The Golden Hour… Transition to Extra-uterine Life

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Objectives
- Review fetal anatomy/physiology
- Identify the key changes necessary for successful transition
- Identify interventions that assist in successful transition to extra-uterine life

Fetal dependence on maternal placenta
- Cardio-pulmonary
- FEN/GI/Renal- Nutrition/waste elimination
- Metabolic- Glucose, Calcium, acid-base equilibrium, etc.
- Thermoregulation
- ID- Infection/ immunity
Transition

What is it?

- Most newborns transition well
- 10% of newborns require some assistance at delivery (stabilization)
- 1% will require advanced resuscitation

What makes the fetus different?

Fetal Lungs

- Blood is diverted away from fetal lungs
Fetal Lungs
- Lungs are filled with fetal lung fluid
  - Secretory Chloride channels
  - Amniotic fluid
  - Fetal contribution
- High Pulmonary Vascular Resistance (PVR)
  - Low intrauterine O2 tension
  - Relatively Acidotic environment
  - Chemical mediators

What makes the fetal heart different?

Fetal cardiovascular system
- Low Systemic vascular resistance (SVR) due to placenta
- Right to Left shunts diverting blood away from the lungs
Which critical events occur at delivery?

- Placenta removed from circulatory circuit
- Fetal lung fluid is cleared
- Spontaneous/effective respirations are initiated
- Pulmonary vascular resistance decreases
- Right to left cardiac shunting ceases
- Thermoregulation and glucose homeostasis shift to the infant

Clearance of fetal lung fluid

- When and how is fetal lung fluid cleared?
Clearance of fetal lung fluid

- Change in respiratory epithelium occur prior to labor
- Physical compression during labor and delivery
- Increased pulmonary blood flow at delivery

Clearing fetal lung fluid

- Failed clearance
  - Precipitous delivery
  - Cesarean section
- What can be done to assist in clearing fetal lung fluid?
  - Initiating respirations

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Effective Respirations initiated
- High pressures required initially to achieve adequate functional residual capacity (FRC)
- Stimulates release of surfactant
- Helps with clearance of fetal lung fluid and reduction of pulmonary vascular resistance

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Pulmonary vascular resistance

Birth-related stimuli that lead to decreased pulmonary vascular resistance. See text for details.
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Right to left cardiac shunts resolve

- Ductus arteriosus and foramen ovale close
- Ductus venosus involutes
- Congenital heart disease
Key steps in aiding the transition

- Respiration
- Circulation
- Thermoregulation
- Glucose Homeostasis
- Further stabilization
- Preparation and team building

Respiration-Gas exchange

- Ventilation- the elimination of CO2 by the lungs
- Oxygenation- the transfer of O2 from the lungs to the blood for delivery to all body tissues
Respiration…as easy as ABC

Ventilation is the single most important aspect of any newborn resuscitation or stabilization

- Establish effective respirations

- Establish Functional Residual Capacity (FRC)

- Provide positive pressure ventilation (PPV)

Establish effective respirations

- Dry

- Suction
  - Clearing the airway as needed
  - No deep suctioning in the 1st 5 minutes of life
  - Meconium

- Stimulate

Primary vs. Secondary Apnea

Establish Functional residual capacity

- FRC- the amount of air present in the lungs at the end of passive expiration
- Maintains lung inflation-prevents collapse
- May require higher initial inspiratory pressure

Provide Positive Pressure Ventilation (PPV)

- Provide positive pressure ventilation (PPV)
  - Apnea, ineffective respirations, cyanosis

Methods for providing PPV

- Self- inflating bags
- Flow-inflating bags
- T-piece resuscitators
- ETT or LMA

Cautions

- Manometers- Avoiding baro and volu-trauma
- Rate- one-and-two-and-three-and- breathe

Figure 5 Pressure-volume relation. The best compliance is seen at the steepest slope of the curve, where ventilation occurs at normal functional residual capacity (FRC). TLC, Total lung capacity.
Ventilation...Ventilation...

- Effective respirations = increasing HR and improving tone
- HR should begin to improve within 15-20 seconds of establishing effective ventilation! If not take corrective steps:
  - MRSOPA
- PPV can be provided with RA
- Resolution of cyanosis takes more time

Respiration- Oxygenation

- Oxygenation- delivery of an adequate amount of O2 to meet the metabolic demands of the patient
- Oxygen should be treated like any other drug
- Toxicity...free radicals...oxidative stress
- Use with caution...

Oxygenation

- Term Infants: Start with RA and titrate
- Preterm Infants: Start with 40% FiO2 and titrate
- Pulse oximetry
- Target pre-ductal O2 saturations
Supplemental O2 should be titrated to achieve the following target saturations (applies to term and preterm infants):

- 1 min: 60-65%
- 2 min: 65-70%
- 3 min: 70-75%
- 4 min: 75-80%
- 5 min: 80-85%
- 10 min: 85-95%

Key steps in aiding the transition:

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Circulation

- Cardiac compressions
  - Heart rate less than 60
  - 90 compressions/minute coordinated with 30 breaths (PPV)/min
  - Only after 30 seconds of **EFFECTIVE PPV!!!**
- Cardiac medications
  - Epinephrine
    - ETT
    - IV
Key steps in aiding the transition

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Thermoregulation

Why does it matter?
- Respiratory distress
- Hypoglycemia
- Acidosis

Thermoregulation

Heat loss
- Radiative
- Convective
- Conduction
- Evaporative
Thermoregulation

- Preterm Infants are at greater risk
  - Skin epithelium is immature
  - Greater body surface area
  - Less fat stores

Thermoregulation

- Preparation of room temperature (OR and delivery rooms)
- Dry
  - Skin to skin with warm blankets if otherwise stable
- Swaddling and head covering
- Transwarmer
- Plastic wraps

Key steps in aiding the transition

- Respiration
- Circulation
- Thermoregulation
- Glucose Homeostasis
- Further stabilization
- Preparation and team building
Glucose Homeostasis

- Once ABC and warming are accomplished
- Checking infant blood sugar
- Establishing protocols for blood glucose monitoring and management of infants at risk for neonatal hypoglycemia
  - Large for gestational age (LGA)
  - Small for gestational age (SGA)
  - Premature infant
  - Infant of diabetic mother

Key steps in aiding the transition

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Preparation and Teamwork

- Preparation
  - Protocols
  - Checklists
  - Anticipation
- Practice
- Team building
Team building

Questions???