The Golden Hour and Beyond

Golden Opportunities in the Care of the Very Low Birthweight Infant

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Disclosures

- Employee of Prolacta Bioscience as the Medical Science Liaison, Neonatal and Pediatric Nursing
- Employee of Kalispell Regional Healthcare where I have been for over 30 years
- 37 years experience in the Neonatal Intensive Care Unit as a bedside nurse, manager/director, and NICU specialist
- Co-founder of Aaspir, LLC, focusing on opiate use disorder

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Objectives

- Understand the importance of a team-oriented, task-driven approach to managing the first 60 minutes of life
- Identify the barriers to the golden hour processes and steps to mitigate them
- Discuss important care factors beyond the first 60 minutes of life

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The Importance of the Golden Hour

- For a newborn, the first hour of life can mean the difference between a good outcome, a poor outcome, and death
- The focus is on resuscitation, thermoregulation, early administration of antibiotics for suspected sepsis, early parenteral nutrition, management of hypoglycemia, and completed admission within one hour of life

The golden hour is 60 minutes of team-oriented and task-driven protocols that can mean the difference between life and death.

SOURCES: Weiner, G., Zaichkin, J. 2016. Neonatal Resuscitation Program, 7th edition. American Academy of Pediatrics. American Heart Association.
Doyle, K., Bradshaw, W. 2012. Sixty golden minutes. Neonatal Netw. Sep-Oct;31(5):289-94. doi: 10.1891/0730-0832.31.5.289.

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First Hour Goals

You will only be successful at meeting these goals if you are well prepared and have the help of a good team.

Appropriate respiratory support	Maintain Normothermia	Admission measurements as appropriate
Monitors on	Lines placed	X-rays
Initial lab work	Boluses as appropriate	TPN/fluids running
Antibiotics given	Admission medications given	Infant nested, isolette closed, humidity on, and walk away

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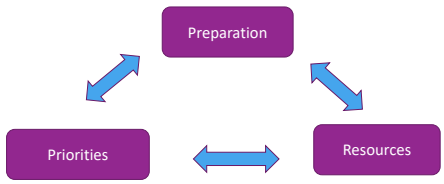
The Keys to Success



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Delivery Room Care

- Have all resuscitation equipment immediately available in sufficient quantity
- Assign roles for the team-don't assume everyone knows their role!

Leader: Neonatologist or NNP	Airway: RT
HR and monitors	Lines/meds
Timekeeper	Scribe

- Turn up the heat – 26-28◦C
- Encourage delayed cord clamping unless resuscitation is needed

SOURCE: American College of Obstetricians and Gynecologists. 2017. Delayed umbilical cord clamping after birth. Committee Opinion Number 684.

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Delivery Room Care (cont)

- Make every effort to prevent hypothermia
  - Associated with increased likelihood of 5 min apgar <7
  - Associated with increase in IVH, sepsis, respiratory distress, and hypoglycemia
  - For every 1◦ C below 36◦ C on admission temperature, mortality increases by 28%
- Prewarm everything
- Use of plastic wrap or bag, plastic lined hat (stockinette is ineffective), chemical thermal mattress, and warmed gases for resuscitation

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Resuscitation

- Immediate appropriate resuscitation is always first
  - Achieve FRC, provide appropriate TV
  - Triggers normal transition to extrauterine life
  - Decreases pulmonary vascular resistance, promotes blood flow into the lungs
  - Allows for gas exchange at the alveolar level
- Target oxygen saturation goals
  - Start at 21-30% FiO2 for <35 weeks gestation (per NRP 7th ed.)
  - Avoid hypo- or hyperoxygenation, both are detrimental

SOURCE: Weiner, G., Zaichkin, J. 2016. Neonatal Resuscitation Program, 7th edition. American Academy of Pediatrics. American Heart Association.

