The Golden Hour?

Deb Fraser

Thank-you very much for inviting me here

St Boniface Hospital

Agenda

- Define the golden hour
  - Relate first hour of care to long-term morbidities
- Describe key concerns to address in the first hour of life
- Identify strategies to optimize care in the first hour of life

Golden Hour

- This sounds like we are going to retire!
- Originated in the ER/Trauma settings
  - Care received in the first hour after trauma determined if a pt would live or die
- A PubMed search of “golden hour” still returns mostly adult ER literature

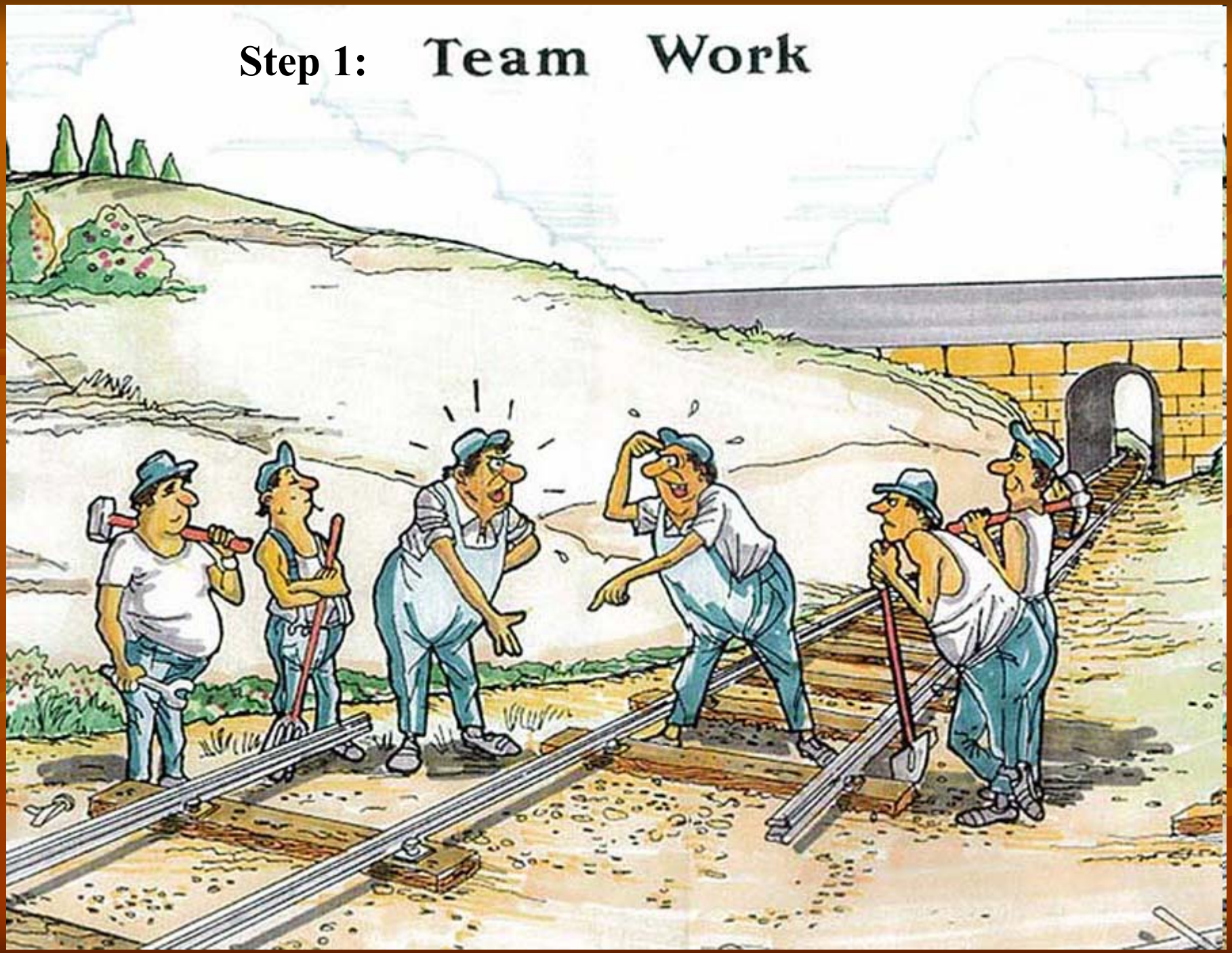
Golden Hour translated

- J Peds editorial (1999) by Narendran and Hoath applied this term to facilitating transition to extrauterine life
- Now recognized to be particularly important in the outcome of the ELBW infant

First Hour Practices

- Focus on minimizing complications
- How?
  - Teamwork
  - Application of Evidence
    -Informed Practices
  - Consistent practices

Step 1: Team Work



Why the push for teamwork?

- Studies of newborn resuscitation have shown improved outcomes when experienced teams attend deliveries and when team cohesion results in good communication
- In U.S. communication errors have been identified as the root cause of 72% of perinatal deaths and injuries (Joint Commission Sentinel Event: 30, 2004)

What makes a highly specialized team?

- Training and practice!
- Mock codes, simulated learning, practice drills are strategies used to facilitate teamwork

