

**STATED OBJECTIVE:**

Discuss some of the more common newborn issues

Describe why newborns aren't little adults, and not even little peds patients

**REAL OBJECTIVE:**

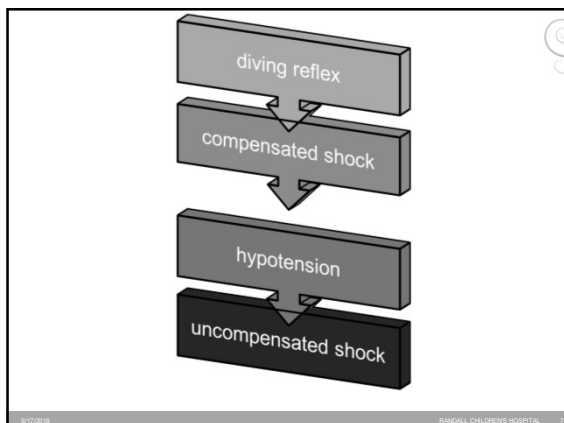
Have a frank discussion about why you don't like to take care of newborns

# Very poor communicators



A collage of five black and white photographs of newborn babies. The top-left photo shows a baby crying with a furrowed brow. The top-right photo shows a baby screaming with its mouth wide open. The middle-left photo shows a baby crying with its mouth open. The middle-right photo shows a baby looking distressed with its hand near its face. The bottom photo shows a baby crying with its mouth open and hands near its face.

The collage consists of six images arranged in a 2x3 grid. The top row contains three anatomical diagrams: a fetus in the womb (top left), a human heart (top center), and kidneys with ureters (top right). The bottom row contains three images: a human brain (bottom left), a baby swimming in water (bottom center), and a small, illegible text box (bottom right).



### "Stiff" myocardium

Limited ability to increase contractility

- Fewer myofibrils, disordered pattern
- Increased fibrous non-contractile tissue
- Hypoxia induced bradycardia is terminal event NOT fibrillation

Myofibrils on cells are disordered and fibrous

HR

→

CO

$CO = SV \times HR$   
(preload, afterload, contractility)

DEVELOPMENTAL STAGE	EMBRYONIC	PSEUDOGLANDULAR	CANALICULAR	TERMINAL SAC	ALVEOLAR
Gestation	0-6 weeks	7-16 weeks	17-24 weeks	25-36 weeks	>37 weeks
Structural morphogenesis	Trachea, bronchi	Bronchioles, terminal bronchioles, lung circulation	Respiratory bronchioles, primitive alveoli	Alveolar ducts, thin-walled alveolar sacs, increasing functional type 2 cells*	Definitive alveoli and mature type 2 cells*
Disease manifestation	Tracheoesophageal fistula, pulmonary sequestration	Bronchogenic cyst, congenital diaphragmatic hernia, congenital cystic adenomatoid malformation	Pulmonary hypoplasia, RDS, BPD, alveolar capillary dysplasia	RDS, BPD	TTN, MAS, neonatal pneumonia, PPHN

### Immature nervous system

#### Neonate

- Myelin membrane around axons undeveloped
- Limited inhibition
  - Early development of excitatory neurotransmitters
  - Delayed inhibitory function of gamma-aminobutyric acid (GABA)
  - Excess of excitatory glutamatergic neurons

= more excitable subunits than the equivalent in adults

#### 1-year old

- Myelination rapid first 2 years > continues for 3 DECADES
- Neurogenesis for...?

MORE SEIZURES IN NEONATAL PERIOD THAN ANY OTHER TIME

### Ineffective immune system

- Limited bone marrow stores of neutrophils
  - Exhaust bone marrow stores easily
- Limited humoral immunity
  - Immunoglobulins 20-60% of adult levels at 1 year
- Ineffective WBC function
  - Opsonization, chemotaxis, phagocytosis, adhesion
- "Leaky" blood-brain barrier

https://ifttt.net/canvass/wordpress.com/2014/07/the-purpose-of-a-blood-cell-to-fight-off-germs-and-protect-the-body-all-at-the-same-time-components.jpg?w=607

