The Golden Hour: Stabilization of the High-risk Neonate at Birth

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Disclosure

• I have no financial relationships to disclose
• I will not be discussing off-label applications for devices or pharmaceuticals
Acknowledgements

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- Gene Nelson
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- Paul Plsek
- Don Goldmann
- W. Edwards
- George Blike
- Julianne Nickerson
- Helen Haskell
- Other families
The Need

- Neonatal intensive care should begin immediately after birth
- Inconsistency of practice (‘dealer’s choice’)
- “Seeds of neonatal morbidity are sown in the delivery room”
Neonatal Resuscitation: Schultze method
Monitoring / Management in the DR

- Need to ‘raise the bar’
- Neonatal intensive care should begin immediately after birth
- Incorporation of intensive care environment in the DR could improve outcomes
- Routine pulse oximetry
- Ventilator in the DR might be helpful
- Tidal volume monitoring?

Vento et al. *Pediatrics* 2008;122;1113-1116
Five Domains

1. Learning system. Performance monitoring and project management
2. The baby
3. The family
4. The stabilization team
5. Physical environment of delivery room
% of admit temperatures

< 35, 35 – 35.9, 36 – 36.9, ≥ 37 deg C

Laptook et al. Pediatrics 2007
<table>
<thead>
<tr>
<th>Study</th>
<th>NICU Admissions</th>
<th>Frequency of Admission Hypothermia</th>
<th>OR (95% CI) of Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epicure study (UK)</td>
<td>&lt; 25 weeks 811 babies</td>
<td>40% below 35 C</td>
<td>1.72 (1.17, 2.56)</td>
</tr>
<tr>
<td>Laptook et al (USA)</td>
<td>&lt; 1500 g 5277 babies</td>
<td>47% below 36.0 C, 14% below 35.0 C</td>
<td>OR rose 1.28 (1.16, 1.41) per 1 C fall</td>
</tr>
<tr>
<td>Malaysian VLBW study group</td>
<td>&lt; 1500 g 868 babies</td>
<td>33% below 36.5 C</td>
<td>1.26 (1.06, 1.50)</td>
</tr>
<tr>
<td>da Mota Silveira et al (Brazil)</td>
<td>320 babies born at home and admitted</td>
<td>32% below 36.5 C</td>
<td>3.09 (2.15, 4.43)</td>
</tr>
</tbody>
</table>
### 1.1 Core body temperature (°C) on admission to NICU or up to 2 hours after birth

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Plastic wrap</th>
<th>Control</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>IV, Fixed, 95% CI</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vohra 1999</td>
<td>36.94</td>
<td>0.56</td>
<td>8</td>
<td>35.04</td>
<td>1.08</td>
<td>10</td>
<td>6.8%</td>
<td>1.90 [1.13, 2.67]</td>
<td>1999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vohra 2004a</td>
<td>36.5</td>
<td>0.8</td>
<td>27</td>
<td>35.6</td>
<td>1.3</td>
<td>26</td>
<td>11.9%</td>
<td>0.90 [0.32, 1.48]</td>
<td>2004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knobel 2005</td>
<td>36.5</td>
<td>0.79</td>
<td>41</td>
<td>36</td>
<td>0.79</td>
<td>47</td>
<td>37.0%</td>
<td>0.50 [0.17, 0.83]</td>
<td>2005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trevisanuto 2009b</td>
<td>35.8</td>
<td>0.9</td>
<td>32</td>
<td>35.3</td>
<td>0.8</td>
<td>32</td>
<td>23.3%</td>
<td>0.50 [0.08, 0.92]</td>
<td>2009</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td>108</td>
<td></td>
<td></td>
<td>79.0%</td>
<td>0.68 [0.45, 0.91]</td>
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<td></td>
</tr>
</tbody>
</table>

Heterogeneity: Ch² = 11.95, df = 3 (P = 0.008); I² = 75%
Test for overall effect: Z = 5.89 (P < 0.00001)