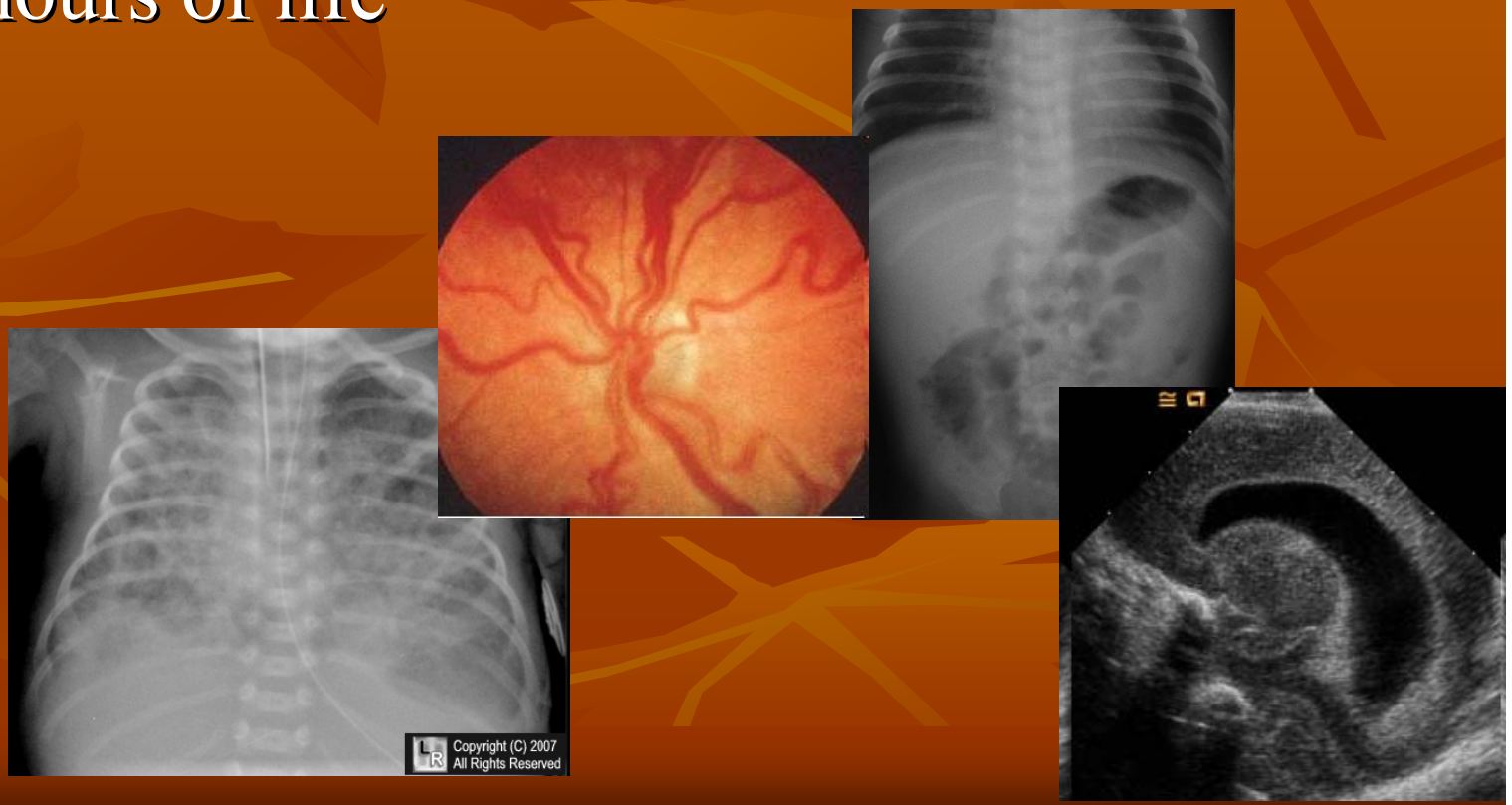
NRP and Teamwork

- Study of interns receiving standard NRP or NRP with team training
- Video of mock codes at the end of the course
- Those with team training- more team behaviors (88% workload management and 88% vigilance) vs 20% and 53% in standard group
    - Thomas, Taggart Crandell et al J Perinat 2007

Step 2: Evidence-Informed Practices

Areas of concern

- Prevention of long-term morbidities that may originate or be affected by care practices in the early hours of life
- BPD
- ROP
- NEC
- IVH



So what care practices affect these "unexplainable" diseases

- Hypothermia
- Hyperoxia
- Ventilation Practices
- Fluids
- Handling
- Pain and stress

Thermoregulation

- Major problem for ELBW infants
- Hypothermia increases the risk of morbidity and mortality
- EPICure study: 36% of infants 24-25 weeks gestation had admission temperatures $<35^0$ C
- Other studies found that 66-93% of small babies become hypothermic (Knobel et al2005, Loughead et al 1997)

Term Infants too!

- A naked infant at room temperature will burn 150 kcal/min (Soll 2008)

Consequences of Hypothermia

- Altered pulmonary vasomotor tone
- Altered cerebral blood flow
- Hypotension
- Hypoglycemia
- Hypovolemia
- Lactic acidosis

Hypothermia

- Hypothermia leads to:
  - Increased oxygen consumption
  - Difficult resuscitation
  - Abnormal coagulation
  - Post-delivery acidosis
  - Delayed adjustment from fetal to newborn circulation

  Increases the risk of developing:
  - RDS
  - NEC
  - IVH

Heat Loss Prevention

- Raise the DR temperature
  - Temperatures below 26^0C associated with colder admission temps in ELBW infants (Knobel 2005)
- Double caps
- Pre-warmed linens/nest liners
- “Wet-in-a-bag”

Preserving thermostability

- Chemical mattress
  - 115 infants <1500g- incidence of hypothermia in mattress group was 52% compared to 77% in standard care group.
- Limit the time for line insertion- keeps heat from reaching the infant

And of course, avoid drafts

And early baths

Hyperoxia

- Oxidative stress results from generation of oxygen free radicals at levels that exceed the body's scavenger system.
- ELBW infants lack effective anti-oxidant scavengers
- Oxidative stress is thought to play a role in chronic lung disease and ROP