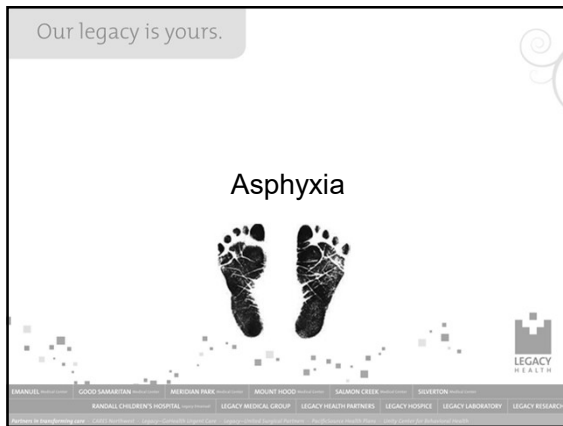
## How does this play out on your shift?

Never trust a baby.

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## Asphyxia definition

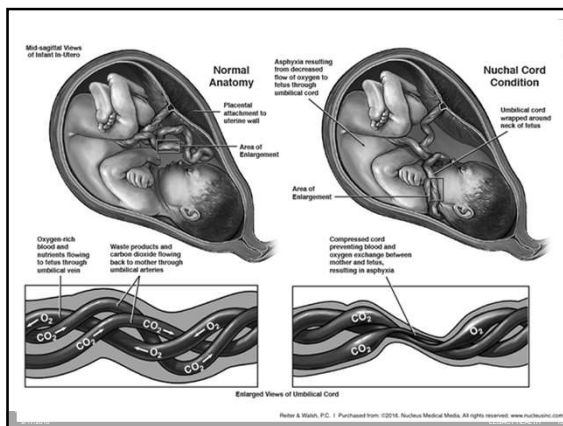
- Interference in gas exchange between organ systems of the mother and fetus
- Impairment of tissue perfusion and oxygenation
- Watershed injury to the brain

## Birth asphyxia

\ˈbərth\ \əsˈfiksēə\

[https://accessmedicine.mhmedical.com/data/book/1763/af\\_ch10\\_af001.png](https://accessmedicine.mhmedical.com/data/book/1763/af_ch10_af001.png)

September 17, 2018



## Incidence

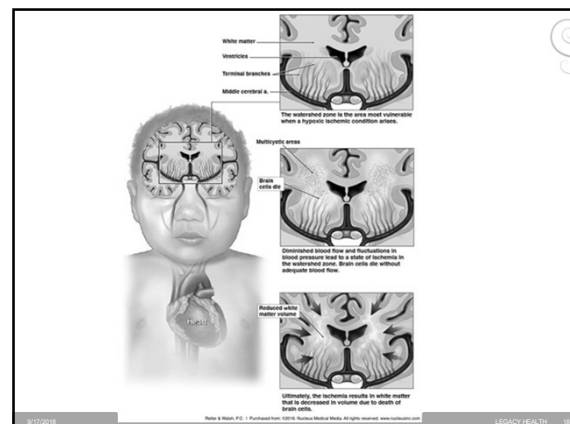
- 1.0-1.5% (do you know your institution's?)
- Usually related to gestational age and birth weight
- Increased risk:
  - IUGR (intrauterine growth restriction)
  - PIH (pregnancy induced hypertension)
  - IDM (infant of a diabetic mother)

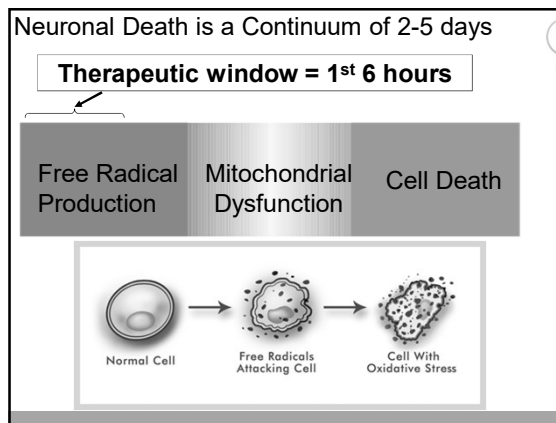
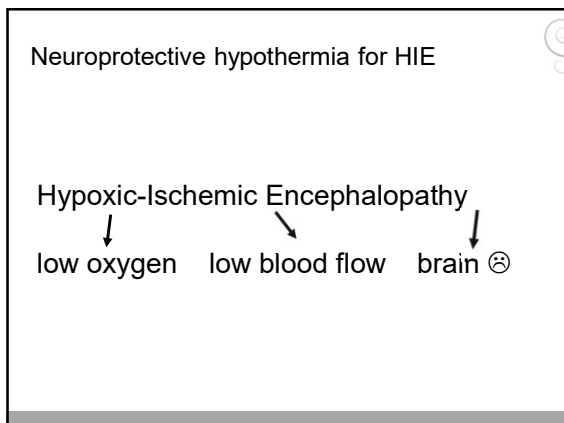
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## Signs/symptoms

