2015 International Liaison Committee on Resuscitation (ILCOR): Highlights of the New Recommendations for Neonatal Resuscitation

Myra H. Wyckoff, MD
Professor of Pediatrics
UT Southwestern Medical Center at Dallas
Achieving Consensus on Resuscitation Science

- Since 2000, a Neonatal Task Force has participated with the International Liaison Committee on Resuscitation (ILCOR) for complete review of newborn resuscitation science every 5 years.
- 23 questions reviewed for the 2015 Neonatal Resuscitation Guidelines
ILCOR Evaluation Process Brings New Resuscitation Science Forward for Review

- Identify and prioritize the questions that need scientific review and assign reviewers (2-3 per question)
- Minimum requirements for every search strategy are specified and done by professional librarians
  - Medline, Embase, and Cochrane Systematic Reviews
  - Hand searches
- Every reviewer rates the level and quality of evidence using a standardized evidence evaluation (GRADE system)
- Consensus for each question reached by entire Neonatal Task Force in Feb 2015
Understanding GRADE

- GRADE: Most widely used method for appraising studies to be included in systematic reviews and guidelines
  - Recommended by Institute of Medicine-to give a common process and language for published guidelines

- GRADE is a method used by systematic reviewers and guideline developers to assess
  - the quality of evidence
  - Decide whether to recommend an intervention

- Grade is different from other appraisal tools because it
  - Separates quality of evidence and strength of recommendation
  - The quality of evidence is assessed for each outcome of interest
  - Observational studies can be “up-graded” if they meet certain criteria
ILCOR Guidelines for Neonatal Resuscitation

- New ILCOR Consensus on Science with Treatment Recommendations (CoSTR) document available online since October 15, 2015
- USA guidelines supplement based on CoSTR co-published in *Circulation, Resuscitation* and *Pediatrics*
- Download at: www.heart.org/cpr
2015 New Algorithm
Initial questions to ask following birth have not changed.

Delayed Cord Clamping: 2010 ILCOR Review
- OK for Term Infants who were not in need of resuscitation
- Not enough data to make recommendation for preterm infants
2015: Delayed Cord Clamping (DCC) for Preterm Infants?

- Outcomes examined: mortality, severe IVH, any IVH, hemodynamic stability, hyperbilirubinemia, neurodevelopment

- Sixteen articles included
  - RCTs 12 articles (691 cases)
  - Non-RCTs 4 articles (811 cases)
  - Excluded 230 articles

- No difference in mortality or severe IVH
- No data for neurodevelopment
- DCC improved any IVH, hemodynamic stability
- We suggest DCC for preterm infants not requiring immediate resuscitation after birth
Outcome: PVH/IVH (gr I-IV)

<RCT>

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>DCC Events</th>
<th>DCC Total</th>
<th>ICC Events</th>
<th>ICC Total</th>
<th>Weight</th>
<th>Odds Ratio M-H, Fixed, 95% CI</th>
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<td>36</td>
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<td>36</td>
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<td>Oh 2011</td>
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<td>16</td>
<td>3</td>
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<td>5.1%</td>
<td>1.56 [0.29, 8.38]</td>
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<td>Rabe 2000</td>
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<td>3</td>
<td>20</td>
<td>6.5%</td>
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<td>Strauss 2008</td>
<td>1</td>
<td>45</td>
<td>1</td>
<td>60</td>
<td>2.0%</td>
<td>1.34 [0.08, 22.03]</td>
</tr>
</tbody>
</table>

Total (95% CI): 240 / 259 = 100.0%  Odds Ratio M-H, Fixed, 95% CI = 0.49 [0.29, 0.82]

Total events: 32 / 51

Heterogeneity: Chi² = 6.20, df = 8 (P = 0.63); I² = 0%

Test for overall effect: Z = 2.70 (P = 0.007)
What about Cord Milking?