### 1.2 28 to 31 completed weeks’ gestational age

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Plastic wrap</th>
<th>Control</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>IV, Fixed, 95% CI</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
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<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vohra 1999</td>
<td>36.69</td>
<td>0.55</td>
<td>19</td>
<td>36.52</td>
<td>0.87</td>
<td>22</td>
<td>21.0%</td>
<td>0.17 [0.27, 0.61]</td>
<td>1999</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td>19</td>
<td></td>
<td></td>
<td>21.0%</td>
<td>0.17 [0.27, 0.61]</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: Not applicable.
Test for overall effect: Z = 0.76 (P = 0.45)

Total (95% CI): 127 / 137 = 100.0% 0.67 [0.37, 0.77]
Heterogeneity: Ch² = 18.04, df = 4 (P = 0.003); I² = 75%
Test for overall effect: Z = 5.58 (P < 0.00001)
Test for subgroup differences: Ch² = 4.00, df = 1 (P = 0.04), I² = 75.5%

### 1.3 Hypothermia on admission to NICU: core body temperature < 36.5°C or skin temperature < 36°C

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Plastic wrap</th>
<th>Control</th>
<th>Events</th>
<th>Total</th>
<th>Weight</th>
<th>Risk Ratio</th>
<th>Risk Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td>M-H, Fixed, 95% CI</td>
<td>M-H, Fixed, 95% CI</td>
</tr>
<tr>
<td>Knobel 2005</td>
<td>18</td>
<td>33</td>
<td>41</td>
<td>47</td>
<td>51.5%</td>
<td>0.63 [0.42, 0.93]</td>
<td>2005</td>
</tr>
<tr>
<td>Trevisanuto 2009b</td>
<td>20</td>
<td>29</td>
<td>32</td>
<td>32</td>
<td>48.5%</td>
<td>0.69 [0.52, 0.92]</td>
<td>2009</td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td>73</td>
<td></td>
<td>79</td>
<td>100.0%</td>
<td>0.66 [0.51, 0.84]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total events: 38 / 62 = 62
Heterogeneity: Ch² = 0.17, df = 1 (P = 0.68); I² = 0%
Test for overall effect: Z = 3.37 (P = 0.0007)

Total (95% CI): 73 / 79 = 100.0% 0.66 [0.51, 0.84]
Heterogeneity: Ch² = 0.17, df = 1 (P = 0.68); I² = 0%
Test for overall effect: Z = 3.37 (P = 0.0007)
Temperature Maintenance

- Pre-heated radiant warmer
- Temperature of delivery room at 77 deg F
- Plastic wrap if \( \leq 28 \) weeks gestation
- Chemical mattress
- Measure infant temperature by ten minutes
- Place infant on servo ASAP
Temperature Management

Temperatures of Infants <28weeks

Polyethylene wrap initiated

Changed to blanket

Polyethylene wrap utilized

1st Temperature
2nd Temperature

Polyethylene wrap

Polyethylene blanket
Color Assessment at Birth

Pulse Oximetry Monitoring

• Pulse oximeter probe on right hand
• Correct sequence: place on hand first, then connect to monitor
• Saturation reading within 2 min
• ‘Black hand’ noted on videos
Room Air vs 100% O2 in Term Infants
Effect on Mortality