- Depression at birth with low Apgar scores and acidosis
  - > < 6 at 5 min
  - > pH < 7.0 BE > 10
- Hypoxic ischemic encephalopathy (HIE)
  - > Low oxygen and blood flow injures brain >> poor tone, lethargic, poor suck, seizures
- Multi-organ system dysfunction
  - > Diving reflex tries to spare heart, brain, adrenals
  - > Other organs like bowels and kidneys are starved for blood flow- even bone marrow and skin
- Fluid, electrolyte and metabolic abnormalities

September 17, 2018





- Cooling criteria: 1) baby is encephalopathic
- ✓ Must begin by 6 hours of age...the sooner, the better
    - > 35-36 weeks post-menstrual age, with seizures or moderate or severe encephalopathy by Sarnat criteria, **plus one** of the following:
      - PH <7 or base deficit > 16 within 1 hour of birth **or**
      - PH 7.01 – 7.15 and base deficit 10-15.9, plus one of the following:
        - Apgar < 5 at 10 minutes **or**
        - Assisted ventilation (not including CPAP) x 10 minutes
  - ✓ Blood gas values: umbilical cord arterial, umbilical cord venous or baby by 1 hour of age arterial/venous/capillary
  - ✓ Send one from baby if can't get cord gases, or if not sure you got a cord arterial sample since it reflects fetal status

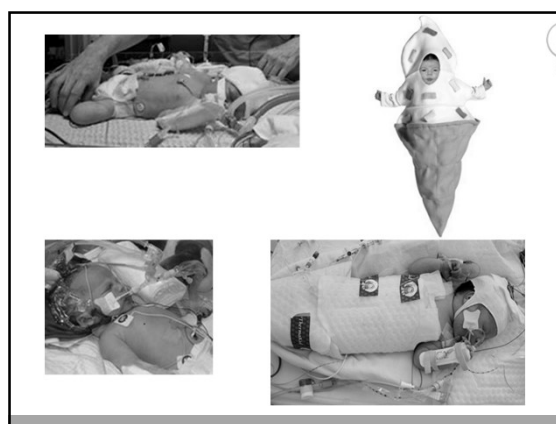
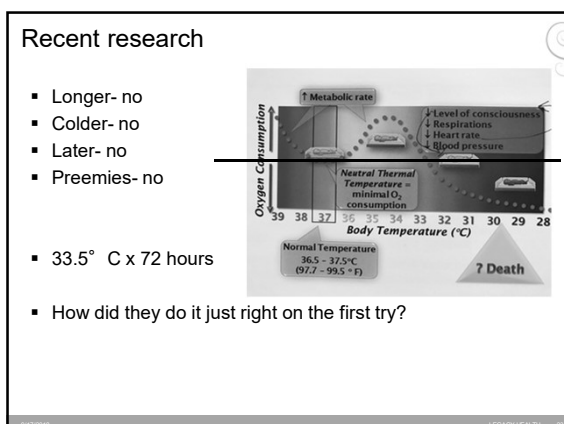
Modified Sarnat Scale

Stage	Stage 0 Normal	Stage 1 Mild	Stage 2 Moderate	Stage 3 Severe
Level of Consciousness	Alert	Hyperalert	Lethargic	**Stupor or Coma
Spontaneous Activity	Normal	Normal	Decreased	Absent
Posture	Normal	Mild Distal Flexion	Strong Distal Flexion	Decorticate
Muscle Tone	Normal	Normal	Hypotonia	Flaccid
Primitive Reflexes				
■ Suck	Normal	Weak	Weak or Absent	Absent
■ Moro	Strong	Strong	Incomplete	Absent
Autonomic Nervous System				
■ Eye Responses	Reactive	Reactive	Constricted	Deviated, Dilated, or Non-reactive
■ Heart Rate	Normal	Tachycardia	Bradycardia	Variable
■ Respiration	Normal	Normal	Periodic Breathing	Apnea
Seizures	None	None	Common	Uncommon

Stage determined by column that has the most identified characteristics  
Based on level of consciousness if signs are equally distributed

\*\*Stupor is defined as "no spontaneous eye opening, and tactile stimulation elicits poorly sustained eye opening."

