

## ISSUES UNIQUE TO THE NEWBORN

### Issues Unique to the Newborn, Case #1

Written by Edward Clark, M.D.

A newborn has an Apgar score of 5 at one minute and 9 at five minutes. What are the components of the Apgar score? How is the Apgar score used?

#### **Definitions for Specific Terms:**

**Apgar score**- The Apgar score quantifies and summarizes the response of the newly born infant to the extrauterine environment and to resuscitation. Each of five components is awarded a value of 0, 1, or 2. The Apgar scores should be done at 1 and 5 minutes after birth. The five values are then added and the sum becomes the Apgar score. A total score of 10 indicates the best possible condition.

**Components of the Apgar score**- The five physiologic parameters that are evaluated are heart rate, respiratory effort, muscle tone, reflex irritability, and color.

Sign/Component	0 points	1 point	2 points
Heart Rate	Absent	<100	≥100
Respiratory Rate	Absent	Irregular, weak cry	Vigorous cry
Color	Pale, generalized cyanosis	Acrocyanosis	Pink, including extremities
Reflex irritability	Absent	Grimace	Vigorous, active cry, sneeze, cough
Muscle tone	Absent, flaccid	Weak, slightly flexed	Good flexion, active motion

**Apgar mnemonic**-Appearance, Pulse, Grimace, Activity, Respiratory

**Acrocyanosis**- A blue or purple mottled discoloration of the extremities, esp. the hands and feet.

#### **Review of Important Concepts:**

Virginia Apgar was an anesthesiologist at Columbia Presbyterian Medical Center in New York City when she introduced the Apgar scoring system in 1953 to assess the newborn infant's response to the stress of labor and delivery.

#### **Historical Points**

Obtain a history of any key portions of the delivery that could contribute to an infant being depressed on delivery.

- Was the mother abusing drugs?
- What medications were given to mother prior or during delivery?
- Narcotics?
- Magnesium Sulfate?

- Was this a meconium delivery?
- Was there a nuchal cord at delivery?

### Physical Exam Findings

1. Acrocyanosis- A blue or purple mottled discoloration of the extremities, esp. the hands and feet.
2. Heart Rate – To assess the infant’s heart rate quickly or when a stethoscope is not handy, hold the umbilical stump in order to feel the pulse. Count the beats for 6 seconds and then multiply times 10 for a quick heart rate assessment in beats per minute.
3. Grimace- the response to a mild pinch or suctioning of the nose and mouth with a suction catheter.
4. Central cyanosis- Assess central cyanosis in neonates with a dark complexion by looking at the lips, gums, tongue and nose.

### Clinical Reasoning

1. What do the Apgar scores at 1 and 5 minutes indicate or reflect?  
The score at 1 minute is reflective of the intrauterine environment and the birth process, whereas the 5 minute score is more indicative of the neonate’s success at transitioning.
2. What might cause a low Apgar score, 0-3?  
An Apgar score of 0-3 may indicate either cardio respiratory arrest or a condition resulting from metabolic acidosis, hypoventilation, or CNS depression. These may be the result of difficulty in establishing adequate ventilation, perinatal depression, congenital malformations, sepsis or other preexisting fetal problems.
3. When should Apgar scores be recorded at longer periods of time?  
If the score is less than 7 at 5 minutes, additional scores should be assigned every 5 minutes for up to 20 minutes.
4. When would resuscitation be needed for lower Apgar scores?  
Indications for resuscitation such as central cyanosis, apnea, gasping for breath, heart rate <100 or <60 are all indicative of low APGAR scores. Different levels and methods of resuscitation are stimulation, blow by oxygen, bag-mask ventilation, chest compressions, and intubation. If resuscitation is indicated, this takes precedence over pausing to obtain APGAR scores. Resuscitate the infant first, score later.

### Suggestions for Learning Activities:

- Describe a neonate at 1 minute and have the student calculate the Apgar score. Example- At 1 minute of life, a newborn’s respiratory rate is slow and irregular with a hear rate of 80 beats/min. There is some flexion of his upper and lower extremities, he does not respond when a catheter is placed into his nose, and he is blue and pale. (Answer 3)
- Discuss what kind of resuscitation might be indicated for the infant in the above scenario with a 1 minute Apgar of 3? Answer: If the infant is cyanotic centrally, blow by oxygen should be

applied and since the Heart Rate is  $<100$ , bag-mask ventilation should be initiated. Since the HR is  $>60$ , chest compression would not be initiated at this time. Continue to reassess the infant.

- Ask the student to describe a neonate with an Apgar score of 4,5,6,7, or 8.
- If a student is rotating on newborn or NICU, ask what were some of the Apgar scores presented on rounds and how were they scored.
- Have the student answer how they would explain to a parent what the Apgar scores are, if asked by a parent.

**Other Resources:**

- Nelson Textbook of Pediatrics, Section-The Fetus and the Neonatal Infant, Chapter: The Newborn Infant: Routine Delivery Room Care

## **Issues Unique to the Newborn, Case #2**

Written by Edward Clark, M.D.

A six-hour-old infant born at term is persistently tachypneic with respiratory rates in the 80's. What additional information would be helpful in evaluating this infant? Discuss the diagnostic considerations and initial approach to the evaluation of this child.

### **Definitions for Specific Terms:**

**Term infant**- An infant with a gestational age that is considered full term ( $\geq 37$ wks), versus a preterm infant ( $< 37$ wks).

**Tachypnea**- An elevated respiratory rate. A normal respiratory rate in a newborn is 40-60 breaths/min.

### **Review of Important Concepts:**

#### **Historical Points**

- Maternal History – diabetes, multiple gestation, Group B Strep infection, other infections, drug use?
- Obstetrical History-Type of delivery, difficulty of delivery, maternal fever during delivery, characteristics of the amniotic fluid, drugs used during delivery (magnesium, narcotics)?
- Gestational age- preterm, term, postdates ( $\geq 42$ wks). How would your differential change?

#### **Physical Exam Findings**

1. Assess that the students know the different terms when discussing respiratory distress in the neonate:
  - a. Retractions and the different types
  - b. Grunting
  - c. Cyanosis
  - d. Nasal flaring
  - e. Apnea
2. Be familiar with other Physical findings that may indicate a cause for Respiratory distress:
  - a. Dysmorphic features
  - b. Scaffoid abdomen
  - c. Asymmetrical facies
  - d. Unusual cry or stridor, macroglossia
  - e. Meconium staining
  - f. Poor tone
  - g. Decreased breath and heart sounds consistent with pneumothorax, pneumopericardium, pneumomediastinum
  - h. Color, the patient may be anemic or plethoric leading to tachypnea.