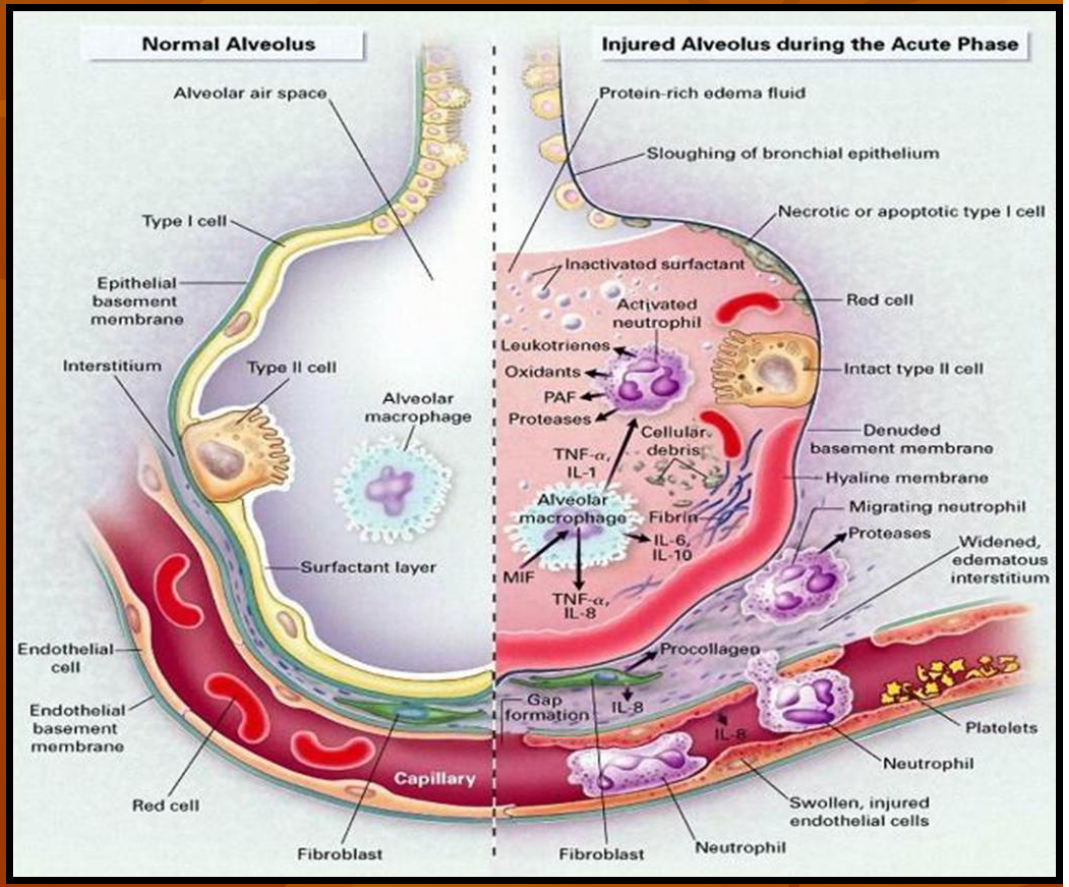
Several studies have found higher rates of leukemia and other cancers in newborns resuscitated with 100% O2.

Preventing Hyperoxia

- Optimal PaO2 or O2 sat levels in VLBW infants unknown
- Several studies have shown that targeting sats of 85-93% results in < CLD, < ROP, ↓ventilator days and fewer infants with postnatal growth failure
- 18 month follow-up shows no decline in neurodevelopmental outcome

Ventilation Practices

- Wallace et al (2009) the period of greatest risk for ventilator-induced lung injury (VILI) may be immediately after birth
- How does this relate to our care practices?



Ventilation Practices

- A classic study of preterm lambs showed that as few as six manually delivered breaths can cause lung damage.

