The sick neonate: post-delivery to 2 months of age

A supplementary module for Emergency Triage Assessment Treatment Provider Course
Learning objectives

• Accurately assess airway, breathing, circulation, and neurologic function for neonates.
• Recognize danger (emergency) signs for neonates.
• Manage neonates with respiratory compromise, shock, altered mental status, convulsions, or dehydration.
• Recognize and treat serious bacterial infections.
• Describe important conditions and diagnostic considerations.
Target audience

• Healthcare providers in any facility who are likely to manage sick neonates, including physicians, midwives, nurses, birth attendants, and assistants.

• Teachers and trainers for healthcare professionals
Danger signs for neonates

• Respiratory difficulties (stridor, cough, grunting, tachypnea, irregular respirations, retractions)
• Temperature instability (hypothermia)
• Persistent vomiting
• Poor feeding
• Lethargy
• Irritability
• Seizures
Airway and breathing: neonates

**Any positive signs**
- Not breathing
- Too fast (RR>60), too slow (RR<20), apnea (>15 sec)
- Central cyanosis (blueness)
- Grunting
- Retractions
- Unable to feed

**Manage**
- Open airway
- Give oxygen
- Give antibiotics
- Keep warm (skin to skin)
Retractions

M3-S9-U13_in-drawing-ex#2E7.avi
Grunting

M3-S8-U16_grunting-exercise.avi
Open the airway

Airway management

• Who needs oxygen?
  – Any patient with airway or breathing problems
  – Infants with shock
• Infants with agonal respirations or apnea require bag mask ventilation.
Bag mask ventilation: choosing the right size mask

Bag mask ventilation

Ventilating a neonate with bag and mask
Pull the jaw forward towards the mask with the third finger of the hand holding the mask
Do not hyperextend the neck

Circulation: neonates

**Circulation**

- Cool hands
- Capillary refill >3 seconds
- Weak pulses
- Bleeding
- Lethargy
- Unable to feed

**Any positive signs**

**Manage**

- Give oxygen
- Restore volume
- Stop bleeding (give vit K)
- Give antibiotics
- Keep warm (skin to skin)
Treatment of shock

• Give oxygen
• Stop any bleeding
• Restore volume with IV fluids
  – 20 mL/kg isotonic fluid (normal saline, lactated Ringers), if no bleeding
  – 10 mL/kg isotonic fluid (normal saline, lactated Ringers), if bleeding
    • Vitamin K 1mg IM if not already given
    • Transfuse 10 mL/kg whole blood
• Give antibiotics
• Keep infant warm (skin to skin)
Fluid management for neonate with signs of shock and no obvious bleeding (Cool hands, cap refill >3 sec, weak pulse, decreased mental status)

Establish vascular access

Give 20 mL/kg Ringer’s lactate or normal saline as rapidly as possible

Re-evaluate (extremity temperature, cap refill, pulses, and mental status)

No improvement

Give 20 mL/kg Ringer’s lactate or normal saline

Re-evaluate (extremity temperature, cap refill, pulses, and mental status)

No improvement

Give 20 mL/kg Ringer’s lactate or normal saline

Improved

Maintenance IV fluid (as for severe dehydration)

Improved
Coma, convulsion: neonates

C
Coma
Convulsion

Any positive signs
• AVPU score P or U
• Abnormal, uncontrolled movements

Manage
• Manage airway (position, oxygen)
• Glucose
• If convulsing, give lorazepam, diazepam, or phenobarbital
Coma

- A
- V
- **P** Is the child responding to **Pain**? (**coma**)
- **U** Is the child **Unresponsive**? (**coma**)
Infant is having a convulsion that has lasted longer than 10 minutes

Manage airway
Give oxygen
Measure/give dextrose

> 2 weeks of age
Give lorazepam (0.1 mg/kg IV) or diazepam (0.5 mg/kg, rectally)

After 10 minutes, convulsion persists
Give lorazepam (0.1 mg/kg IV) or diazepam (0.5 mg/kg, rectally)

After 10 minutes, convulsion persists
Give lorazepam (0.1 mg/kg IV)
Or diazepam (0.5 mg/kg, rectally)
Or phenytoin, 20 mg/kg, IV
Or phenobarbital, 20 mg/kg, IM or IV

≤ 2 weeks of age
Give phenobarbital: 20 mg/kg, IM or IV*

After 10 minutes, convulsion persists
Give phenobarbital: 10 mg/kg, IM or IV

*If phenobarbital is not available, use lorazepam, diazepam and phenytoin as per left side of algorithm.
### Lorazepam and diazepam doses

