

CARE OF THE EXTREMELY LOW BIRTH WEIGHT INFANT (ELBW)

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OBJECTIVES

| | |
|-----------------|---|
| Review | Review antenatal and neonatal preparation techniques for the ELBW infant birth |
| Discuss | Discuss initial resuscitation and stabilization of the ELBW infant using the “Golden Hour” concepts |
| Evaluate | Evaluate nursing care to optimize outcomes and minimize complications common to the ELBW infant |

EXTREMELY LOW BIRTH WEIGHT INFANTS (ELBW)

- Less than 1000gms (2lbs. 3oz)
 - Usually less than 28wks gestation
- Mortality and morbidity rises as gestational age decreases
- Vermont Oxford Network (VON) reports survival rates 23wks- 25%, 24wks-50%, 25wks-75%
- Developmental delays, cerebral palsy, auditory and visual defects common in 50% of infants < 25wks
 - [Use the Tool | NICHD - Eunice Kennedy Shriver National Institute of Child Health and Human Development](#)



FACTORS CONTRIBUTING TO PRETERM LABOR

- Age-older than 35 (AMA) or younger than 16
- Use of tobacco, cocaine, or amphetamines during pregnancy
- African American race
- Low socioeconomic status
- Lack of prenatal care
- Poor nutrition
- **Physical factors:** preeclampsia, diabetes, high blood pressure, cervical incompetence, uterine defects, placenta previa, abruption placentae, maternal infections
- Multiple pregnancy
- Fetal infection
- Hydramnios

ANTENATAL PREPARATIONS

- Administration of antenatal steroids- decreases the incidence and severity of RDS, IVH, PVL, BPD, and NEC
- Administration of Magnesium sulfate for neuroprotection
- Antibiotic administration for the management of PROM/PTL
- Delivery timing and delivery route

OPTIMIZE ANTENATAL MANAGEMENT

- Delivery in a tertiary center with a NICU leads to improved outcomes
- Experienced team with appropriate trained personnel available 24/7 (neonatologist, neonatal nurse practitioner, NICU nurse and Respiratory Therapist)
- Collaborative counseling with the family including mortality/morbidity, complications and long-term deficits. Using the National Institute of Health website to look at current survival rates.

OPTIMIZE NEONATAL MANAGEMENT

- **Appropriate equipment**
- **Assign roles/responsibilities**
- **Adherence to Neonatal Resuscitation Program (NRP) algorithm**
- **Appropriate notification from L&D of impending delivery**
- **Golden Hour Worksheet**



EVIDENCE BASED DELIVERY ROOM MANAGEMENT

Current Practices:

- delayed cord clamping-increases Hct, decreases need for PRBC transfusions, decreased risk IVH, improves circulation
- delivery room temperature stabilization- thermoregulation delivery process checklist
- strategies to establish functional residual capacity and adequate ventilation
- appropriate oxygen use-target oxygen saturations per NRP guidelines (decreases the incidence of ROP and BPD)
- BPD bundles

GOLDEN HOUR CONCEPT

- Defined as 60 minutes of team-oriented and task-driven protocols in the initial management of the premature infant less than 30 weeks gestation
- Requires teamwork and communication in a controlled environment
- Completed admission to NICU within one hour of life
- 1st hour of life can have short and long term consequences, affect neurodevelopmental status, and even result in death

GOLDEN HOUR CONCEPT (CONTINUED)

Key Areas of Focus

- Resuscitation: saturation monitoring, respiratory support, oxygen content, surfactant
- Thermoregulation: evaporation, convection, radiation, and conduction mechanism
- Prevention of IVH: IVH Bundle guidelines will be discussed in the Golden Hour discussion
- Sepsis management: early administration of antibiotics
- Nutrition: hypoglycemia management and early intravenous protein administration (Vanilla TPN with dextrose/protein)
- Developmentally supportive care



RESUSCITATION

- **Pediatrics 2008, Engle reports 80% of infant < 28wks or BW < 1000gms required mechanical ventilation and 70% required surfactant**
- **Many VLBW infant have underdeveloped lungs, poor respiratory drive, surfactant deficiency, and possible retention of lung fluid**
- **Goal: support normal gas exchange while minimizing lung injury which can lead to BPD**

RESUSCITATION

Appropriate equipment in the delivery room should include:

- ETT (2.5)
- Blade (00)
- Handle
- Pedicap
- Stethoscope
- Suction equipment
- Surfactant
- Pulse oximeter
- Blended/humidified oxygen
- T-piece resuscitator (Neopuff) using settings of 16/5 with a goal of TV 4-6ml/kg