Exquisite attention needed

- High tidal volumes in the first 6 hrs of life upregulates expression of connective tissue growth factor (CTGF)
- Say what?
- This growth factor has been implicated in the decrease in alveolar septal development characteristic of BPD

Golden Hours Fluids

- Attention to preventing hypoglycemia but also fluid overload
- Many ELBW infants are treated for hypotension in the immediate newborn period
  - No operational defns of hypotension
  - Meta-analysis shows some association between hypotension and poorer outcome (methodol limitations) Dempsey et al J Perinat 2007

Treating hypotension

- Fluid bolus-common initial approach
  - Most ELBW infants have normal blood volumes, here is no physiologic rationale for this approach
  - Increased fluid volume associated with BPD
  - Increased IVH rates with rapid fluid vol expansion
- Inotropes
  - Shown to increase BP but at the expense of systemic perfusion
- Glucocorticoids- increase BP, increase in hyperglycemia and gastric perforation

Importance of humidity

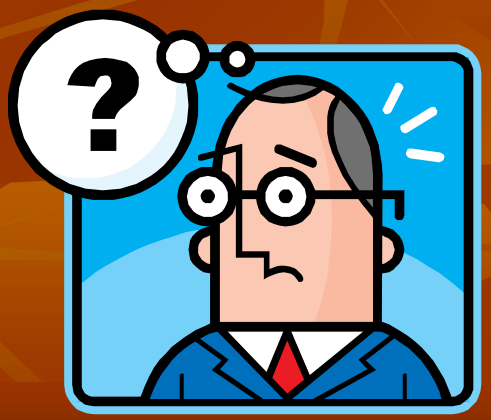
- Kim et al 2009 (Peds 2009)
  - Eval use of hybrid humidified incubator (Giraffe) and found that those infants in HI required lower fluid intake, had less wt loss, less hypernatremia and required less blood work and fewer transfusions. Also had better growth velocity
  - No difference in rates of sepsis, NEC, IVH or BPD but less severe BPD in HI group

Handling, Pain and Stress

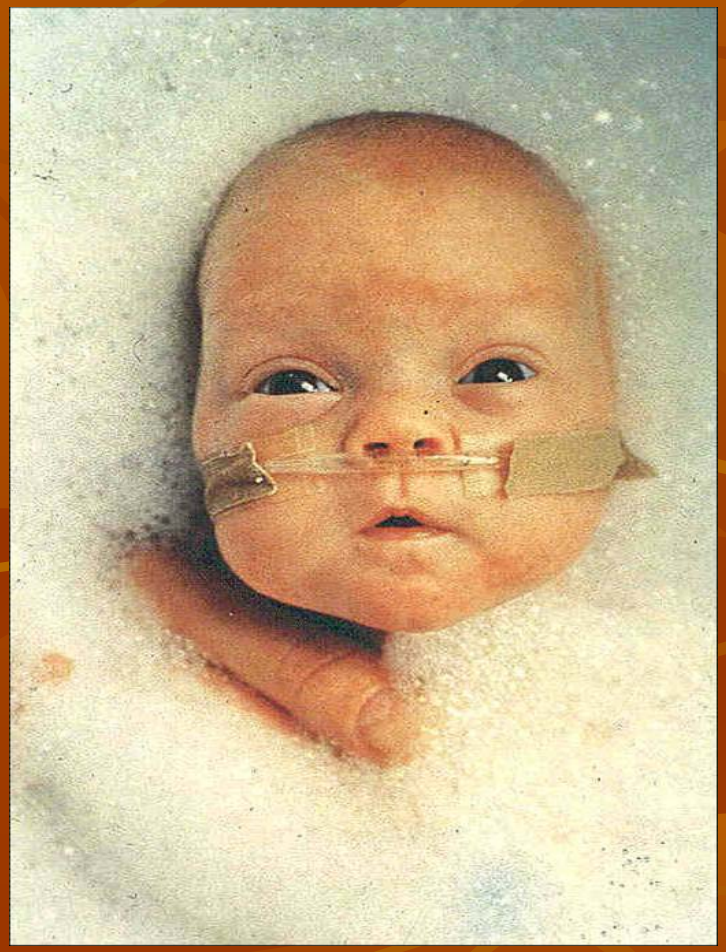
- Much research supporting negative effects of pain and stress on long-term outcomes in LWB infants
- Handling, pain and care practices such as suctioning increase the risk of IVH
- Cochrane review of developmental care as a pkg failed to demonstrate benefit however, positive results for individual interventions were demonstrated (Symington & Pinelli 2006)

Questions to consider

- Do you use premedication for intubations?
- What about containment during line placement?
- Do you have a policy about who attempts procedures in ELBW infants and how many attempts they get?