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Admission

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Respiratory Support

- Support normal gas exchange
- Use the least invasive, least aggressive support necessary

CPAP, nIPPV

Intubation if indicated

- Surfactant administration
  - Institution policy? (<29 weeks, <27 weeks)
  - INSURE if appropriate
- Inadequate respiratory effort

Skin protection in place

- Columella and cheeks

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Maintain Normothermia and Reduce Insensible Water Loss

- Heat and humidify supplemental air/oxygen as soon as possible
- Humidified environment
  - Improve thermal regulation and
  - Decrease insensible water loss
  - No consensus on how much humidity to use or for how long
- Hyperthermia is associated with respiratory depression, lung injury, acidosis, inflammation, and death

SOURCE: Wyckoff, MH. 2014. Initial resuscitation and stabilization of the periviable neonate: the Golden-Hour approach. *Sem in Perinatol*. Feb;38(1):12-6. doi: 10.1053/j.semperi.2013.07.003.

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Measurements

- Initial weight is *critically* important
  - Calculation of medications and fluids
  - Baseline for fluid adjustments later
- OFC and length measurements
  - Not critical at this time
  - Infant may not tolerate this degree of handling
  - Don't delay other Golden Hour tasks for the sake of getting measurements
- Quickly assess gestational age, especially if dates are questionable

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Fluids

- Boluses
  - Perfusion vs blood pressure
    - Normal saline vs blood products
  - Hypoglycemia
- Total fluids for ELBW may be as high as 200 ml/kg/day to offset insensible water losses
  - May be 80-100 ml/kg/day if in humidified isolette

SOURCE: Fanaroff, A,. Martin, R. 2015. Neonatal-Perinatal Medicine. Diseases of the Fetus and Newborn. Elsevier/Saunders, Philadelphia, PA. pg 615-618.

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Fluids (cont)

- Starter (vanilla) TPN should be available and at least room temperature before infant arrival
  - D10W is most common; ELBW infants may need D5W because of higher fluid needs
  - Needs to have amino acids-3.5%
  - No electrolytes
  - Start as soon as line placement is complete to decrease the time the infant is without a protein source – should be within 30 minutes of birth

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Labwork and Xrays

- Xrays
  - Line placement
  - Lung fields
  - Be sure infant is positioned straight, supine, with arms in neutral position
  - Protect yourself
- Labs can be drawn from an umbilical line or peripherally
  - CBC, ABG, blood culture, blood sugar, others as relevant
  - Be aware of the amount of blood drawn and keep a running total
    - 3%/day, 10%/month (TBV~90-105 ml/kg in preterm infants)
    - Minimize re-draws and overdraws
  - Some facilities draw initial labs from the placenta
  - Know your state guidelines for newborn metabolic screens

SOURCE: Fanaroff, A,. Martin, R. 2015. Neonatal-Perinatal Medicine. Diseases of the Fetus and Newborn. Elsevier/Saunders, Philadelphia, PA. p 1354.

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Medications

- Antibiotics
  - Recent antibiotic stewardship has promoted less prophylactic use of antibiotics
  - Most common are ampicillin and gentamicin
  - If started prophylactically should be discontinued within 48 hours unless continued use is indicated
- Admission medications
  - Eye prophylaxis - some facilities administer eye meds even if the eyelids are fused and repeat when eyes open
  - Vitamin K-1/2 dose if infant is <1500 grams
    - Preterm infants are at higher risk of bleeding due to immature hepatic function

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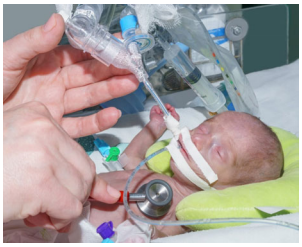
Barriers to Success



- Inadequate preparation
- Inadequate resources
- Conflicting priorities

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Overcoming Barriers: Preparation

- Develop and use checklists for delivery and admission set up
- Develop kits or designated cart drawers for all procedures
  - Intubation
    - Laryngoscopes, tubes, stylets, LMA, securement devices
  - Line placement
    - Trays, catheters, extensions, caps, transducers, restraints, PPE
  - Thermoregulation
    - Chemical mattress, plastic wrap, plastic lined or wool hatHave starter
- Have starter TPN in the unit and prewarming

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Overcoming Barriers: Preparation