## Clinical Reasoning

1. How does the gestational age of term, preterm, or postdates change your differential?
  - a. The more preterm the infant, the risk for respiratory distress syndrome, Group B Strep pneumonia increases.
  - b. The more postdates the infant, the higher the risk for meconium aspiration syndrome.
2. What perinatal infections may present as respiratory distress in the newborn?
  - a. Group B Streptococcus
  - b. Listeria monocytogenes
  - c. Escherichia coli and other gram-negative organisms
  - d. Congenital syphilis and herpes simplex viral infections should be considered especially in at risk situations
3. How would a maternal history of insulin dependent diabetes affect your differential?
  - a. An infant of a diabetic mother is at an increased risk for respiratory distress syndrome (RDS), large for gestational age (LGA), and cardiac dysfunction, a difficult delivery and its complications.
  - b. A cesarean section increases the risk of transient tachypnea of the newborn (TTN).
4. How would a history of maternal fever affect your differential?  
Consider causes of infection, sepsis, and possible chorioamnionitis.
5. What pulmonary and non-pulmonary causes are in your differential for respiratory distress?
  - a. Airway obstruction
  - b. Poor respiratory muscle effort
  - c. Space-occupying lesions
  - d. Parenchymal disease
  - e. Hematologic
  - f. Cardiac
  - g. Shock
  - h. Metabolic in origin
6. After you have considered the differential for this patient, what would be the initial evaluation?  
Unless the cause is obvious, consider the following for the patient's evaluation: pulse oximetry, the need for oxygen, chest x-ray findings, and the need for laboratory evaluation of glucose, electrolytes (calcium, magnesium, pH, ammonia), CBC with a differential, and sepsis workup.

## Diagnosis:

There could be multiple causes depending on the scenario. Most likely transient tachypnea of the newborn, respiratory distress syndrome, and /or pneumonia

## Suggestions for Learning Activities:

- Discuss the different parenchymal pulmonary causes of respiratory distress (transient tachypnea of the newborn, respiratory distress syndrome, pneumonia, meconium aspiration syndrome, pulmonary hypoplasia) and how each one differs in presentation and course.

- Review chest radiographs of different causes listed above (Google image search or your local radiologist may be good sources)
- Role play – have the students explain to you as the “parent” what the problem is with this patient (respiratory distress) and what treatment plan they will use.
- Have the student discuss how the differential changes when some of the “other physical findings” mentioned above are found on exam. I.e. scaphoid abdomen-diaphragmatic hernia; stridor- tracheomalacia, vocal cord paralysis, choanal atresia, etc.

**Other Resources:**

- Nelson Textbook of Pediatrics: Section-The Fetus and the Neonatal Infant, Chapter: Delivery Room Emergencies, and Respiratory Tract Disorders

## **Issues Unique to the Newborn, Case #4**

Written by Cassandra Wilson, M.D.

A full-term infant appears yellow at 48 hour of age. She weighs 3700 g. The total bilirubin is 13 mg/dl and the indirect is 12.7 mg/dl. What components of the history, physical examination and laboratory data would be helpful in evaluating this child?

### **Definitions for Specific Terms:**

**Jaundice**- The yellow-orange discoloration (skin, mucous membranes, sclera) seen with increased bilirubin levels (generally is seen with total serum bilirubin of  $>5\text{mg/dl}$ ). Approximately 60% of term infants and 80% of preterm have at least some degree of jaundice.

**Bilirubin**- The product of heme catabolism, primarily from RBC breakdown. It can be present in many forms in the blood, but its unconjugated form is primarily bound to albumin. The free, unconjugated form is lipophilic and can easily cross the blood-brain barrier, where irreversible damage can be caused (bilirubin encephalopathy/kernicterus).

**Indirect Hyperbilirubinemia**- Elevation of unconjugated bilirubin; the level that is considered “pathologic” or would require treatment is dependent on several variables, such as age in hours, gestational age, presence of hemolysis/Coombs positivity, prior sibling with notable hyperbilirubinemia, etc.

**Direct Hyperbilirubinemia**- Elevation of conjugated bilirubin; a level of 2.0 mg/dL or greater is always considered pathologic.

### **Review of Important Concepts:**

#### **Historical Points**

##### Important Considerations

- Physical examination findings
- Mother & baby blood type, DAT/Coombs positive
- Family history (eg, sibling that required phototherapy, RBC disorders, hemoglobinopathies, history of splenectomy, etc)
- Ethnicity
- Maternal complications – Diabetes mellitus, hypertension, infections, certain medications (eg TMP-SMX), drug abuse
- Gestational age
- Breast or bottle feeding?
- Is the infant feeding well?
- Percentage of weight loss since birth
- Has the newborn passed meconium/stooling adequately?
- Other signs of illness in the baby? (eg lethargy, temperature instability, vomiting, decreased urine output, etc)
- History of birth trauma or difficult delivery (eg large for gestational age/macrosomia, forceps-assisted, bruising, cephalohematoma)

- Delayed cord clamping (i.e. if born at home)
- Rate of rise of serum bilirubin
- Conjugated or unconjugated hyperbilirubinemia?

Discuss why the above points are relevant in the management of this patient.

### Physical Exam Findings

1. Discuss the approximate serum bilirubin level as jaundice progresses in cephalocaudal manner (Jaundice to – head: ~5mg/dl; mid abdomen: ~15 mg/dL; soles of feet: ~20 mg/dL).
  - a. Ask student to demonstrate physical assessment of jaundice in a newborn, by pressing on skin gently and looking for any yellowish tint in the blanched area. It should be discussed, however, that there is great variability in clinicians' estimations of serum bilirubin based on physical exam alone.
  - b. Note that unconjugated hyperbilirubinemia results in a more yellow to yellow-orange, whereas conjugated hyperbilirubinemia usually causes more of a greenish to yellow-brown appearance.
2. With student, go through complete examination, assessing for and discussing any possible signs that could put the baby at increased risk of worsening or pathologic jaundice.
  - a. Signs of Down's Syndrome: LGA or SGA infant, plethora, lethargy, decreased tone, syndromic features
  - b. Poor peripheral perfusion or signs of dehydration: Abdominal distention, decreased bowel sounds (or any other signs that could be associated with decreased GI motility or decreased/absent stooling and hence increased enterohepatic circulation)
  - c. Signs of congenital hypothyroidism: (While not typically symptomatic at birth, this is something to keep in mind as can commonly present with prolonged jaundice.) Bruising, petechiae, cephalohematoma; hepatosplenomegaly; wide fontanelles, umbilical hernia, sluggishness.