\*\*Coma is defined as "no eye opening to vigorous tactile stimulation."





### Physiologic (delayed/timed) cord clamping

- Consider delaying clamping of the umbilical cord for at least 30-45 seconds
- Establish airway before cord cut
- Intraventricular hemorrhage (IVH) decreased by **50%!**  
> 18.3% vs 35.2% (Chiruvolu et al., 2015)

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### Ventilation while delaying cord clamping

- Compared  $\leq 29$  week infants who breathed during DCC with non-breathers
- Non-breathing group was more likely to be intubated ( $p = 0.01$ ), have chronic lung disease ( $p = 0.02$ ), and severe intraventricular hemorrhage ( $p = 0.02$ )

(Nevill & Meyer, 2015)

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### Physiologic cord clamping is PHYSIOLOGIC

- Cardiac transition/circulation more stable
  - Improved blood pressure: fewer pressors
  - Hematocrit: fewer transfusions
- Immune system
  - Stem cells—'nuff said
- Iron stores
  - Iron deficiency anemia > mental retardation
  - Bridge to solid food

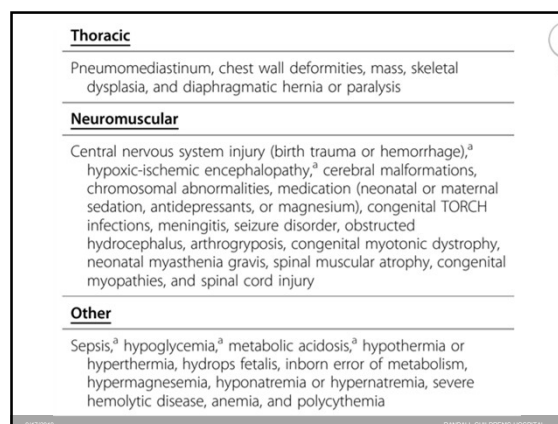
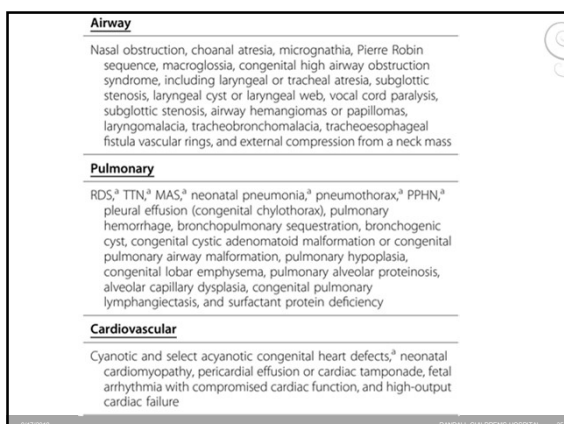
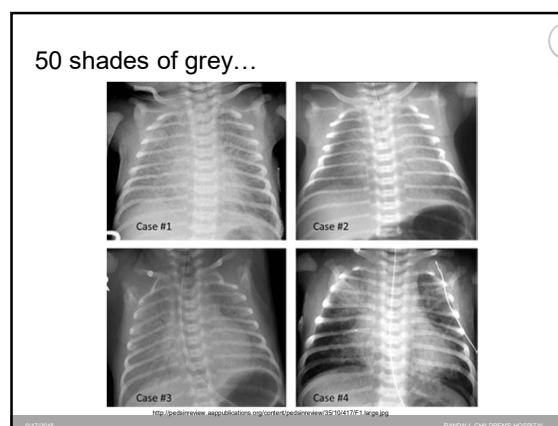
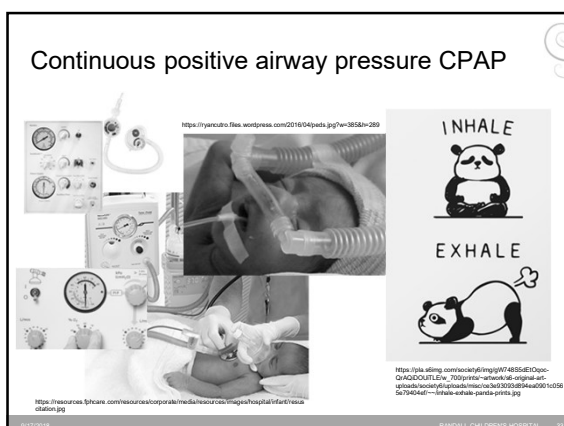
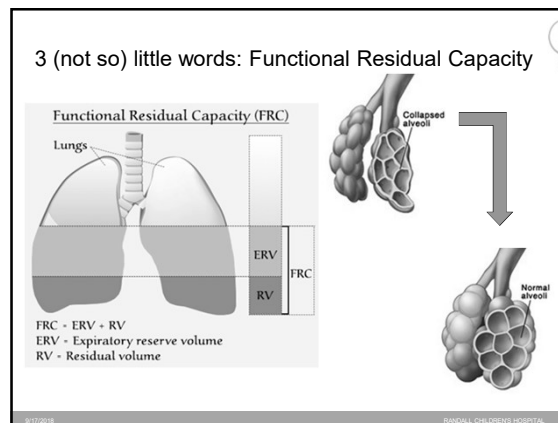
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### Respiratory Symptoms