- Appealing as can be done quickly so that resuscitation could commence quickly for babies who are not breathing

- ~200 babies randomized to either cord milking or immediate cord clamping in 4 small RTCs, 1 cohort study

- At the time of review no studies comparing cord milking to delayed cord clamping
Cord Milking Treatment
Recommendations

- We **suggest against the routine use** of cord milking for infants born at less than 29 weeks of gestation but cord milking may considered a reasonable alternative to immediate cord clamping to improve initial mean blood pressure, hematological indices and ICH. However, there is no evidence for improvement or safety in long term outcomes.

- All studies included in this evidence review milked 20 cm of umbilical cord toward the umbilicus 3 times while the infant was held at the level of the introitus or below the level of the placenta prior to cord clamping.
5 different systematic reviews regarding importance and methods of temperature stabilization in the DR
There is evidence from 36 observational studies of increased risk of mortality associated with hypothermia at admission (low-quality evidence but upgraded to moderate-quality evidence due to effect size, dose-effect relationship, and single direction of evidence).

- Hypothermic infants have increased morbidity
  - Hypoglycemia, Respiratory Distress, IVH, Late onset sepsis

- Temperature should be monitored and maintained between 36.5-37.5°C after delivery
Will Likely Need Combination of Strategies to Provide Warmth

- For all newborns
  - Environmental Temperature at least 25°C (77°F)
  - Warm Blankets for Drying
  - Hats (wool or plastic)

- For newborns requiring resuscitation
  - Radiant Warmer
  - Warm, humidified gases

- For Preemies
  - Polyethylene Occlusive wrapping
  - Heated (NaAcetate) Mattresses
Initial Steps now the Same Regardless of Amniotic Fluid Status

- Open airway by positioning
- Clearing airway if needed
  - Apneic
  - Drowning in secretions
  - Airway obstructed despite ventilation corrective steps (MRSOPA)

Birth

Term gestation? Breathing or crying? Good tone?

Yes, stay with mother

Routine Care
- Provide warmth
- Ensure open airway
- Dry
- Ongoing evaluation
2015: Do We Still Intubate and Suction Every Non-vigorous Meconium Exposed Infant?

Routine tracheal suction no longer recommended for non-vigorous babies with meconium stained fluid
2015: Meconium Management

- Still need a provider with PPV and intubation skills present at birth of infants born through meconium stained fluid.
- Much higher need for effective PPV.
- Will still need to practice the skill of intubation and suction for the rare case of airway obstruction.
Respiratory Effort and Heart Rate?

- Term gestation? Breathing or crying? Good tone?
  - No
  - Warm, open airway, dry, stimulate
    - No
    - HR below 100/min, gasping, or apnea?
      - No
      - Labored breathing or persistent cyanosis?
        - Yes
        - SpO₂ monitoring, consider CPAP
        - No
        - Consider ECG monitoring
          - Yes
          - SpO₂ monitoring, consider CPAP
            - No
            - Routine Care
              - Provide warmth
              - Ensure open airway
              - Dry
              - Ongoing evaluation
2015: Initial Heart Rate Determination

- Initial HR assessed by auscultation
  - PPV begins, consider electronic cardiac monitor for assessment of heart rate
Unnecessary Interventions may be initiated if relying solely on Pulse Oximetry for Heart Rate in the delivery room.
Strategies for Accessing ECG in the Delivery Room

- Have a portable ECG on a cart or pole that can be pulled into the room.
- Utilize the ECG on the maternal crash cart that is already present on L&D.
- Obtain/place monitor next to Radiant Warmer for each LDR and OR ($$) but can be done with new construction.
- New technologies for rapid acquisition of ECG are under development.
Pulse Oximetry to Guide Oxygen Use During Resuscitation
What Oxygen Concentration Should We Start PPV with for ELGAN Infant?