Specific Morbidities



Chronic Lung disease

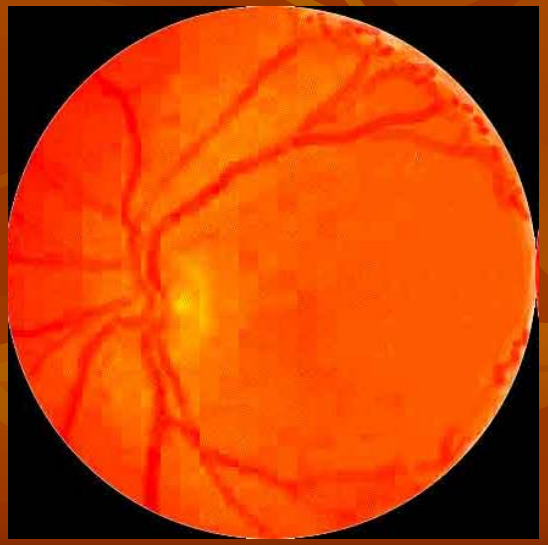
- Etiology- prematurity, oxygen therapy, ventilation, infection/inflammation

Practices to reduce CLD

- In the first few hours:
  - Avoid hyperoxia, hypoxia, hypocapnia
  - AVOID ventilation
    - INSURE- intubate, surfactant and extubate to NCPAP
  - Early surfactant better than rescue
  - Avoid even a few breaths at high PIPs

ROP

- Multifactorial disease
- Greatest risk factors- prematurity and oxygen
- Golden hour interventions
  - O2 saturation monitoring initiated in the DR with avoidance of hyperoxia



ROP- getting the O2 right

- Masimo or similar technology?
- Audits of 24 hr saturation levels?
- Ongoing education of staff?
- Buy-in for a unit approach to managing oxygen?
- Homework:
  - Chow LC, Wright KW, Sola A; CSMC Oxygen Administration Study Group. Can changes in clinical practice decrease the incidence of severe retinopathy of prematurity in very low birth weight infants? Pediatrics. 2003 111(2):339-45.
  - Vanderveen DK, Mansfield TA, Eichenwald EC. Lower oxygen saturation alarm limits decrease the severity of retinopathy of prematurity. J AAPOS. 2006 10(5):445-8

IVH

- Precise onset unknown but majority occur in first 3 days of life
- Associated factors:
  - Hypoxia
  - Mechanical ventilation
  - Changing cerebral perfusion pressures
    - Triggered by
      - changes in BP, fluid boluses
      - Cold stress
      - Head positioning
      - Pain

Avoiding IVH

- What practices have been identified that reduce the incidence or severity of IVH?
  - Antenatal steroids (Level 1)
  - Deliver in a tertiary centre (Level 3)
  - Use an experienced team for delivery (2)
  - Maintain body temp >36
  - Maintain CV stability during surfactant admin
  - Optimize positioning- neutral head with turning

Avoiding IVH

- Treat only overt hypotension (mean BP < Gest age) Level 2
  - Only two boluses before inotropes (Level 3)
  - Boluses over 30 minutes
- Optimize respiratory management
  - SIMV or HFV- optimal lung volume
  - Avoid hypocapnia
  - Avoid routine suctioning
- Limit bicarb- if used, give slowly

Avoiding IVH

- Minimize pain and stress response
  - ↓ noise
  - ↓ handling
  - ↓ lighting
  - Judicious use of narcotic sedation

Step 3: Application of consistent practices

- Drills should go beyond NRP
- Do you have a drill for first hour care?
- Do you track time to surfactant? Time for line insertion? Time till the infant is settled and left alone?
- What about developmental care in the first hour?