### Clinical Reasoning

1. What laboratory studies would be indicated in the evaluation of the jaundiced neonate?
  - a. Although the case prompt describes a newborn with elevated indirect bilirubin, the student should keep in mind that it is critical to differentiate between conjugated and unconjugated hyperbilirubinemia.
  - b. In the patient with unconjugated hyperbilirubinemia, laboratory studies are not always indicated (other than monitoring of serum or transcutaneous bilirubin). History and physical examination should be used to determine extent of lab workup.
  - c. If there is jaundice in the first 24 hr of life, rapidly rising serum bilirubin, hyperbilirubinemia unresponsive to phototherapy, or if hemolysis is suspected, basic labs that should be considered include: blood type (mother and baby) and Coombs, reticulocyte count, complete blood count, and a peripheral smear to assess RBC morphology.
  - d. The student should also understand why these studies are relevant and how an abnormality would change management. For example: With hemolysis, abnormal laboratory results could include fragmented red blood cells, microspherocytes, and a positive Coombs. In such cases the serum bilirubin would need to be monitored more closely and phototherapy initiated at lower serum bilirubin levels.

2. Discuss additional clinical findings that may guide further workup as indicated.
  - a. In a baby that is ill-appearing, lethargic, poor feeding, in respiratory distress, hypotonia, or has temperature instability, a sepsis evaluation should be done. Include a CBC with differential, blood culture, +/- CSF studies &/or urine culture (depending on age & other symptoms/signs).
  - b. A central hematocrit should be done if polycythemia is suspected (Either based on history, such as infant of diabetic mother, &/or based on physical exam findings or clinical signs, for example: a ruddy/plethoric appearance).
  - c. Infants with metabolic disorders may present with neonatal jaundice. Such babies may exhibit prolonged jaundice (3 weeks old or more), sepsis/serious bacterial infections, feeding intolerance, or signs of hypothyroidism, such as wide fontanelles, constipation, and umbilical hernia. In the case of such findings, check thyroid studies (serum thyroxine and TSH), and urine reducing substances (positive in galactosemia). Although state screens do test for these disorders, there can be false-negatives, and it is recommended to test for the condition if there are clinical signs, regardless of state newborn screen results.
3. Using bilirubin nomogram, determine along with the student what your next step in management should be. Demonstrate how, per AAP guidelines, the acceptable bilirubin level varies by age in hours, gestational age, risk factors such as isoimmune hemolytic disease, asphyxia, significant lethargy, etc.

**Diagnosis:**

Given the information in the case prompt, this is most likely an example of physiologic jaundice of the newborn. The patient's weight of 3.7 kg may be indicative of mild macrosomia, which can be associated with increased heme load and hence, hyperbilirubinemia. However, the student must take into consideration other data obtained as discussed above. The history, physical examination, and laboratory studies should be used to guide further evaluation, management, and consideration of other diagnostic possibilities.

**Suggestions for Learning Activities:**

- Have student explain to parents what causes jaundice in newborns, as well as the problems it can cause, and worrisome signs to watch for upon discharge (e.g. poor feeding, lethargy/somnolence, decreased wet diapers). Also should reinforce the importance of the newborn follow-up that will take place 24-48hr after discharge.
- Discuss the main contributing factors to physiologic jaundice of the newborn (increased heme load due to higher Hgb level and decreased RBC lifespan in neonates; decreased activity of hepatic enzymes that function in formation of conjugated bilirubin (UDP glucuronyl transferase), increased enterohepatic circulation).
- Discuss the indicators of pathologic jaundice.
- Explain why babies that are breastfeed or are poor feeders are more likely to have hyperbilirubinemia.
- Differentiate between breastfeeding jaundice and breastmilk jaundice.

**Other Resources:**

- <http://bilitool.org/>
- Lange Neonatology: Management, Procedures, On-Call Problems, Diseases, and Drugs by Tricia Lacy Gomella, et al. 6th edition.
- Pediatrics in Review: Neonatal Jaundice, by M. Jeffrey Maisels, MB, BCh. Pages 443-453.

## **Issues Unique to the Newborn, Case #6**

Written by Yameika Head, M.D.

A twenty-four-hour-old full term infant has not passed meconium. Discuss the possible explanation and your concerns.

### **Definition for Specific Terms:**

**Meconium**- The first stools of an infant. Unlike later feces, meconium is composed of materials ingested during the time the infant spends in utero: intestinal epithelial cells, lanugo, mucus, amniotic fluid, bile, and water. The term Meconium derives from meconium-arion, meaning "opium-like", in reference either to its tarry appearance or to Aristotle's belief that it induces sleep in the fetus.

Assess if student knows difference between meconium, transitional stools, breastfed stools. Meconium is the baby's first stool and is a thick dark green to black sticky material. Transitional stool represents the change from meconium to the normal yellow, seedy stools that characterize infants feeding on milk only. Normal breastfed baby stool is usually a mustardy yellow color, grainy in texture and quite runny.

What is the timeframe for an infant to have his first stool? Answer: Most infants stool and have their first void within the first 24 hours (95% at 24 hours and >99% at 48 hours old).

### **Review of Important Concepts:**

#### **Historical Points**

- Maternal history- general anesthesia, drug use, narcotics, maternal OTC medicine use (antacids, iron) family history of delayed stooling
- Was there a stool while in the womb i.e. Meconium baby? Infants at risk have a history of fetal distress or a post-term, post-dates infant.
- Was there a stool at the stand after delivery or in the nursery? Did the mother or nurse fail to document any stools? Sometimes stools may not be documented so don't be afraid to ask again.
- Does this child have an anatomic reason that may cause a delay in stooling? I.e., imperforate anus, spina bifida, volvulus, or meconium ileus.