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Treatment</th>
<th>Control</th>
<th>Weight</th>
<th>Risk ratio M-H, fixed, 95% CI</th>
<th>Risk ratio M-H, fixed, 95% CI</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>events</td>
<td>total</td>
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<tr>
<td>Randomized trials</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Toma, 2006 [15]</td>
<td>0</td>
<td>27</td>
<td>0</td>
<td>27</td>
<td>Not estimable</td>
</tr>
<tr>
<td>Toma, 2006 [16]</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>24</td>
<td>Not estimable</td>
</tr>
<tr>
<td>Toma, 2007 [17]</td>
<td>1</td>
<td>30</td>
<td>2</td>
<td>26</td>
<td>0.43 (0.04, 4.51)</td>
</tr>
<tr>
<td>Vento, 2001 [9]</td>
<td>1</td>
<td>300</td>
<td>7</td>
<td>237</td>
<td>0.11 (0.01, 0.91)</td>
</tr>
<tr>
<td>Vento, 2003 [10]</td>
<td>1</td>
<td>55</td>
<td>2</td>
<td>51</td>
<td>0.46 (0.04, 4.96)</td>
</tr>
<tr>
<td>Vento, 2005 [13]</td>
<td>2</td>
<td>17</td>
<td>4</td>
<td>22</td>
<td>0.65 (0.13, 3.13)</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>5</td>
<td>15</td>
<td>11.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total events</td>
<td>449</td>
<td>387</td>
<td>11.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: $\chi^2 = 1.87$, d.f. = 3 (p = 0.60), $I^2 = 0%$</td>
<td>Test for overall effect: $Z = 2.30$ (p = 0.02)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Quasi-randomized trials</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Bajaj, 2005 [14]</td>
<td>17</td>
<td>107</td>
<td>17</td>
<td>97</td>
<td>0.91 (0.49, 1.67)</td>
</tr>
<tr>
<td>Ramji, 1993 [7]</td>
<td>3</td>
<td>42</td>
<td>4</td>
<td>42</td>
<td>0.75 (0.18, 3.15)</td>
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<tr>
<td>Ramji, 2003 [11]</td>
<td>24</td>
<td>204</td>
<td>39</td>
<td>214</td>
<td>0.65 (0.40, 1.03)</td>
</tr>
<tr>
<td>Saugstad, 1998 [8]</td>
<td>40</td>
<td>280</td>
<td>60</td>
<td>311</td>
<td>0.74 (0.51, 1.07)</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>84</td>
<td>120</td>
<td>88.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total events</td>
<td>633</td>
<td>664</td>
<td>88.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: $\chi^2 = 0.74$, d.f. = 3 (p = 0.86), $I^2 = 0%$</td>
<td>Test for overall effect: $Z = 2.35$ (p = 0.02)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>1,082</td>
<td>1,051</td>
<td>100.0%</td>
<td>0.69 (0.54, 0.88)</td>
<td></td>
</tr>
<tr>
<td>Total events</td>
<td>89</td>
<td>135</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: $\chi^2 = 4.16$, d.f. = 7 (p = 0.76), $I^2 = 0%$</td>
<td>Test for overall effect: $Z = 2.98$ (p = 0.003)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Low vs High (>50%) O\textsubscript{2} in Preterms: Effect on Mortality prior to Hospital Discharge

Brown et al. PLoS ONE 7(12): e52033
Low vs High (>50%) O$_2$ in Preterms
Additional Randomized Trials

- Vento 2009 [30 vs 90%]: Less ventilator days, duration of O2 supplementation & BPD
- Kapadia 2013 [room air vs 100%]: less oxidative stress and less BPD
- Rook 2014 [30 vs 65%]: no difference in oxidative stress or BPD
- No long-term follow up in any trial so far
Oxygen Management

- Starting FiO2 of 0.4 for preterm infants
- Use FiO2 1.0 if baby not responding
- Prevent rapid increase of oxygen saturation
- Target $O_2$ saturation:
  - 80-85% at five min, 85-95% at ten min
Oxygen Saturation Percentiles for All Infants with No Medical Intervention

Dawson et al. *Pediatrics* 2010;125:e1340–e1347
Fig 2 Forest plot comparison of death or bronchopulmonary dysplasia (BPD), or both, at 36 weeks corrected gestation; death; and bronchopulmonary dysplasia at 36 weeks corrected gestation.