RESUSCITATION

- Oxygen use in the Delivery Room
- Place pulse oximeter on right hand to ensure preductal saturations
- Use oxygen as needed by following NRP 10 minute saturation guidelines (less than 35wks gestation use 21-30%)

Remember normal fetal oxygen saturations are 30-40% (high risk for reperfusion injury)

Targeted Pre-ductal SpO₂ after birth

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

RESUSCITATION

Oxygen toxicity to ELBW infant can exacerbate problems such as BPD, ROP, and IVH

- Vermont Oxford Network recommendations to decrease the incidence of BPD
 - Permissive hypercapnia- mild respiratory acidosis
 - Early surfactant administration- infant less than 26 weeks give in DR, 26-28 weeks give if FIO₂ needs >30% prior to 2 hours of life, 28 weeks or greater if FIO₂ needs >30% discuss with MD/NNP
 - Use of a T-piece resuscitator- maintain set PIP/PEEP
 - Use of CO₂ detector with mask CPAP/PPV as a visual cue to identify when you have achieved ventilation that aerates the lungs (NRP 8th edition recommendation)
 - Titration of oxygen based on O₂ saturations

STEROIDS

Hydrocortisone and Dexamethasone

- ❖ Postnatal steroid use (anti-inflammatory effects have been shown to be effective in facilitating extubation and reducing BPD in RCT's)
- ❖ Adverse effects: hyperglycemia, hypertension, hypertrophic obstructive cardiomyopathy, GI hemorrhage and perforation, growth failure, and increased neutrophil and platelet counts
- ❖ Long term effects on brain growth and increased rate of cerebral palsy

HYDROCORTISONE

Low dose prophylactic in prevention of BPD

Initiation on day #0-1 of life in infants < 28 weeks gestation should be considered if:

- significant risk for development of BPD, especially for a mother who did not receive antenatal steroids
- born to mothers with suspected/confirmed chorioamnionitis

Avoid the combination of Indomethacin and systemic steroids due to increased risk of GI perforation

Increased risk of late onset sepsis

Dose 1mg/kg/day divided BID for 7 days, followed by 0.5mg/kg/day for 3 days

DEXAMETHASONE

Should not be given for the prevention of BPD in the first 7 days of life due to increased risk of cerebral injury

Consider use on infants if:

- 8-13 days of life if intubated with increasing oxygen/ventilator support or if $> 50-60\%$ FIO_2 and not weaning
- >14 days of life who are unable to be weaned from mechanical ventilation

Exclusion criteria: infants receiving indomethacin or ibuprofen for PDA treatment, infants with an active infection, infants with GI/NEC evaluation

DEXAMETHASONE

Short term adverse effects: GI bleeding, intestinal perforation, hyperglycemia, hypertension, hypertrophic cardiomyopathy, and growth failure

Long term adverse effects: increased risk of abnormal neurological exam and cerebral palsy

Potential risks and benefits of using dexamethasone should always be discussed with infant's parents and permission to treat obtained