#### **Physical Exam Findings**

1. Be familiar with physical findings that may indicate a cause for delayed meconium passage:  
abdominal distension, displaced/imperforate anus
  - a. Absent anal wink
  - b. Midline hair tuft
  - c. Sacral dimple
  - d. Pigment changes
  - e. No lumbar-sacral curve
  - f. Decreased strength/tone in the lower extremities

2. What do the abnormalities mean?
  - a. Abdominal distension: volvulus, obstruction;
  - b. Absent anal wink, midline tuft, sacral dimple, pigment changes, no lumbar-sacral curve, decreased strength/tone in lower extremities: spina bifida, tethered cord

### Clinical Reasoning

1. How does maternal history of narcotic ingestion, medicine use, or general anesthesia affect infant stooling?  
All of these causes slow the gastrointestinal tract and may cause a delay in passage of meconium.
2. What is the most common reason that one may miss noting a stool?  
Failure of documentation by nurse or mother.
3. What is meconium plug syndrome?  
Meconium plug syndrome, also termed functional immaturity of the colon, is a transient disorder of the newborn colon characterized by delayed passage (>24-48 h) of meconium and intestinal dilatation.
4. What are some differential diagnoses of metabolic causes that can lead to a delay in stooling?
  - a. Hypothyroidism
  - b. Cystic fibrosis (meconium ileus)
 Neonatal metabolic screens are very important in that they can diagnosis these conditions early.
5. After you have considered your differential diagnoses excluding failure of documentation, what is your workup for this infant?
  - a. If the physical exam is unremarkable you may want to watch the infant for 48% since >99% of infants will have a stool by this time.
  - b. If physical exam depicts otherwise then consider an abdominal x-ray for abdominal distension or a general overview of the abdomen looking for possible ileus, Hirschsprung's or other causes of obstruction.
  - c. Consider a MRI if sacral issues, thyroid studies for concerns of hypothyroidism, barium or air contrast enema for imperforate anus, or sweat chloride test for cystic fibrosis (meconium ileus).

### Diagnosis:

Depending on the scenario there could be multiple causes. The most likely diagnosis would be either a normal infant or failure to document a stool or a meconium plug syndrome.

### Suggestions for Learning Activities:

- Discuss normal stooling from birth to childhood.
- Review radiological studies for conditions that can cause delayed meconium passage or obstruction.
- Role play delivering concerns about the delayed passage of the first stool.

**Other Resources:**

- Nelson Textbook of Pediatrics, 19th edition, pp 600-601: Meconium Plugs, Meconium Ileus
- Primary Care of the Newborn: Gastroenterology Chapter: Delayed passage of meconium/constipation

## **Issues Unique to the Newborn, Case #7**

Written by Jennifer Hudson, MD

The mother of a newborn infant asks your advice about why she should breast-feed her infant. She will need to return to work in 8 weeks and wonders if she should just use formula. How would you counsel her?

### **Definition for Specific Terms:**

**Exclusive breastfeeding**- Exclusive breastfeeding means that a newborn is given no formula or other fluids by mouth. The American Academy of Pediatrics and other experts recommend exclusive breastfeeding as the optimal nutrition for infants 0 to 6 months of age. After 6 months, complementary foods should be added for additional nutrients needed for growth and brain development. Breastfeeding should continue until 12 months of age, or as long as a mother and baby are comfortable with breastfeeding.

**Formula feeding**- Human milk substitutes, such as commercial infant formulas, cannot match the nutritional quality of human milk, but their use is appropriate when medically indicated, or when a mother cannot or chooses not to feed her baby breast milk. Some medical reasons to use formula supplements when a mother is not able to supply breast milk include: hypoglycemia, inadequate urine output, excessive weight loss, and poor milk production due to maternal conditions such as a history of breast reduction surgery.

### **Review of Important Concepts:**

The US Department of Health and Human Services has established national breastfeeding goals in its “Healthy People 2020” objectives. Our national goals for breastfeeding habits are that 82% of mothers should initiate breastfeeding after birth, 61% of mothers should be breastfeeding at 6 months, and 34% of mothers should be breastfeeding at 1 year. Current breastfeeding rates are much lower than these goals.

### **Clinical Reasoning**

1. Benefits of breastfeeding for the infant include lower rates of:
  - a. Infection and hospitalization – especially otitis media, vomiting and diarrhea, and lower respiratory tract infections
  - b. Sudden Infant Death Syndrome (SIDS)
  - c. Eczema (atopic dermatitis) and asthma
  - d. Childhood obesity and type II diabetes mellitus
  - e. Childhood leukemias
  - f. Child abuse and neglect
2. Benefits of breastfeeding for the mother:
  - a. Lower rates of breast and ovarian cancer
  - b. Lower fertility levels and improved child spacing while exclusively breastfeeding
  - c. Improved psychosocial well-being, bonding and attachment to infant

- d. Economic benefits of lower feeding and health care costs (Bartick study + Business case for breastfeeding—see references)
3. Barriers to breastfeeding:
- a. Lack of knowledge of specific benefits
  - b. Hospital practices and provider attitudes toward breastfeeding (Baby Friendly Hospital Initiative; BF-friendly office practices)
  - c. Lack of family and social support
  - d. Different social norms for their cultural group
  - e. Embarrassment
  - f. Lactation problems and concern about supply
  - g. Employment and child care issues—Workplace support for nursing mothers in health care reform law
  - h. Lack of prenatal education—for mothers, secondary to lack of OB training (ABM Protocol available)

### Suggestions for Learning Activities:

- Role play – have students tell exactly how they would counsel a mother prenatally and also after delivery about the benefits of breastfeeding
- Demonstrate basic breastfeeding holds and how to help a mother get her infant latched to the breast successfully
- Show how to assemble and use a standard breast pump
- Check You Tube for a good latch demonstration video
- <http://www.breastfeedinginc.ca/>
- <http://www.youtube.com/watch?v=VHs2Ql5Kylo>
- Introduce students to your lactation consultants and suggest that they spend an hour or two rounding with them during their nursery rotation. It is important to talk about Baby Friendly Hospital Initiative.