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>No of events/total</th>
<th>Risk ratio (Mantel-Haenszel) random (95% CI)</th>
<th>Weight (%)</th>
<th>Risk ratio (Mantel-Haenszel) random (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Death or BPD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dunn 2011</td>
<td>68/223</td>
<td>138/425</td>
<td>12.6</td>
<td>0.94 (0.74 to 1.19)</td>
</tr>
<tr>
<td>Morley 2008</td>
<td>108/307</td>
<td>118/303</td>
<td>17.0</td>
<td>0.90 (0.73 to 1.11)</td>
</tr>
<tr>
<td>Sandr10</td>
<td>33/103</td>
<td>32/105</td>
<td>4.5</td>
<td>1.05 (0.70 to 1.57)</td>
</tr>
<tr>
<td>SUPPORT8</td>
<td>323/663</td>
<td>353/653</td>
<td>65.9</td>
<td>0.90 (0.81 to 1.00)</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>532/1296</td>
<td>641/1486</td>
<td>100.0</td>
<td>0.91 (0.84 to 0.99)</td>
</tr>
<tr>
<td>Test for heterogeneity: $\chi^2=0.00$, $\chi^2=0.60$, df=3, $P=0.90$, $I^2=0%$</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Test for overall effect: $z=2.10$, $P=0.04$</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Death</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dunn 2011</td>
<td>9/223</td>
<td>30/425</td>
<td>11.4</td>
<td>0.57 (0.28 to 1.18)</td>
</tr>
<tr>
<td>Morley 2008</td>
<td>20/307</td>
<td>18/303</td>
<td>15.2</td>
<td>1.10 (0.59 to 2.03)</td>
</tr>
<tr>
<td>Sandr10</td>
<td>22/103</td>
<td>18/105</td>
<td>18.0</td>
<td>1.25 (0.71 to 2.18)</td>
</tr>
<tr>
<td>SUPPORT8</td>
<td>94/663</td>
<td>114/653</td>
<td>55.4</td>
<td>0.81 (0.63 to 1.04)</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>145/1296</td>
<td>180/1486</td>
<td>100.0</td>
<td>0.88 (0.68 to 1.14)</td>
</tr>
<tr>
<td>Test for heterogeneity: $\chi^2=0.01$, $\chi^2=3.69$, df=3, $P=0.30$, $I^2=19%$</td>
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<td></td>
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<tr>
<td>Test for overall effect: $z=0.95$, $P=0.34$</td>
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<tr>
<td><strong>BPD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dunn 2011</td>
<td>59/223</td>
<td>108/425</td>
<td>15.7</td>
<td>1.04 (0.79 to 1.37)</td>
</tr>
<tr>
<td>Morley 2008</td>
<td>84/287</td>
<td>100/285</td>
<td>20.4</td>
<td>0.83 (0.66 to 1.06)</td>
</tr>
<tr>
<td>Sandr10</td>
<td>11/103</td>
<td>14/105</td>
<td>2.1</td>
<td>0.80 (0.38 to 1.68)</td>
</tr>
<tr>
<td>SUPPORT8</td>
<td>229/569</td>
<td>239/539</td>
<td>61.7</td>
<td>0.91 (0.79 to 1.04)</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>383/1182</td>
<td>461/1354</td>
<td>100.0</td>
<td>0.91 (0.82 to 1.01)</td>
</tr>
<tr>
<td>Test for heterogeneity: $\chi^2=0.00$, $\chi^2=1.56$, df=3, $P=0.67$, $I^2=0%$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for overall effect: $z=1.73$, $P=0.08$</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Delivery of preterm<35 weeks

Perform initial steps of resuscitation

<26 week gestation

- Intubate and administer surfactant within 15 min
- Place on ventilator and transport to ICN
- EXTUBATE TO CPAP if meets criteria for extubation (see below) AND has spontaneous breathing

26 0/7-35 WKS

- PPV (mask or ET)
- Spontaneously breathing?
  - Yes
  - No

Place on CPAP of 5 cm H2O:
- All babies 26 - 28 6/7 weeks GA
- ≥29 weeks with signs of resp. distress

- Assess severity of resp. distress 15-30 min after starting CPAP
  - Severe resp. distress AND consistently on FiO2>0.4 to keep Spo2 >88%
  - Not severe

- Intubated
- Not intubated

- Consider giving surfactant*

- Intubate and give surfactant as soon as possible
- Extubate as soon as possible (with the goal to extubate within 24 hours)
- Continue With CPAP