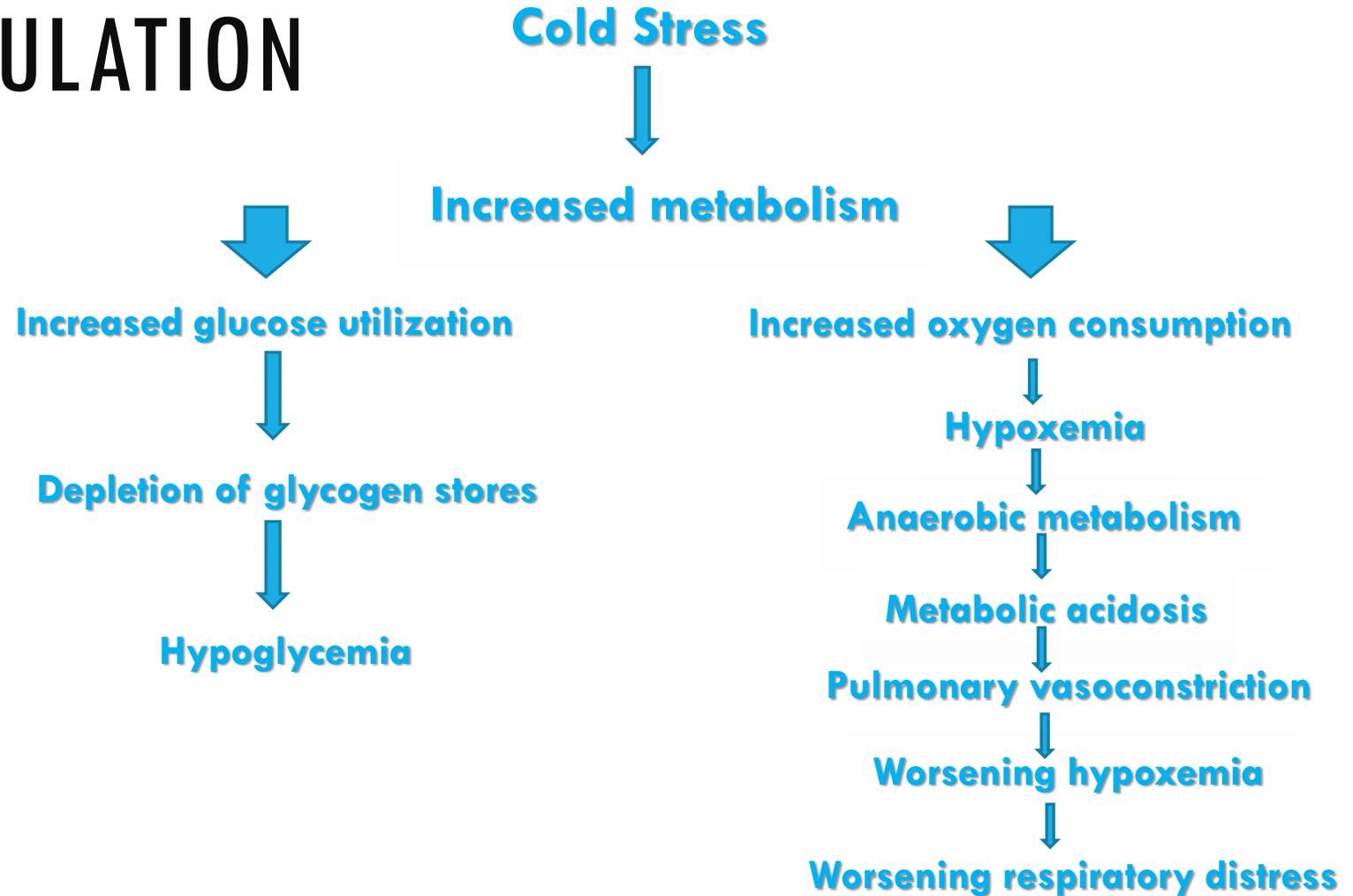
Dose: DART protocol x 10 days

- 0.075mg/kg/dose po/iv q12hrs x 3 days
- 0.05mg/kg/dose po/iv q 12hrs, x 3 days
- 0.025mg/kg/dose po/iv q 12hrs x 2 days
- 0.01mg/kg/dose po/iv q 12hrs x 2 days

THERMOREGULATION

- Studies show that 66-93% of VLBW infants are admitted to the NICU with hypothermia which can affect blood sugar, oxygenation and acid/base balance
- ELBW infants are at higher risk for hypothermia than term infants due to:
 - Thin skin
 - High ratio of body surface area to weight
 - Increased insensible water loss
 - Lack of insulating brown fat
 - Poor tone with decreased ability to maintain flexion

THERMOREGULATION



THERMOREGULATION

Adverse effects associated with hypothermia (cold stress) in ELBW infants include:

- Lungs-decreased circulating oxygen may lead to increased work of breathing, cyanosis, respiratory failure, pulmonary hemorrhage, pulmonary hypertension (PPHN) and surfactant inactivation
- GI- decreased circulation may lead to decreased absorption and motility, increased distention may result in bowel ischemia and NEC
- Kidney-decreased circulation may lead to decreased urine output, electrolyte abnormalities and acute renal failure

THERMOREGULATION

Adverse effects associated with hypothermia (cold stress) in ELBW infants include:

- **Muscles-decreased activity, lethargy, hypotonia, abnormal use of amino acids can lead to tissue breakdown**
- **Heart-decreased perfusion can lead to impaired contractility and function, often see bradycardia and hypotension**
- **Brain-decreased circulation and increased permeability of blood brain barrier can lead to fluctuations in cerebral blood flow and increased risk of IVH**

THERMOREGULATION

- **Evaporation** - heat loss from wet skin and respiratory tract -place in bowel bag, preheated omnibed on porta warm mattress, 2 hats, remove wet linens
- **Convection** - heat loss from moving air (exposure to cold OR temperatures) increase DR temperature, use preheated omnibed and heated humidified oxygen
- **Radiation** - heat loss to cooler objects in the environment-use preheated omnibed
- **Conduction** - heat loss from skin to cool surfaces it comes in contact with and from internal organs to skin surface-use porta warm mattress and hat in DR.