### Other Resources:

- The Surgeon General’s Call to Action to Support Breastfeeding, 2011 (DHHS online publication): [www.womenshealth.gov](http://www.womenshealth.gov)  
<http://www.surgeongeneral.gov/topics/breastfeeding/>
- Lactation Self-Study Modules, Level 1 – a free download from Wellstart International at: [www.wellstart.org](http://www.wellstart.org)  
[www.breastfeedingtraining.org--free](http://www.breastfeedingtraining.org--free) training modules, CME available
- Academy of Breastfeeding Medicine: <http://www.bfmed.org>  
Position on Breastfeeding
- Educational Objectives and Skills for the Physician with Respect to Breastfeeding
- Protocols: <http://www.bfmed.org/Resources/Protocols.aspx>
- Clinical Protocol-Hypoglycemia:  
<http://www.bfmed.org/Media/Files/Protocols/hypoglycemia.pdf>
- Clinical Protocol-Supplementation:  
<http://www.bfmed.org/Media/Files/Protocols/Protocol%203%20English%20Supplementation.pdf>

- Clinical Protocol-Jaundice:  
<http://www.bfmed.org/Media/Files/Protocols/Protocol%2022%20Jaundice.pdf>
- AAP Policy Statement Pediatrics. 1997 Dec;100(6):1035-9.  
Breastfeeding and the use of human milk. American Academy of Pediatrics.  
Work Group on Breastfeeding.  
Section on Breastfeeding <http://www.aap.org/breastfeeding/>
- AAP Speaker's Kit—full Power Point available to educate:  
<http://www.aap.org/breastfeeding/healthProfessionalsResourceGuide.html#speakersKit>
- ACOG-<http://www.acog.org/departments/underserved/clinicalReviewv12i1s.pdf>
- Baby Friendly Hospital Initiative: <http://www.babyfriendlyusa.org/>
- <http://www.babyfriendlyusa.org/eng/10steps.html>
- US Breastfeeding Committee: <http://www.usbreastfeeding.org/>
- La Leche League: <http://www.llli.org/>
- Business Case for Breastfeeding: <http://www.womenshealth.gov/breastfeeding/government-in-action/business-case-for-breastfeeding/index.cfm>
- CDC-BF report card: <http://www.cdc.gov/breastfeeding/data/reportcard.htm>
- Workplace support for working mothers (time and space required for nursing/pumping mothers)  
Part of Health reform law- PPA from March 23, 2010  
<http://www.usbreastfeeding.org/Workplace/WorkplaceSupport/WorkplaceSupportinHealthCareReform/tabid/175/Default.aspx>
- Bartick M, Reinhold A. The burden of suboptimal breastfeeding in the United States: a pediatric cost analysis. Pediatrics. 2010 May;125(5):e1048-56. Epub 2010 Apr 5.

## **Issues Unique to the Newborn, Case #8**

Written by Pat Patterson, M.D.

A term newborn weighs 4800 grams. His mother is an insulin dependent diabetic who had good control during her pregnancy. What immediate complications might this infant experience in the nursery?

### **Definitions for Specific Terms:**

**Large for Gestational Age (LGA infants)**- Infants whose birth weight (or length, or head circumference) lies above the 90th percentile for that gestational age. Currently, an infant is considered LGA if birth weight is over 4.0 kg.

**Macrosomia**- Excessive weight for gestational age secondary to increased adiposity

**IDM**- Infant of a Diabetic Mother

**IDDM**- Insulin Dependent Diabetes Mellitus (former name for Type 1 Diabetes Mellitus)

**Gestational Diabetes**- Carbohydrate intolerance of variable severity with onset or first recognition during pregnancy. Management of gestational diabetes is generally achieved through close glucose monitoring to insure normalization of blood glucose values after dietary and exercise changes.

**Gestational Diabetes Requiring Insulin**- Insulin is added to the treatment plan of a woman with gestational diabetes if good glucose control is not achieved with appropriate changes in diet and exercise.

### **Review of Important Concepts:**

- Complications associated with infants born to mothers with insulin dependent diabetes and are large for gestational age
  - Signs and symptoms of hypoglycemia in newborns
  - The suspected etiology of the hypoglycemia and macrosomia associated with infants born to a mother with IDDM
1. Immediate Complications Associated with LGA infants born to mothers with IDDM
    - a. Hypoglycemia: The highest incidence of hypoglycemia occurs 4-6 hours after delivery but can occur any time after delivery up to 48 hours after birth. Hypoglycemia is more apt to occur if maternal history is positive for diabetes but can occur in LGA infants without a maternal history of IDDM.
    - b. Signs and Symptoms of hypoglycemia in the newborn: Jitteriness, tachypnea, hypotonia, poor feeding, apnea, temperature instability, seizures, lethargy
      - Note: infants can experience hypoglycemia without displaying signs and/or sx prompting protocols to check glucoses frequently especially in the first 24 hours of life in infants born to mothers with IDDM even if asymptomatic.
    - c. Diagnostic tests: blood glucose, usually bedside. Normal > 45 mg/dl infants <24 hours of age and > 50 mg/dl infants >24 hours of age

- d. Treatment: Dependent upon severity of hypoglycemia and the infant's clinical condition; infant offered either enteral supplemental feeds orally or via nasal-gastric tube or D10 IV for glucoses under 30.
  - e. Prevention: Good metabolic control in the last trimester may decrease the incidence of neonatal hypoglycemia. Early feeding of infants born to mothers with IDDM.
2. Other Complications of Infants Born to Mother's with IDDM
    - a. Macrosomia: Increased body fat, muscle mass and organomegaly especially of the heart and liver
    - b. Congenital anomalies: Sacral agenesis, femoral hypoplasia, heart defects (see below) and cleft palate are among the anomalies more commonly associated with IDMs
    - c. IDM's experience 3x's the risk for malformations compared with infants of mothers without diabetes. Poor control of IDDM in the first trimester appears to significantly increase the risk of major congenital malformations for the infant.
    - d. Congenital Heart Disease: double-outlet right ventricle, truncus arteriosus, transposition of the great vessels, congestive or hypertrophic cardiomyopathy. Signs and symptoms will vary based on the specific defect. The infant may exhibit: tachypnea, respiratory distress, difficulty feeding, tachycardia, +/- cyanosis, abnormal pulses or may be asymptomatic if the defect is mild.
    - e. Birth Trauma: (Birth Trauma can occur in LGA infants with or without maternal history of IDDM) Shoulder dystocia, brachial plexus injury, clavicular fracture, facial nerve palsy, ocular hemorrhage, cephalohematoma, subdural hematoma, abdominal organ injury, diaphragmatic paralysis, external genitalia hemorrhage
    - f. Asphyxia: May be associated with macrosomia and may acutely affect respiratory, renal, central nervous system and gastrointestinal functioning.
    - g. Respiratory Distress: Transient tachypnea of the newborn, meconium aspiration, air-leak syndromes and diaphragmatic paralysis all occur in increased numbers in IDM's.
    - h. Poor Feeding: Occurs in almost 1/3 of IDM's. Etiology unclear.