* Babies who are intubated for respiratory depression only or for apnea (without lung disease) may not need surfactant. An example is a baby whose mother received magnesium sulfate
Hudson Prongs

Ram Cannula
Manual PPV during Resuscitation:
Looking at Manometer vs Elsewhere
Total time: 245 secs; Manometer: 34 secs (14%)

Intubation Safety

- Use bag mask ventilation as safety net
- No inexperienced intubators
- Two attempts per intubator
- 30 seconds per intubator
- State intubation indicators loudly and explicitly
- Call for back-up early - Stat airway team
- Psychology of intubation
Minimally Invasive Surfactant Therapy
Cardiovascular Support

• Measure HR per NRP and announce a number loudly
• Auscultation needs silence, quiet environment
• Nurses sometimes not confident about auscultated heart rate
• Avoid chest compressions without adequate ventilation
Case Report

Severe Hemorrhage from the Umbilical Cord at Birth: A Preventable Cause of Neonatal Shock

Neetu Singh and Gautham Suresh

Department of Pediatrics, Division of Neonatology, Dartmouth Hitchcock Medical Center, 1 Medical Center Drive, Rubin 529, Lebanon, NH 03756, USA

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Academic Editors: C. Aldana-Valenzuela, W. B. Moskowitz, J. Muraskas, and I. Riaño Galán

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Posthemorrhagic anemia is a rare but important cause of anemia in neonates, second only to hemolytic anemia of newborn. Most cases of posthemorrhagic anemia are reported from fetomaternal hemorrhage or umbilical cord accidents in utero. This case report describes a preterm infant who developed severe anemia and shock immediately after delivery related to an acute hemorrhage through patent umbilical cord vessels secondary to a tear in the umbilical cord at the site of cord clamping. We believe that umbilical cord bleeding from errors in cord clamping could be an important cause of acute blood loss in the delivery room and that it may result in significant clinical morbidity, especially in extremely premature infants.
Family Support During Resuscitation

• Briefing: assign family support person
• Training for family support person
  – Scripted statements
  – Simulations
• Involve family members in development of practices, policies and training
• ‘My birth story’ cards
Teamwork: Temporal Model
Neonatal Resuscitation Team Episode

Briefing

- Introduction of team members
- Assignment of roles
- Leadership assignment
- Review of maternal, family details
- Contingency planning
- Equipment check
- Setting of tone and atmosphere for resuscitation
- Use of a checklist
High-risk Resuscitation Checklist

• Prior to all high-risk deliveries
• Assists in briefing, foundation of good teamwork
• Ensures that equipment is available, room setup is optimal, roles are clear, sequence of activities is clear, and contingencies are planned for
• Multiple revisions and refinements over time with experience and reflection
**Nurses / LNAs**

- PANDA temp set to 77° F
- Radiant warmer on
- Pulse oximeter ready
- Warm blankets OR
- Plastic wrap available (for infants ≤ 28 weeks)
- Transwarmer if less than 28 weeks
- Suction ready
- Medication dosage sheet available

**RCP**

- Face mask present, right size
- Laryngoscope present, working
- ET tubes present, appropriate size
- CO2 detector present
- Neopuff set up
- Fio2 at 40%
- Ventilator set up

**TEAM**

- Team leader identified
Action Phase

1. Leadership
2. Communication
3. Situation monitoring
4. Mutual support
Debriefing

• Should be done after each resuscitation
• Requires facilitator with skill, sensitivity
• Non-judgmental, non-critical approach
• Balance ‘truth versus grace’
• Three open ended questions
  – What went well?
  – What could have been done better?
  – What should we do differently next time?
Simulation Based Training

Real
Simulated

Experience

Reflection
- Memory
- Video
- Narrative

Learning

Cognitive
Technical
Behavioral
Improvements based on in-situ Simulations

- Weight-based med sheets in code cart
- Code carts redesigned - more user friendly
- Emergency umbilical line placement kit
- Second monitor screen added to be in full view of respiratory therapists
Delivery Room Layout Changes