- Request pre-are-admission for all infants that will likely come to the NICU before delivery or prior to arrival if a transfer in
- Have RT set up CPAP and have ventilator set up if this is a possibility. Better to have it and take it down than to wait while it calibrates
- Set up for probable procedures
  - Intubation
  - Line placement or PIV supplies
  - Flush tubing - it will warm faster in the tubing than in the bag
- Standardize protocols and order sets

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Overcoming Barriers: Resources

- Assign roles upon admission
  - Assisting with airway
  - Monitors
  - IV, labs
  - Admission meds, weight
  - Communication with family
- Do you have the right number of the right people to do the job?
- If you feel you are frequently lacking in the right people it is time to have a discussion with leadership, but use evidence to back you up

SOURCE: Weiner, G., Zaichkin, J. 2016. Neonatal Resuscitation Program, 7th edition. American Academy of Pediatrics. American Heart Association.

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Overcoming Barriers: Priorities

Is the Golden Hour Really a Big Deal?

- Prompt interventions can help lessen the severity of disease processes and reduce the risk of long-term complications
- Interventions during the first hour of life impact ongoing care
- Impress upon your team the importance of the Golden Hour through education (lab, radiology, nursing, ancillary staff, leadership)

"Decisions made and actions taken in the first hour of life can either support a smooth transition to extrauterine life or hasten and worsen maladaptation."

SOURCE: Bissinger, R, Annibale, D., 2014. Golden Hours. Care of the Very Low Birth Weight Infant. 2nd edition. National Certification Corporation, Chicago, IL.

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Beyond the First Hour

Continuing to Provide Care That Supports Good Outcomes

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Respiratory Support

- Try non-invasive support first
  - CPAP, nIPPV
  - Adequate stomach venting is critical
- Consider permissive hypercapnia
  - Don't force it, (but tolerate it)
  - If T_v is ok, FiO2 is ok, and baby is clinically ok
- Be a stickler for sat parameter goals

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Respiratory Support (cont)

- If you must intubate
  - Minimize lung injury: Volume ventilation
  - High pressures have little adverse effect if not over-distending the lungs
- Extubate ASAP
  - Every day (several times/day) ask: does this baby still need the vent
  - Weaning to nIPPV-has been shown to decrease extubation failure
- Use caffeine
  - Decreases extubation failure
  - Decreases apnea of prematurity
  - Decreases the incidence of BPD
  - Associated with improved neurodevelopmental outcomes

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Source: Moschino, L., Zivanovic, S., et al. Caffeine in preterm infants: where are we in 2020? ERJ Open Research 2020 6:00330-2019; doi: 10.1183/23120541.00330-2019

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Sepsis

- Preterm infants are naturally set up for infection
- Antibiotic use or delayed enteral feedings may disrupt the gut microbiota
  - (Predisposes the infant to delays in immune development and sepsis)
- Humidified environment?
- Attention to asepsis is paramount in every encounter
- Exposure to mother's milk and skin-to-skin care
- Consider prophylactic fluconazole

SOURCES: Gritz, E., Bhandari, V. 2015. The human neonatal gut microbiome: a brief review. Frontiers in Pediatrics. 3: 17. doi: 10.3389/fped.2015.00017. DaSilva Rios, J., Camargos, P. Fluconazole prophylaxis in preterm infants: a systematic review. *The Brazilian Journal of Infectious Diseases*. Volume 21, Issue 3. May–June 2017, Pages 333-338.

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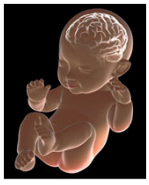
IVH Prevention

- Risks include prematurity, hypotension, hypothermia, hypoxemia, sepsis, RDS, and acidosis
  - Antenatal steroid and magnesium sulfate administration have a protective effect with regard to IVH
  - Delayed cord clamping at delivery has been shown to help prevent IVH in the preterm infant
- Develop an IVH bundle and use it
  - Midline head position for 72 hours
  - Elevate the HOB 30◦ to promote venous drainage – avoid head down
  - Prevent the risk factors listed above
  - Avoid routine endotracheal suctioning
  - Do not exceed 1 ml/min infusions or blood draws
  - Minimal stimulation protocol



SOURCE: American College of Obstetricians and Gynecologists. 2017. Delayed umbilical cord clamping after birth. Committee Opinion Number 684.

