes, hypertension, substance abuse)
    • Fetal conditions (prematurity, postmaturity, multiple gestation, anomalies)
    • Antepartum problems (oligohydramnios, polyhydramnios, placental anomalies)
    • Delivery (breech, transverse, meconium, maternal narcotics, difficult delivery)

• Difficulties Transitioning
  – Lack of respiratory effort
  – Blockage of the airways
  – Impaired lung function
  – Persistent pulmonary hypertension
  – Cardiac anomalies
Inverted Pyramid of Newborn Resuscitation

Frequency

- Postnatal assessment
- Provide warmth, stimulation, position
- Bag-mask ventilation
- Endotracheal intubation
- Chest compressions
- Epinephrine
- Volume expansion

Intervention

- 1/10
- 3–5/100
- 1/100
- 1/1000
- 5/10,000
- 1/12,000

Inverted triangle and frequency (bar on right) of interventions performed in the delivery room.


Newborn Resuscitation

- Term gestation? Breathing or crying? Good color?
  - Yes, stay with mother
  - Warm, clear airway if necessary, try stimulate

- HR below 100: gasping, or cyanosis?
  - No
  - PPH, SpO2, monitoring
    - HR below 100?
      - Yes
      - Take ventilation corrective steps
      - HR below 60?
        - No
        - Consider intubation
          - Chest compressions
            - Consult with PPV
              - HR below 60?
                - Yes
                - IV ephedrine

- Laboring breathing or persistent cyanosis?
  - Yes
  - Chest airway
    - SpO2, monitoring
      - Consider CPAP

Routine care
- Provide warmth
- Clear airway if necessary
- Drapings evaluation

Targeted PPV
- 1 min
- 2 min
- 3 min
- 4 min
- 5 min
- 10 min

**Note:** This diagram is an example of the resuscitation process for newborns. The specific interventions and timings may vary depending on institutional protocols and patient needs.
Who Requires Resuscitation?

Answer 3 questions:

1) Term gestation?
2) Breathing or Crying?
3) Good tone?

Who Requires Resuscitation?

**APGAR SCORING SYSTEM**

<table>
<thead>
<tr>
<th>Points</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>Points totaled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity (muscle tone)</td>
<td>Absent</td>
<td>Arms and legs flexed</td>
<td>Active movement</td>
<td></td>
</tr>
<tr>
<td>Pulse</td>
<td>Absent</td>
<td>Below 160 bpm</td>
<td>Over 160 bpm</td>
<td></td>
</tr>
<tr>
<td>Grimace (cough irritability)</td>
<td>Hacrid</td>
<td>Some flexion of extremities</td>
<td>Active motion (sneeze, cough, pull away)</td>
<td></td>
</tr>
<tr>
<td>Appearance (skin color)</td>
<td>Blue, pale</td>
<td>Body pink, extremities blue</td>
<td>Completely pink</td>
<td></td>
</tr>
<tr>
<td>Respiration</td>
<td>Absent</td>
<td>Slow, irregular</td>
<td>Vigorous cry</td>
<td></td>
</tr>
</tbody>
</table>

Severely depressed 0-3
Moderately depressed 4-6
Excellent condition 7-10
Newborn Resuscitation

- General Overview of Resuscitation Steps
  - Warm, suction, dry and stimulate
  - Further intervention
    - Breathing
    - Circulation
    - Drugs

The most recent changes to NRP:

A. No longer routinely perform tracheal suctioning for non-vigorous infants with meconium staining
B. Use of cardiorespiratory monitor is the preferred method for assessing the heart rate in newborn infants
C. Recommend to intubate prior to chest compressions
D. There were changes to NRP??
Newborn Resuscitation

**Meconium**

Non-vigorous newborns with meconium stained fluid DO NOT require routine intubation and tracheal suctioning.

“Meconium stained amniotic fluid is a perinatal risk factor that requires the presence of one resuscitation team member with full resuscitation skills, including endotracheal intubation”

-NRP Instructor Update

Approximately what percentage of term infants have meconium stained amniotic fluid?

A: 5%
B: 12%
C: 27%
D: 53%
E: All of them….They ALL have Meconium!

“Meconium stained amniotic fluid is a perinatal risk factor that requires the presence of one resuscitation team member with full resuscitation skills, including endotracheal intubation”

-NRP Instructor Update
Newborn Resuscitation

Meconium

– In 2000, routine suctioning for vigorous infants with meconium stained fluid was no longer recommended

– 2012 study found for each 30 second delay of bag valve mask ventilation increased mortality and morbidity by 16%

– 2015 First randomized study comparing suctioning vs no suctioning in non-vigorous infants found no difference in meconium aspiration syndrome, asphyxia, mortality or PPHN

Newborn Resuscitation

Meconium Take Home Message

• Little or no evidence suggesting a benefit to suctioning and at least some evidence of potential harm
• Routine suctioning is no longer recommended
• If the infant requires respiratory support this should begin as soon after birth as feasibly possible
Newborn Resuscitation

CASE 1

Introduction – Multiparous female to ED with severe contractions; is preterm (28 weeks); precipitous delivery of pre-term neonate as put into resuscitation bay.

PMH for mother – G6P6, Normal prenatal visits, estimate gestational age 28 weeks currently, no other issues.

Exam for mother – Awake, alert, stable, can provide appropriate history as needed
Newborn Resuscitation

Initial Description of Neonate –
Placed in warmer; is not breathing or crying; poor muscle tone; cyanotic; note clear amniotic fluid.