- Bed position
Delivery Room Layout Changes

Ventilator position
Delivery Room Layout Changes
**RESPIRATORY**

- Pulse oximeter on RIGHT wrist
- Target SpO2

<table>
<thead>
<tr>
<th>Minute of life</th>
<th>SpO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60s</td>
</tr>
<tr>
<td>5</td>
<td>70s</td>
</tr>
<tr>
<td>10</td>
<td>80s</td>
</tr>
</tbody>
</table>

- Supplemental O2 – start at 40%
- Limit intubation attempts to 30 seconds
- Confirm ETT placement and attach to vent ASAP

**HEART RATE**

- Announce heart rate loud and clear

**Temperature**

- Check temp within 10 minutes

**Got Servo?**

**ET Tube Length Chart**

<table>
<thead>
<tr>
<th>WEIGHT (kg)</th>
<th>ETT SIZE</th>
<th>DEPTH OF ORAL INSERTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;000</td>
<td>2.5</td>
<td>6.7 cm</td>
</tr>
<tr>
<td>001-700</td>
<td>3.0</td>
<td>7.9 cm</td>
</tr>
<tr>
<td>&gt;700</td>
<td>3.5</td>
<td>8.9 cm</td>
</tr>
<tr>
<td>&gt;1000</td>
<td>4.0</td>
<td>9.1 cm</td>
</tr>
</tbody>
</table>

**CUROSURF® Intratracheal Suspension Dosing Chart**

<table>
<thead>
<tr>
<th>WEIGHT (grams)</th>
<th>INITIAL DOSE (mg)</th>
<th>REPEAT DOSE (mg)</th>
<th>WEIGHT (grams)</th>
<th>INITIAL DOSE (mg)</th>
<th>REPEAT DOSE (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400-600</td>
<td>1.6</td>
<td>0.4</td>
<td>1000-1200</td>
<td>3.2</td>
<td>1.0</td>
</tr>
<tr>
<td>601-700</td>
<td>1.8</td>
<td>0.6</td>
<td>1201-1400</td>
<td>3.4</td>
<td>1.4</td>
</tr>
<tr>
<td>701-900</td>
<td>2.0</td>
<td>1.0</td>
<td>1401-1600</td>
<td>3.6</td>
<td>1.6</td>
</tr>
<tr>
<td>901-950</td>
<td>2.2</td>
<td>1.2</td>
<td>1601-1800</td>
<td>3.8</td>
<td>1.8</td>
</tr>
<tr>
<td>951-1000</td>
<td>2.5</td>
<td>1.5</td>
<td>1801-2000</td>
<td>4.0</td>
<td>2.0</td>
</tr>
<tr>
<td>1001-1050</td>
<td>2.8</td>
<td>1.8</td>
<td>2001-2200</td>
<td>4.2</td>
<td>2.2</td>
</tr>
<tr>
<td>1051-1100</td>
<td>3.1</td>
<td>2.1</td>
<td>2201-2400</td>
<td>4.4</td>
<td>2.4</td>
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<tr>
<td>1101-1150</td>
<td>3.4</td>
<td>2.4</td>
<td>2401-2600</td>
<td>4.6</td>
<td>2.6</td>
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<tr>
<td>1151-1200</td>
<td>3.7</td>
<td>2.7</td>
<td>2601-2800</td>
<td>4.8</td>
<td>2.9</td>
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<tr>
<td>1201-1250</td>
<td>4.0</td>
<td>3.0</td>
<td>2801-3000</td>
<td>5.2</td>
<td>3.2</td>
</tr>
</tbody>
</table>

**Guideline for Initial Respiratory Management in OR**

- Hypoxemia:
  - Pulse oximetry monitoring
  - Oxygen administration
- Bradycardia:
  - Heart rate monitoring
  - Atropine administration
FUTURE DIRECTIONS

• Delayed cord clamping / milking
• Neurodevelopmental care in the DR
• Documentation of resuscitation
• Ethics – periviability
Thank you!

QUESTIONS?