### Clinical Reasoning

1. How might the presence of maternal hyperglycemia contribute to the ultimate development of neonatal hypoglycemia in IDMs? What is the baby's insulin level in such a case and why?
  - a. Infants born to mothers with hyperglycemia have upregulated their insulin production to compensate for the higher levels of glucose they experienced in utero.
  - b. After birth, this increased production of insulin in the infant drives glucose levels down placing the infant at risk for hypoglycemia.
2. If an IDM persists with jitteriness after correction of an initial period of hypoglycemia what other metabolic derangements might you consider that would account for persistence of jitteriness in this infant?
 

Hypocalcemia can cause persistent jitteriness and may occur in IDM's secondary to suppression of neonatal parathyroid function.
3. Why are IDM's often macrosomic?
 

Insulin functions as the primary anabolic hormone of fetal growth and development resulting in visceromegaly and macrosomia.

**Other Resources:**

- Cowett RM. Neonatal care of the infant of diabetic mother. NeoReviews. 2002;3:e190-e196.

## **Issues Unique to the Newborn, Case #9**

Written by Pat Patterson, M.D.

A mother with no prenatal care and a history of known substance abuse delivers a baby at term. What special medical and social concerns do you have about caring for this infant? What evaluations and treatments are necessary before discharge?

### **Teaching Points for Students:**

- The importance of prenatal care and the impact it has on the health of the infant
- The potential problems for the newborn if exposed to substances of abuse in utero including neonatal abstinence syndrome (NAS)
- The role of social workers in assessing potential health and safety risks to the infant.

### **Definitions for Specific Terms:**

**SGA**- Small for gestational age: infants whose birth weight (or length, or head circumference) lies below the 10% for that gestational age.

**LGA**- Large for Gestational Age, LGA infants: Infants whose birth weight (or length, or head circumference) lies above the 90th percentile for that gestational age.

**IUGR**- Growth restriction of the fetus in utero.

**LBW**- Low Birth Weight: a weight of less than 2500 g (up to and including 2499 g), irrespective of gestational age.

**Neonatal abstinence syndrome scoring system**- A system of scoring that assigns points based on each symptom of withdrawal the newborn exhibits and its severity. The infant's score can help determine treatment.

### **Review of Important Concepts:**

#### **Historical Points**

- The importance of prenatal care:  
The primary purposes of prenatal care are to identify and treat complications of pregnancy and fetal health and to promote healthy behaviors. Outcome data suggest that babies born to mothers who do not receive prenatal care are more likely to be of low birth weight and more likely to die compared with babies born to mothers who receive prenatal care.  
Lack of prenatal testing places the infant at increased risk for a host of diseases and conditions routinely picked up with adequate prenatal care. These include:
  - Infectious Diseases: Group B Strep, Hepatitis B, HIV, GC, Chlamydia, Syphilis, Rubella
  - Other: Hemolytic disease secondary to maternal red blood cell antibodies, hypoglycemia; abnormal fetal growth, structural abnormalities of the skeleton and organ systems routinely picked up on ultrasound including congenital heart disease and neural tube defects.

- Which substances did the mother use and what are the risks to the infant exposed to one or more substances of abuse?  
 NAS: A generalized disorder presenting a clinical picture of CNS hyperirritability, gastrointestinal dysfunction, respiratory distress and vague autonomic symptoms. Manifestations of neonatal abstinence syndrome depend upon various factors including the drug used, its dose, frequency of use, and the infant's specific ability to metabolize and excrete the drug. Several scoring systems exist to monitor signs and symptoms of NAS in the newborn. Generally, the need for pharmacologic treatment for withdrawal symptoms is limited to neonates exposed to opioids or opiates. Pharmacologic treatment may involve morphine, methadone, phenobarbital, buprenorphine or diazepam.
- Does the infant have current issues or signs of withdrawal i.e. feeding problems, jittery, excessive crying, loose stools?

### Physical Exam Findings

1. Weight loss
2. Adequate suck vs. weak suck
3. Jitteriness, tremors
4. Increased tone
5. Skin excoriations

### Clinical Reasoning

1. Which classes of drugs have been associated with causing neonatal psychomotor behavior consistent with withdrawal?
  - a. Opiates and Opioids are the substances of abuse most likely to cause withdrawal NAS and produce the most dramatic effects on the neonate. In addition to NAS, infants exposed to these substances show an increased risk of LBW with 50% of those infants being SGA. 50-75% show clinical manifestations of withdrawal within 48 hours. Seizures during withdrawal are possible with this risk being higher in the methadone exposed infant compared with the infant exposed to heroin.
  - b. Stimulants: The stimulants cocaine and methamphetamine do not commonly cause NAS and, if present, the symptoms are generally much less severe compared with NAS associated with narcotics. The abnormalities seen in stimulant exposed infants likely represent the effect of the drug and not a withdrawal from the drug. Infants exposed to cocaine or methamphetamine also are at increased risk for IUGR, asphyxia, placental abruption and prematurity.
  - c. Depressants and Sedatives: Alcohol: increased risk of hypoglycemia and acidosis. Withdrawal is uncommon but when present, the symptoms may be indistinguishable from narcotic induced withdrawal although milder in severity. Infants exposed to alcohol in utero are at increased risk for Fetal Alcohol Syndrome: a constellation of physical, behavioral and cognitive abnormalities.
  - d. SSRI's: May cause NAS in up to one third of the infants exposed in utero but symptoms are usually mild and self-limited
2. What Medical Evaluations and Treatments are needed prior to discharge (in addition to 'Routine Newborn Care')?
  - a. CBC with differential, platelets (consider blood culture)
  - b. Consider C Reactive Protein. CRP's are elevated in response to infection and inflammation.
  - c. Serum glucose

- d. Calcium
  - e. Urine and meconium toxicology screen
  - f. Offer HIV testing to mother if not already done
  - g. Confirm maternal hepatitis status (B and C), RPR, GC, Chlamydia and treat accordingly  
Hepatitis B vaccine should be administered to infant immediately and HBIG if Hepatitis B status not available <48hrs
  - h. Neonatal Abstinence Scoring in nursery
  - i. Social Work Consult: The role of the social worker in this setting is to help evaluate the capability of the mother to provide a safe, supportive environment for her infant. This involves in depth discussions with the mother and often other family members and close friends and relatives. The social worker would assist the mother in arranging for financial support, medical care and substance abuse cessation programs, if desired, by mother. In most cases where there is a lack of prenatal care and substance abuse, the social worker would involve Child Protective Services to help in the determination as to the placement of the infant once the infant is medically stable. Infants are not generally allowed to be discharged with Mom until they are medically stable and a social worker has had the opportunity to evaluate the ability of the mom to care for the child and assess the general safety of the home environment.
  - j. Maternal toxicology screen
3. What treatment is available for NAS and what are the indications for treatment?  
The decision to use drug therapy for neonatal drug withdrawal should depend on the presence of signs of withdrawal. Some protocols quantify the signs of withdrawal from a neonatal abstinence scoring system. Be familiar with your institutions protocol. Treatment should be based on the drug that the infant is withdrawing from and the degree of withdrawal. Treatment options may include the use of phenobarbital, methadone, paregoric, tincture of opium, as well as, techniques to decrease stimuli to the infant (swaddling, quiet environment, minimal stimulation, low lighting, etc.).