- Tachypnea > 60 breaths/minute
- Grunting
- Flaring <https://youtu.be/NBA9iigiDgk>
- Retractions
- Central cyanosis
- Apnea
- Bradypnea < 30 breaths minute
- Gasping

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You to the rescue!

**I'M A  
NURSE  
WHAT'S YOUR  
SUPERPOWER?**

[https://img.etsystatic.com/44668a/1231246681/340270/1231246681\\_nrk.jpg?version=1](https://img.etsystatic.com/44668a/1231246681/340270/1231246681_nrk.jpg?version=1)

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The American College of  
Obstetricians and Gynecologists  
WOMEN'S HEALTH CARE PHYSICIANS

**COMMITTEE OPINION**

Number 677 • October 2016

**Committee on Obstetric Practice**

*This Committee Opinion was developed by the American College of Obstetricians and Gynecologists' Committee on Obstetric Practice in collaboration with committee members Yasser Y. El-Sayed, MD, Ann E.B. Borders, MD, MS, MPH, and the Society for Maternal-Fetal Medicine's liaison member Cynthia Gyamp-Burner, MD, MS. This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed.*

**Antenatal Corticosteroid Therapy for Fetal Maturation**

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**ABSTRACT:** Corticosteroid administration before anticipated preterm birth is one of the most important antenatal therapies available to improve newborn outcomes. A single course of corticosteroids is recommended for pregnant women between 24 0/7 weeks and 33 6/7 weeks of gestation, including for those with ruptured membranes and multiple gestations. It also may be considered for pregnant women starting at 23 0/7 weeks of gestation who are at risk of preterm delivery within 7 days, based on a family's decision regarding resuscitation, irrespective of membrane rupture status and regardless of fetal number. Administration of betamethasone may be considered in pregnant women between 34 0/7 weeks and 36 6/7 weeks of gestation at imminent risk of preterm birth within 7 days, and who have not received a previous course of antenatal corticosteroids. A single repeat course of antenatal corticosteroids should be considered in women who are less than 34 0/7 weeks of gestation who have an imminent risk of preterm delivery within the next 7 days, and whose prior course of antenatal corticosteroids was administered more than 14 days previously. Rescue course corticosteroids could be provided as early as 7 days from the prior dose, if indicated by the clinical scenario. Continued surveillance of long-term outcomes after in utero corticosteroid exposure should be supported. Quality improvement strategies to optimize appropriate and timely antenatal corticosteroid administration are encouraged.

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Can't get enough?

- <https://www.youtube.com/watch?v=j3ypUILLMLRls>
- [www.openpediatrics.org](http://www.openpediatrics.org)

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Our legacy is yours.