THERMOREGULATION

Neutral Thermal Environment (NTE)

- Neither gaining or losing heat
- Minimal oxygen consumption
- 36.5-37.5 degrees C (97.8-99.5 degrees F)

GOAL: minimize heat loss and maintain core body temperature

THERMOREGULATION

Thermoregulation delivery room process for infants <30 weeks

OR Process

- Call to increase the OR temperature
- NNP or MD to receive infant in sterile plastic bag
 - Delayed cord clamping per provider discretion while in bag



This is an example of use of the bag which allows radiant heat from the warmer to pass through to infant while stopping all evaporative losses. Note: bowel bag, port-a-warm mattress, 2 hats

SEPSIS MANAGEMENT

- Major cause of morbidity and mortality in premature infants
- Risk of sepsis is inversely proportional to birth weight, increased sepsis with lower birth weight
- ELBW infants have very immature immune systems which increases their risk for sepsis

SEPSIS MANAGEMENT

- Signs/symptoms are subtle
 - Changes in vital signs
 - Hypoglycemia
 - Temperature instability
 - Changes in behavior

Obtain blood cultures and start antibiotics (Ampicillin and Gentamicin) within the first 60 minutes of life

EOS calculator is used for infants 35+ weeks gestation

EARLY NUTRITION STRATEGIES

- Goal of early nutrition management in the ELBW infant includes:
 - Optimizing growth
 - Preventing metabolic shock and hypoglycemia
 - Promoting the best neurodevelopmental outcome

EARLY NUTRITION STRATEGIES (CONTINUED)

- Early administration of parenteral protein via vanilla TPN which delivers 4% trophamine and 10% dextrose (within the 1st two hours after delivery)
 - prevents protein catabolism
 - prevents hypoglycemia
 - prevents hypokalemia
 - Prevents poor neurodevelopmental outcomes
- Use of standardized feeding protocols
 - Reduced incidence of NEC
 - Less variability
 - Begin with trophic feeds for the first 3 days of life, then advance by 20ml/kg/day daily as able (per feeding consensus guidelines for less than 1000g or less than 28 0/7wk gestation)

SKIN INTEGRITY



ELBW infants have increased skin permeability which increases their risk for:

- Infection
- Water loss
- Increased susceptibility to topical absorption
- Careful drying in the delivery room

SKIN INTEGRITY (CONTINUED)

- Humidified incubator
- Avoid tape on the skin- use duoderm barriers
- Betadine utilized prior to invasive procedures and cleansed off the infant's skin with a sterile wipe as soon as possible
- Use warm sterile water for bathing infants less than 28 weeks gestation
- Mepitac Silicone Tape-taping IV sites, securing a NG/OG, over temperature probe, under tegaderm for umbilical lines. Do not use for primary securement of any life sustaining devices
- Mepilex One-skin breakdown, under cardiac leads to protect skin (only sticky on one side, place sticky side down against infant's skin)

DEVELOPMENTALLY SUPPORTIVE CARE

Individualized developmentally supportive care of the infant and family-centered care begins before birth, continues through delivery and the entire NICU stay.

Prenatal period

- Neuroprotective strategies
- MgSO₄, steroids, antibiotics
- Collaborative decision making including all team members
- Open, honest communication, long term outcomes including morbidity and mortality (consult with neonatologist)

Delivery room

- Provide warmth and proper positioning
- Awareness of environment and noise levels
- Support parental needs
- Open communication

DEVELOPMENTALLY SUPPORTIVE CARE



- Awareness of environment noise and light levels
- Assess behavioral cues
- Appropriate positioning with nesting or swaddling, positional aids
- Support during potentially painful procedures- use of sucrose
- Promote parental bonding and encourage participation with cares, skin-to-skin (Kangaroo care after 72hrs with ELBW infants)
- Open communication with parents will build a trusting relationship with all team members

PARENTAL SUPPORT/ETHICAL DILEMMAS

Ethical principles

- Autonomy-appropriate information to make an informed decision
- Justice-take actions that are fair to all involved
- Beneficence- do what is good (best interests of the infant)
- Non-maleficence-do no harm (balance risk of harm with benefits)

Parental Involvement

- Emotional
- Physical
- Social
- Cultural
- Spiritual

Counseling (communication)

- Antenatal
- Delivery room resuscitation
- NICU care



Respect all decisions and parental wishes

SURVIVAL RATES FROM NATIONAL INSTITUTE OF HEALTH

Rates of resuscitation

22wks-20%

23wks-64%

24wks-93%

80% of these infants will have major morbidities and 66% will have multiple major morbidities

Survival after resuscitation

22wks- 31%

23wks- 42%

24wks- 64%

Improved survival associated with increased birth weight, female and C-section delivery

Survival rates to 1 year of age

22wks- 6%

23wks- 27%

24wks- 60%

25wks- 78%

28wks- 94%

78% of deaths occurred during the first week of life

THANKS FOR LISTENING



ANY QUESTIONS?

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