### Diagnosis:

#### Withdrawal

1. What factors may affect the timing of the symptoms of withdrawal in the neonate?  
The timing of withdrawal is most closely linked to the half-life of the substance the infant is withdrawing from.
  - a. Morphine has a short half life and symptoms are seen within 24 hours of birth and generally peaking around 48-72 hours after birth.
  - b. Methadone has a longer half-life of over 24 hours with symptoms of withdrawal in the infant often not in evidence before 48 hours of age and sometimes not seen for as long as 1-4 weeks later; even longer for sub acute signs.
2. What characteristics of the drug increase the likelihood that the drug would affect the CNS of the fetus?  
Substances that cross the placenta are lipophilic and of low molecular weight more readily cross into the CNS of the fetus.

**Suggestions for Learning Activities:**

- Assign students in small groups to research the effects of various substances on the neonate
- Role play, having the student disclose the infant's toxicology screen result to the parent or that the infant has NAS.
- Have the students obtain and review the Neonatal abstinence protocol at your institution and prepare a plan based on an infant with severe withdrawal from methadone with a weight of 2.5 kg.

**Other Resources:**

- Neonatal Abstinence Protocol at your institution
- Nelson Textbook of Pediatrics 19th Edition, pp 624-625

## **Issues Unique to the Newborn, Case #10**

Written by Yameika Head, M.D.

The parents of a newborn ask your opinion about whether the baby should be circumcised. How should you counsel these parents?

### **Definition for Specific Terms:**

**Circumcision**- Surgical removal of some or the entire foreskin (prepuce) from the penis. The word "circumcision" comes from Latin circum (meaning "around") and cædere (meaning "to cut"). Early depictions of circumcision are found in cave paintings and Ancient Egyptian tombs.

**Phimosis (Greek for muzzle)**- Stenosis or narrowness of the preputial orifice so that the foreskin cannot be pushed back over the glans penis.

**Paraphimosis**- Strangulation of the glans penis due to retraction of a narrowed or inflamed foreskin.

### **Review of Important Concepts:**

#### **Historical Points**

- Circumcision is a very controversial topic around the world.
- There are spiritual and religious reasons that circumcisions are performed. For example, Judaism, Islamic, and Christianity practice circumcisions. For Jewish families, the circumcision is performed by a rabbi on the 8th day after birth.
- Prolonged bleeding from circumcisions can be the first sign of a bleeding disorder.

#### **Physical Exam Findings**

Does the male infant have normal penile anatomy?

Hypospadias, epispadias, hooded prepuce, and any other penile deformities are contraindications for circumcision.

#### **Clinical Reasoning**

1. What are the different types of circumcision techniques and how are they performed?
  - a. Plastibell Method: once the glans is freed the Plastibell is placed over the glans, and the foreskin is placed over the Plastibell. A [ligature](#) is then tied firmly around the foreskin and tightened into a groove in the Plastibell to achieve [hemostasis](#) to cut off circulation. The Foreskin distal to the ligature is excised and the handle is snapped off the Plastibell device. The Plastibell falls from the penis after the wound has healed, typically in four to six days.
  - b. Gomco Method: With a Gomco clamp, a section of skin is dorsally crushed with a [hemostat](#) and then slit with scissors. The foreskin is drawn over the bell shaped portion of the clamp and inserted through a hole in the base of the clamp. The clamp is tightened, "crushing the foreskin between the bell and the base plate." The crushed blood vessels provide hemostasis. The flared bottom of the bell fits tightly against the hole of the base plate, so the foreskin may be cut away with a scalpel from above the base plate.

- c. Mogen clamp method: The foreskin is pulled dorsally with a straight hemostat, and lifted. The Mogen clamp is then slid between the glans and hemostat, following the angle of the corona to "avoid removing excess skin ventrally and to obtain a superior cosmetic result" to Gomco or Plastibell circumcisions. The clamp is locked, and a scalpel is used to cut the skin from the flat (upper) side of the clamp
2. What is the response to parents if they question about the pain with circumcision? What ways do physicians ensure that infants have minimal pain?  
Explain to parents that there are simple anesthesia methods that can be given to their child to ensure that they are not in pain such as Sweetease (oral sucrose), injectable 1% Lidocaine without epinephrine as a pudendal nerve block, and topical prilocaine cream. Some institutions use all three and some use none. What is your institution's policy?
  3. What are different organizations stances on the subject of circumcision?  
For example, the American Academy of Pediatrics (2012) states "that the health benefits of newborn male circumcision outweigh the risks and that the procedure's benefits justify access to this procedure for families who choose it". If parents choose to circumcise, analgesia should be used to reduce pain associated with the circumcision.
  4. What are some of the complications of circumcisions?  
Most common is bleeding and less common is infection, or damage/disfigurement to the penis.
  5. What are the pros for circumcision?
    - a. Less UTIs
    - b. No phimosis
    - c. Decreased risk of penile cancer
    - d. Protection against STDs including HIV
  6. What are the cons for circumcision?
    - a. Pain
    - b. Risk of infection
    - c. Decreased sensation
    - d. Poor hygiene
    - e. Paraphimosis
    - f. Cosmetic problems
  7. What is the care for the circumcised versus uncircumcised penis?
    - a. The circumcised penis has to be kept clean with a mild soap and water.
    - b. With uncircumcised penis, the parents may feel the need to pull back the foreskin and clean around the glans with mild soap and water the best that they can.

### Suggestions for Learning Activities:

- Watch a pediatrician perform a circumcision.
- Have student role-play discussion about circumcision with parents.
- Have student obtain consent s for circumcisions and discuss pros and cons.
- Have students obtain articles on female circumcision and its controversy.