**Seizures**



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**Neurologic symptoms**

- Lethargic <https://youtu.be/r9TCHchWbns>
- Abnormal Tone <https://youtu.be/7z2FXVtxgal>
- Irritability <https://youtu.be/Xw2TBCONUz8>
- Arching <https://youtu.be/iO4GbeOuayw>
- Jittery <https://youtu.be/EuKn17kb2ho>
- Lip smacking <https://youtu.be/Hg8hEVgjeog>
- Eye deviation
- Tonic movements
- Clonic movements

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### Normal newborn behavior commonly mistaken for seizures

- Awake or drowsy
  - > roving eye movements with or w/o jerking
  - > sucking or puckering movements w/o ocular
- Benign neonatal sleep myoclonus
  - > only during sleep, disappear on arousal
- Neurologic irritability
  - > search history for drugs, depression

### Jitteriness vs Seizure Activity

CHARACTERISTIC	JITTERINESS	SEIZURE
STIMULUS INITIATED	Yes	No
MOVEMENTS	Symmetrical	Irregular Eye deviation
HEART RATE	No change	Rise
RESPIRATIONS	No change	May see apnea
EXTREMITY FLEXING/HOLDING OR SUCKING	Stop	Continue to be felt Self limited

### Seizures


First day of life	Second day of life
<ul style="list-style-type: none"> <li>Hypoxic Ischemic Encephalopathy (HIE)</li> <li>Hypoglycemia</li> <li>Infection</li> <li>Intracranial hemorrhage</li> <li>Pyridoxine deficiency</li> <li>Trauma</li> </ul>	<ul style="list-style-type: none"> <li>Benign familial neonatal seizures</li> <li>Congenital anomalies or developmental brain disorders</li> <li>Drug withdrawal</li> <li>Hyperphosphatemia</li> <li>Hypocalcemia</li> <li>Hypoglycemia</li> <li>Hyponatremia/hyponatremia</li> <li>Inborn errors of metabolism</li> <li>Sepsis</li> <li>Trauma</li> </ul>

### Labs

- SERUM GLUCOSE !
- Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup>, CO<sub>2</sub><sup>-</sup>, Ca<sup>++</sup>, Mg<sup>++</sup>
- Blood gases
- Septic work up with LP
- Serum Ammonia, Lactic Acid
- Metabolic screen as indicated
- Drug screen

### Hypoglycemia Rx 40% dextrose gel

- Dry baby's mouth with gauze
- Massage 200 mg/kg (0.5 mL/kg) gel into buccal mucosa
  - > Equal to 2mL/kg mini bolus of D<sub>10</sub>W
- Encourage baby to feed
- Blood glucose 30 min after gel administration




### "To do" List:

- Advocate, advocate, advocate
- Communicate, communicate, communicate
- Document, document, document
- Establish airway and breathing (NRP)
- Skin to skin
- Assess condition (close look and then ongoing)
- Interventions PRN
  - Blood sugar
  - Pulse oximetry
  - Cardiorespiratory monitoring
- Family education and support; teach parents what to watch for
- Screen at risk and symptomatic babies: blood sugar, toxicology
- Intervene promptly
- Think about cooling- must be initiated within 6 hours >> call for advice
  - Passive cooling while waiting for transfer- turn down warmer, follow temp closely




# SUMMARY



- Keep a high index of suspicion
- Subtle symptoms can be serious

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## Why do we come to work every day?



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## Resources

- American Academy of Pediatrics & American Heart Association. (2015). Neonatal Resuscitation Program (7<sup>th</sup> ed). AAP & ACOG: Elk Grove Ill.
- Noori, S., & Seri, I. (2015). Evidence-based versus pathophysiology-based approach to diagnosis and treatment of neonatal cardiovascular compromise. *Seminars in Fetal and Neonatal Medicine*, 20(4), 238-245. doi: 10.1016/j.siny.2015.03.005
- Polglase, G. R., Ong, T., & Hillman, N. H. (2016). Cardiovascular alterations and multiorgan dysfunction after birth asphyxia. *Clinics in perinatology*, 43(3), 469-483. doi:10.1016/j.clp.2016.04.006
- Reuter, S., Moser, C., & Baack, M. (2014). Respiratory distress in the newborn. *Pediatrics in review*, 35(10), 417.
- Volpe, J. (2018). *Volpe's Neurology of the Newborn*, 6<sup>th</sup> Ed. Elsevier

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HOSPITAL  
LEGACY EMANUEL

## Thank you!

LEGACY HEALTH PARTNERS: EMANUEL, GOOD SAMARITAN, MEDINA PARK, MOUNT HOOD, SALMON CREEK, SEASIDE  
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