<table>
<thead>
<tr>
<th>Age/weight</th>
<th>Lorazepam (IV)</th>
<th>Diazepam (rectal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 mg/kg</td>
<td></td>
<td>0.5 mg/kg</td>
</tr>
<tr>
<td>2 weeks to 2 months (&lt;4 kg)</td>
<td>0.3 mg</td>
<td>1.5 mg (0.3 mL)</td>
</tr>
</tbody>
</table>

### Phenobarbital dose (IV or IM) for infants <2 weeks of age

<table>
<thead>
<tr>
<th>Phenobarbital (200 mg/mL)</th>
<th>2 kg or less</th>
<th>3 kg or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial dose (20 mg/kg)</td>
<td>0.2 mL</td>
<td>0.3 mL</td>
</tr>
<tr>
<td>Still convulsing (10 mg/kg)</td>
<td>0.1 mL</td>
<td>0.15 mL</td>
</tr>
</tbody>
</table>
How to give glucose

- Give 2 mL/kg\(^1\) of 10% glucose, IV push.
- Recheck blood glucose in 30 minutes.
- Repeat 2mL/kg of 10% glucose if it is still low.
- Without IV access, give milk or sugar solution (4 teaspoons of sugar in 200 mL of clean water) via NG tube.
- Feed child as soon as she is conscious.

\(^1\)Avery’s diseases of the neonate, p 1418, Elsevier Saunders, Philadelphia 2005.
Severe dehydration: neonates

D
Severe Dehydration

Any 2 positive signs
- Lethargy
- Sunken eyes
- Very slow skin pinch
- Unable to feed
- Persistent vomiting

Manage
- Start IV and
- Begin giving fluids
- Give antibiotics
- Keep warm (skin to skin)
# Daily fluid requirements (Oral plus IV)

<table>
<thead>
<tr>
<th>Age</th>
<th>Total daily fluid requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>60 mL/kg/day</td>
</tr>
<tr>
<td>Day 2</td>
<td>90 mL/kg/day</td>
</tr>
<tr>
<td>Day 3</td>
<td>120 mL/kg/day</td>
</tr>
<tr>
<td>Day 4 and older</td>
<td>150 mL/kg/day</td>
</tr>
</tbody>
</table>
Diagnostic considerations

- Serious bacterial infection
- Low birth weight (<2.5 kg, <2 kg is priority)
- Jaundice
- Perinatal asphyxia
- Congenital abnormalities
  - Cardiac
  - Metabolic
  - Surgical emergencies (such as neural tube defects, bowel obstruction)
Serious bacterial infections

**Danger signs**
- Abnormal respiratory rate (>60, <20, apnea >15 sec)
- Grunting
- Retractions
- Cyanosis
- Lethargy
- Convulsions
- Severe jaundice
- Severe abdominal distention
- Localizing signs (joints, skin, umbilicus, bulging fontanelle)

**Risk factors**
- Maternal fever (>37.5°C axillary or 38°C rectally) before or during labor
- Membranes ruptured >18 hours\(^1\) prior to delivery
- Foul smelling amniotic fluid

\(^1\)Red Book Online, //http://aapredbook.aappublications.org/current.dtl (accessed 3.27.10).
Treatment of serious bacterial infections

• Ampicillin AND gentamicin
• Give cloxacillin instead of penicillin with extensive skin pustules or abscesses (signs of Staphylococcus infection)
• For meningitis, ampicillin and gentamicin. Add cefotaxime if gram negative organisms are suspected.¹

¹Guidelines for acute care of the neonate, p 54, Section of Neonatology, Department of Pediatrics, Baylor College of Medicine, Texas Children’s Hospital, Houston 2009.
## Antibiotic doses

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Route</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>50 mg/kg/dose</td>
<td>IM/IV</td>
<td>1 week of age: every 12 hours 2-4 weeks of age: every 8 hours</td>
</tr>
<tr>
<td>Cloxacillin</td>
<td>25-50 mg/kg/dose</td>
<td>IV</td>
<td>1 week of age: every 12 hours 2-4 weeks of age: every 8 hours</td>
</tr>
<tr>
<td>Ceftriaxone (meningitis)</td>
<td>50 mg/kg/dose OR 100 mg/kg/dose</td>
<td>IM/IV</td>
<td>Every 12 hours Once daily</td>
</tr>
<tr>
<td>Ceftriaxone (not meningitis)</td>
<td>50 mg/kg/dose</td>
<td>IM/IV</td>
<td>Once daily</td>
</tr>
<tr>
<td>Cefotaxime¹</td>
<td>50 mg/kg/dose</td>
<td>IV</td>
<td>Weight &lt;1200 grams, 0-4 week: every 12 hours Weight 1200-2000 grams ≤7 days: every 12 hours &gt;7 days: every 8 hours Weight &gt;2000 grams ≤7 days: every 8-12 hours &gt;7 days: every 6-8 hours</td>
</tr>
</tbody>
</table>