**Other Resources:**

- AAP policy statement on circumcision
- AMA policy statement on circumcision
- WHO policy on circumcision

## **Issues Unique to the Newborn, Case #11**

Written by Jennifer Hudson, M.D.

What anticipatory guidance would you give to the parents of a healthy, full-term, first born infant at the time of discharge from the newborn nursery?

### **Definitions for Specific Terms:**

**Anticipatory Guidance**- A personal discussion with a pediatrician about what to expect after discharge helps to lay the groundwork for healthy lifestyles starting in the newborn period. It is best to have both parents, or whichever caregivers will be primarily responsible for the newborn, present during this teaching session.

**Metabolic Screening**- It's not just the "PKU test" any longer! Every state is different. Genetic or metabolic disorders caused by changes in the genes. If caught early, some diseases can be treated to minimize long term effects.

### **Review of Important Concepts:**

#### **Clinical Reasoning (Anticipatory Guidance)**

1. Nutrition
  - a. Normal breast- and formula-feeding patterns
  - b. Normal voiding and stooling patterns
  - c. Normal weight loss and gain patterns for the first 2 weeks
  - d. Normal "spitting up"
2. Safety
  - a. Sleeping habits
  - b. SIDS prevention and pacifiers
  - c. Crying and Shaken Baby Syndrome
  - d. Car seat recommendations
  - e. Smoke exposure
3. Hygiene
  - a. Bathing, cord, nail and skin care
  - b. Circumcision, vaginal discharge and other genital care issues
  - c. Infection prevention
4. Fever in a newborn-taking a temperature
5. Jaundice awareness
6. Irregular breathing patterns in the newborn
7. Newborn screening results:  
When and where?

8. Normal Habits:  
Sneezing, hic-ups, and passing gas!
9. Postpartum depression awareness
10. Follow-up plan and when to call the doctor for concerns
11. Opportunity for questions

**Suggestions for Learning Activities:**

- Role play – ask students typical questions related to anticipatory guidance that a new parent may be curious about i.e. Explain to the “mother” the definition of jaundice and what she should be monitoring.
- Role play- Practice telling the “mother” the discharge anticipatory guidance spill.
- Shopping trip – have students guess the price of a list of common baby supplies, and then research actual costs online or in stores

**Other Resources:**

- Bright Futures Guidelines for Health Supervision
- Goldenring JM. What to tell parents before they leave the hospital. Contemporary Pediatrics, April 2007

## **Issues Unique to the Newborn, Case # 13**

Written by Jennifer Hudson, M.D.

A full term newborn weighs 2000 grams. What factors might have contributed to this infant's small size? How do you assess the maturity of this infant? What should you monitor in the nursery?

### **Definitions for Specific Terms:**

**Large, appropriate, and small for gestational age-** Weight measurements for all newborns should be plotted on standardized growth curves published by the CDC. Infants with birth weights less than 10th percentile for gestational age are classified as small for gestational age (SGA), while those with birth weights more than 90th percentile are classified as large for gestational age (LGA). All infants with birth weights between 10th and 90th percentiles are classified as appropriate for gestational age (AGA).

**Intrauterine growth restriction (IUGR)-** Poor fetal growth caused by one or more general problems in pregnancy: placental insufficiency, maternal health problems, and fetal factors.

**Ballard (Dubowitz) scoring-** The gestational age of a neonate can be estimated by two methods: 1) obstetrical dating (using menstrual history and ultrasound) or 2) assessment by physical exam. The Ballard Score is obtained after examination for signs of physical maturity (such as skin and genital appearance) and signs of neuromuscular maturity (such as posture and measures of joint flexibility). It is generally considered accurate to within two weeks of actual gestational age. Any significant discrepancies between obstetrical dating and Ballard scoring should be documented on the newborn's chart, with a final physician determination of which gestational age will be used for the patient care plan.

### **Review of Important Concepts:**

- IUGR, or poor fetal growth, can be caused by one or more general problems in pregnancy: placental insufficiency, maternal health problems, and fetal factors.
- Placental insufficiency may be caused by small size of the placenta, placental tumors, and hypertension from chronic causes, pregnancy itself, or drugs (such as cocaine and nicotine.)
- Maternal health problems such as poor nutrition or chronic illness can cause fetal undergrowth.
- Inherent fetal problems, such as genetic disorders or anomalies, exposure to teratogens, infections, multiple gestation and endocrine disorders are also causes of IUGR. Growth-restricted fetuses are at risk for fetal demise and postnatal hypoglycemia and polycythemia.

### **Physical Exam Findings**

1. Fetal growth restriction usually results in one of two patterns.
  - a. Early, toxic, and severe insults to the fetus cause symmetric growth restriction, with the newborn's head and body size both being proportionately small.
  - b. In contrast, insults toward the end of pregnancy, such as poor nutrition or late gestational hypertension, tend to result in asymmetric growth restriction, with the newborn's head size being relatively normal compared with a smaller body and overall weight.

2. All growth-restricted infants tend to have poor subcutaneous fat stores. A careful examination should be performed to assess for dysmorphologies and signs of infection or drug effects. In addition, plethora (ruddy skin) may indicate polycythemia, and tremors, irritability, or other neurologic symptoms may indicate the presence of hypoglycemia.
3. Screening tests:
  - a. All SGA and LGA newborns should be screened for hypoglycemia (serum or whole blood glucose before feedings) from birth to 12 or 24 hours.
  - b. Other workup may be obtained, depending on physical examination findings. Tests to consider may include complete blood count or hematocrit measurement, genetic testing, drug screens, and specific tests for TORCH infections.

**Suggestions for Learning Activities:**

- Have students watch a nurse or physician perform a Ballard assessment and then practice performing one
- Have students practice obtaining newborn weight, length, and head circumference measurements and plot them on the growth chart appropriately
- Have students review newborn glucose screening protocol for your institution and practice blood collection methods in your nursery (procedural pain control, heel-stick, labeling and filling collection tube or using a glucometer)

**Other Resources:**

- Nelson Textbook of Pediatrics, 19th ed., 2011
- Guidelines for Perinatal Care, 6th ed. AAP and ACOG, 2008
- Stellwagon L and Boies E, Care of the Well Newborn. Pediatrics in Review, 2006;27;89-98
- AAP Committee on Fetus and Newborn, Postnatal Glucose Homeostasis in Late-Preterm and Term Infants, Pediatrics 2011;127;575-579