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Early Nutrition: Parenteral

- Approximately 50% of extra uterine growth failure is related to fat and protein deficits
- Maintain protein intake of 3.5-4.5 g/kg/day
- Lipids at a minimum of 0.5-1.0 g/kg/day on dol 1 helps avoid essential fatty acid deficiency (EFAD)
  - EFAD can develop in less than 72 hours without adequate non-protein energy
  - Hypoglycemia due to disrupted gluconeogenesis
  - May impede membrane development in the brain, resulting in potential abnormal neurodevelopment

SOURCE: Bissinger, R, Annibale, D., 2014. Golden Hours. Care of the Very Low Birth Weight Infant. 2nd edition. National Certification Corporation, Chicago, IL.

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Early Nutrition: Enteral

- Start oral immune therapy on day of birth (mother's colostrum is best, donor milk second)
- Begin trophic feeds within 24 hours of birth if stable with human milk
  - 15-20 ml/kg/day
  - Early enteral nutrition is a stimulus for postnatal metabolic adaptation and enzyme production
  - Formula should not be a back up for MOM if the infant is <1500 grams
- Have a feeding protocol and use it
- Consider the use of an exclusive human milk diet for ELBW infants

SOURCE: AAP COMMITTEE ON NUTRITION, AAP SECTION ON BREASTFEEDING, AAP COMMITTEE ON FETUS AND NEWBORN. Donor Human Milk for the High-Risk Infant: Preparation, Safety, and Usage Options in the United States. *Pediatrics*. 2017;139(1):e20163440.

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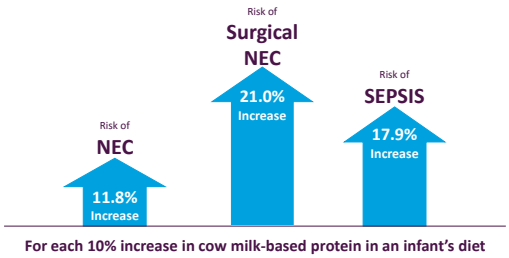
Dose-Response Relationship



For each 10% increase in cow milk-based protein in an infant's diet

SOURCE: Abrams SA, Schanler RJ, Lee ML, Rechtman DJ. Greater mortality and morbidity in extremely preterm infants fed a diet containing cow milk protein products. *Breastfeed Med*. 2014;9(6):281-285. doi.org/10.1089/bfm.2014.0024.

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Early Nutrition-support growth

- If using human milk, faster advancement is tolerated (30-35 ml/kg/day) and has not been shown to increase the risk of NEC
- Fortify early – if using human milk-derived fortifiers many facilities are starting fortification to 26 cal/oz at 60 ml/kg/day or earlier with good results
- When beginning TPN wean be sure macronutrients are still being met
  - Consider concentrating TPN during weaning
  - Wean based meeting nutrients rather than meeting volume
  - Decrease protein deficits and electrolyte issues

SOURCE: Miller, M. 2017. Transitioning preterm infants from parenteral nutrition: A comparison of 2 protocols. *JPEN J Parenter Enteral Nutr*. 2017 Nov; 41(8): 1371-1379. doi: 10.1177/0148607116664560.

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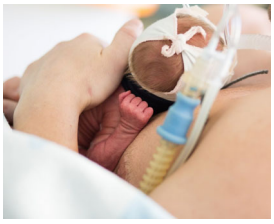
Developmental Care

- Skin-to-skin care (Kangaroo Care®)
  - Improved cardiorespiratory and temperature stability, sleep organization and neurodevelopmental outcomes
  - Increased production of breastmilk
  - No evidence of detrimental effects on physiological stability
- Midline head positioning is not a contraindication for skin-to-skin care
  - Position infant side-lying against parent
  - Use standing transfer from infant bed to parent
- Umbilical lines and intubation are not contraindications



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To a new human, the first 60 minutes of life are golden.

What you do in that hour and beyond impacts a lifetime.

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