¹Guidelines for acute care of the neonate, p 67, Section of Neonatology, Department of Pediatrics, Baylor College of Medicine, Texas Children’s Hospital, Houston 2009.
## Gentamicin doses

<table>
<thead>
<tr>
<th>Age (postmenstrual)</th>
<th>Dose</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;35 weeks</td>
<td>3 mg/kg/dose IV</td>
<td>Every 24 hours</td>
</tr>
<tr>
<td>≥35 weeks</td>
<td>4 mg/kg/dose IV</td>
<td>Every 24 hours</td>
</tr>
<tr>
<td>&gt;44 weeks</td>
<td>2.5 mg/kg/dose IV</td>
<td>Every 8 hours</td>
</tr>
</tbody>
</table>

Note: Calculate exact dose based on infant’s weight

1Guidelines for acute care of the neonate, p 67, Section of Neonatology, Department of Pediatrics, Baylor College of Medicine, Texas Children’s Hospital, Houston 2009.
Low birth weight

• Definitions
  – Low birth weight <2500 grams
  – Very low birth weight <1500 grams

• At risk for the following:
  – Hypothermia
  – Apnea
  – Hypoxemia
  – Sepsis
  – Necrotizing enterocolitis
  – Feeding intolerance

• Monitor closely and respond promptly to danger signs
Jaundice

Abnormal

• Jaundice starting on first day of life
• Jaundice lasting >14 days in term, >21 days in preterm
• Jaundice with fever
• Deep jaundice (palms and soles)

Causes

• Serious bacterial infection
• Hemolytic disease due to blood group incompatibility or G6PD deficiency
• Congenital syphilis or other intrauterine infection
• Liver disease (hepatitis, biliary atresia)
Summary

• Support airway and breathing.
• Fluid resuscitate infants with shock.
• Treat coma and convulsions.
  – Anticonvulsants
  – Glucose
• Maintain hydration (oral, IV, or combination).
• Infants with danger signs should receive antibiotics.
• Keep warm
### IMCI: Sick Young Infant Age up to 2 Months

<table>
<thead>
<tr>
<th>Signs</th>
<th>Classify As</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any one of the following signs</td>
<td><strong>Very Severe Disease</strong></td>
<td>- Give first dose of intramuscular antibiotics.</td>
</tr>
<tr>
<td>≠ Not feeding well or</td>
<td></td>
<td>- Treat to prevent low blood sugar.</td>
</tr>
<tr>
<td>≠ Convulsions or</td>
<td></td>
<td>- Refer URGENTLY to hospital.**</td>
</tr>
<tr>
<td>≠ Fast breathing (60 breaths per minute or more) or</td>
<td></td>
<td>- Advise mother how to keep the infant warm on the way to the hospital.</td>
</tr>
<tr>
<td>≠ Severe chest indrawing or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≠ Fever (&gt;37.5°C* or above) or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≠ Low body temperature (less than 35.5°C*) or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≠ Movement only when stimulated or no movement at all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≠ Any jaundice if age less than 24 hours or</td>
<td><strong>Severe Jaundice</strong></td>
<td>- Treat to prevent low blood sugar.</td>
</tr>
<tr>
<td>≠ Yellow palms and soles at any age</td>
<td></td>
<td>- Refer URGENTLY to hospital.</td>
</tr>
<tr>
<td>≠ If two of the following signs:</td>
<td></td>
<td>- Advise mother how to keep the infant warm on the way to the hospital.</td>
</tr>
<tr>
<td>≠ Movement only when stimulated or no movement at all</td>
<td><strong>Severe Dehydration</strong></td>
<td></td>
</tr>
<tr>
<td>≠ Sunken eyes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≠ Skin pinch goes back very slowly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≠ If infant has no other severe classification:</td>
<td></td>
<td>- Give fluid for severe dehydration (Plan C).</td>
</tr>
<tr>
<td>≠ If infant also has another severe classification:</td>
<td></td>
<td>- OR</td>
</tr>
<tr>
<td>≠ Refer URGENTLY to hospital with mother giving frequent sips of ORS on the way.</td>
<td></td>
<td>- Advise mother to continue breastfeeding.</td>
</tr>
</tbody>
</table>