Exam –
Cyanotic neonate, unresponsive, floppy
No respiratory effort/apneic
Heart rate 50’s (< 60)
APGAR = 1
Newborn Resuscitation

• What is the next step?
  – “ABCDs”
    • Initial steps – provide warmth, suction Airway as necessary, dry, stimulate
    • Reassess
    • Ventilation corrective steps (Breathing)
    • Reassess
    • Chest compressions
    • Reassess
    • Give Drugs

Newborn Resuscitation

• Initial steps
  – Provide warmth
    • Warm towels
    • Radiant warmer
  – Clear airway as necessary
  – Dry and stimulate
  – Reassess
Newborn Resuscitation

CASE 1

Reassessment

Patient remains:
Cyanotic
Apneic
Pulse is in the 50s

Newborn Resuscitation

• Subsequent steps
  – Positive-pressure ventilation (PPV)
    • Self-inflating bag
    • Position neck in neutral position
    • Ventilate at 40-60 bpm
    • ECG (3-lead) monitoring
  – SpO2 monitoring
    • Right hand or wrist
  – Reassess

HR less than 100? Gasping or Apnea? 
Yes
No
Labored Breathing Cyanosis

Positive-Pressure Ventilation SpO2 monitoring

30 sec

HR below 100?

Yes

Clear airway SpO2 monitor CPAP?
Newborn Resuscitation

CASE 1

Reassessment

Somewhat improved heart rate and color

Heart rate increases to 90’s with continued PPV

Oxygen saturation in the 80’s

Newborn Resuscitation

Quick Tangential Point

- Pulse oximetry
  - Attached to preductal location on right upper extremity
  - Saturation may normally remain low for several minutes after delivery

<table>
<thead>
<tr>
<th>Targeted preductal SpO2 after delivery</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 min</td>
<td>60-65 percent</td>
</tr>
<tr>
<td>2 min</td>
<td>65-70 percent</td>
</tr>
<tr>
<td>3 min</td>
<td>70-75 percent</td>
</tr>
<tr>
<td>4 min</td>
<td>75-80 percent</td>
</tr>
<tr>
<td>5 min</td>
<td>80-85 percent</td>
</tr>
<tr>
<td>10 min</td>
<td>85-95 percent</td>
</tr>
</tbody>
</table>
Newborn Resuscitation

• Subsequent steps
  – Heart rate between 60-100 BPM
    • Ventilation corrective steps
    • Continue BMV ventilation (30 sec)

HR below 100? No
Yes

Postresus. care

Ventilation corrective steps
HR < 100 but > 60?

Yes
Continue ventilation
No

HR < 60?

Newborn Resuscitation

Quick Tangential Point

• Ventilation Corrective Steps – 3 possible reasons for ineffective ventilation
  – Inadequate mask seal
  – Airway is blocked
  – Not enough pressure used

<table>
<thead>
<tr>
<th>Measures to improve positive-pressure ventilation</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
</tr>
<tr>
<td>R</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>O</td>
</tr>
<tr>
<td>P</td>
</tr>
<tr>
<td>A</td>
</tr>
</tbody>
</table>
**Newborn Resuscitation**

**CASE 1**

**Reassessment**

Heart rate increases to > 100 with continued PPV

Attempts to provide supplemental oxygen result in decreasing oxygen saturation and decreasing heart rate

Obvious inadequate respiratory effort

---

**Newborn Resuscitation**

Your kind of stuck here aren’t you…

- HR below 100? [No]
  - Ventilation corrective steps
    - HR < 100 but > 60? [Yes]
    - Postresus. care
    - HR < 60? [No]
    - Continue ventilation
  - No
- Yes
Newborn Resuscitation

What to do if positive-pressure ventilation is to be continued...

- Consider placing an orogastric tube to...
  - Suction gastric contents
  - Serve as vent for air in stomach
- Consider endotracheal intubation for...
  - Bag-mask ventilation is ineffective or prolonged
  - Chest compressions
  - Special circumstances

Newborn Resuscitation

CASE 1

Reassessment

Heart rate with PPV remains above 100

Color improved

Continue to provide respiratory support (oxygen saturation in low 90’s)

NICU team present with warmer
Endotracheal Tube Selection for Newborn Resuscitation

<table>
<thead>
<tr>
<th>Tube Size</th>
<th>Gestational Age (Weeks)</th>
<th>Weight (Grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>&lt; 28</td>
<td>&lt; 1,000</td>
</tr>
<tr>
<td>3</td>
<td>28 – 34</td>
<td>1,000 – 2,000</td>
</tr>
<tr>
<td>3.5</td>
<td>34 – 38</td>
<td>2,000 – 3,000</td>
</tr>
<tr>
<td>3.5 - 4</td>
<td>&gt; 38</td>
<td>&gt; 3,000</td>
</tr>
</tbody>
</table>

Newborn Resuscitation

Quick Tangential Point

- Vascular access
  - Umbilical vein catheter
    - Aseptic technique
    - Depth of 2-4 cm

Vein with catheter inserted

Note: umbilical tape for hemostasis
Newborn Resuscitation

Quick Tangential Point

• Drugs
  – Epinephrine
    • Action – increases heart rate and myocardial contractility, causes peripheral vasoconstriction
    • Indication – heart rate < 60 despite adequate ventilation and chest compressions
    • Dose – 0.01 mg/kg of 1:10,000 solution IV

Newborn Resuscitation

• Summery of resuscitation steps
  – Initially provide warmth, clear airway, dry and stimulate infant
  – If meconium staining and non-vigorous infant, suction before stimulation
  – If infant continues with poor respiratory effort or HR < 100, start PPV with BMV, initiate pulse oximetry
  – Intubate if BMV is ineffective or prolonged, or chest compressions are being performed
  – If HR < 60 despite adequate ventilation, start chest compressions at 90 per minute
  – If HR rate < 60 despite adequate ventilation and chest compressions, administer IV epinephrine
The End!

[Images of babies]