Putting it all together

- Who: infants less than 30 weeks or 1250 grams
- What: a Golden Hour plan (one units example)
  - Preheat warmer and DR room
  - Set up transport ventilator and T-Piece bag
  - Activate chemical mattress and warm linens
  - Place two hats under chemical mattress
  - Set blender at 40%
  - Cut hydrocolloid barriers

Golden Hour Plan

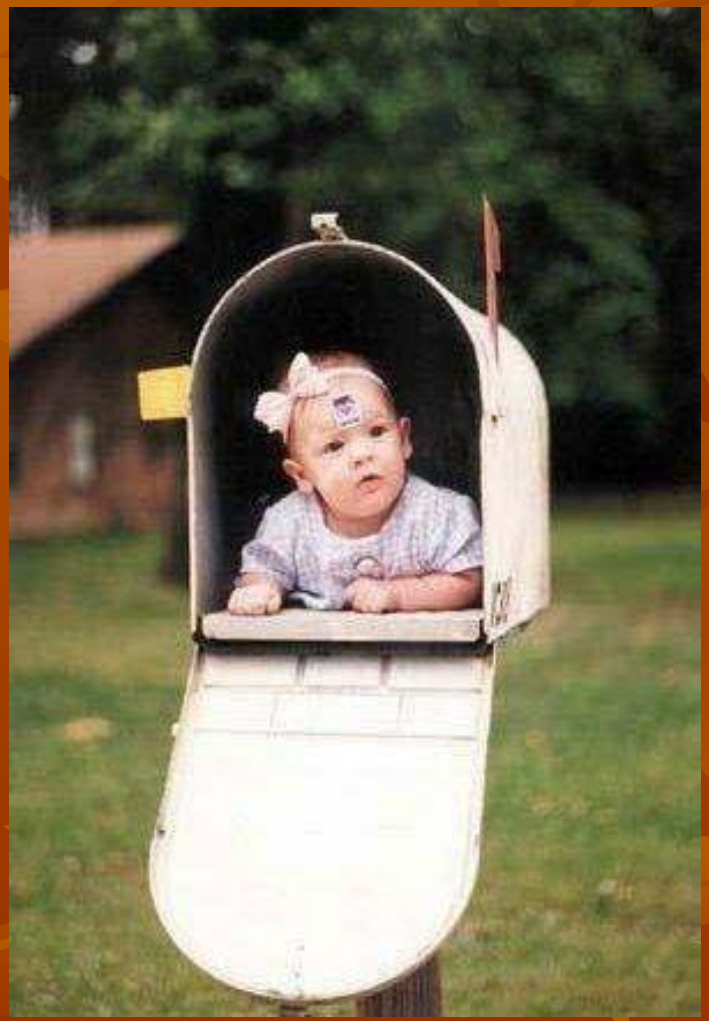
- Receive infant in warm blanket and place on preheated warmer
- Place in bag, attach pulse ox and temp probe
- Intubate if necessary, use T-piece to ventilate
- Keep sats 85-92
- Secure tube using hydrocolloid
- Place two hats on
- Move to transport incubator

Ok, you might be doing most of that

- What about the first hour after birth?
  - How many of our babies are hypothermic
  - How often is the first Pa02 >100 or first PaCo2 < 40
  - Is surfactant given within 1 hour?
  - How are you doing with pain and stress?
  - What about positioning, suctioning?

Closing Thoughts

- Implementing potentially better practices
  - Ask the question
  - Find the evidence- lit review, benchmarking
  - Implement the change- get the key people on board
  - Evaluate the result




muchas
Gracias
Bethbella