- **P**: Among preterm newborns (< 37 wk GA) who receive PPV in the delivery room, does
- **I**: low initial oxygen (21-30%)
- **C**: high initial high oxygen (50-100%)
- **O**: decrease mortality, BPD, ROP, intraventricular hemorrhage, neurologic deficit, time to HR > 100 bpm

Final AHA search strategy → 1752 citations, 46 potentially relevant studies → **9 Studies included** → **8 RCTs, 1 Cohort**
<table>
<thead>
<tr>
<th>Study</th>
<th>Design/n</th>
<th>GA (wk)</th>
<th>FiO2 % Low/Hi</th>
<th>Sat Targeting?</th>
<th>FiO2 masked?</th>
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<tbody>
<tr>
<td>Dawson ’09</td>
<td>Cohort/125</td>
<td>&lt;30</td>
<td>21 / 100</td>
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<td>Rook ’14</td>
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<td>&lt;32</td>
<td>30 / 65</td>
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<td>Kapadia ’13</td>
<td>RCT/88</td>
<td>24 - 34</td>
<td>21 / 100</td>
<td>Y</td>
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<td>Armanian ’12</td>
<td>RCT/32</td>
<td>29 - 34</td>
<td>21 / 100</td>
<td>Y</td>
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<td>Rabi ’11</td>
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<td>≤ 32</td>
<td>21 / 100</td>
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<td>Lundstrom ’95</td>
<td>RCT/69</td>
<td>&lt; 33</td>
<td>21 / 100</td>
<td>N*</td>
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</table>
Mortality before discharge: *All RCT and quasi-RCT*

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<tr>
<th>Study or Subgroup</th>
<th>Low oxygen</th>
<th>High oxygen</th>
<th>Risk Ratio M-H, Random, 95% CI</th>
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<td>0.71 [0.08, 6.54]</td>
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<td>Rook 2014, 1322</td>
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<td>0.57 [0.22, 1.51]</td>
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<td>Saugstad 1998, e1</td>
<td>16</td>
<td>70</td>
<td>0.58 [0.34, 0.97]</td>
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<td>Vennin 2009, e439</td>
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<td>1.48 [0.35, 6.17]</td>
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<td>Wang 2008, 1083</td>
<td>1</td>
<td>18</td>
<td>1.28 [0.09, 19.06]</td>
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</table>

Total (95% CI): 352 / 393 (100.0%)

Risk Ratio M-H, Random, 95% CI: 0.62 [0.41, 0.92]

Total events: 32 / 53

Heterogeneity: Tau² = 0.00; Chi² = 2.39, df = 6 (P = 0.88); I² = 0%

Test for overall effect: Z = 2.39 (P = 0.02)

**2015 Treatment Recommendation:** Among preterm newborns, we recommend that resuscitation be initiated with low oxygen (21-30%) and titrated to reach the saturation target.
What About Initial Sustained Inflations (SI)?

- Lots of heterogeneity in definition of SI (5-20 seconds, PIP of 20-30 cm H$_2$O)
- 3 RCTs (n=404), 2 cohort studies (n=331)
- No advantage: mortality, BPD, air leak, Apgar scores
- Advantage: reduced need mechanical ventilation in first 72 hrs
- Tx Recommendation: We suggest against the routine use of initial SI (greater than 5 sec duration) for preterm infants without spontaneous respirations immediately after birth, but an SI may be considered in individual clinical circumstances or research settings
What stays the same?

- Corrective steps for achieving effective ventilation
  - Mask, Reposition, Suction, Open the Mouth, Increase Pressure, Intubate

- No change in cardiac compression recommendations
  - Two Thumb technique

- No change in drug (Epinephrine or Volume) recommendations
  - IV preferred route
Veni, Venti, Vici

- For 2015 Neonatal Resuscitation Guidelines, another thing that has **NOT** changed is...

- “Ventilation of the lungs is the single most important and most effective step in resuscitation of the compromised newborn.”
Acknowledgments

- Thanks to the AAP for several of the drawings and photos used for illustration.

http://pediatrics.aappublications.org/content/136/Supplement_2/S196 (USA Guidelines)

http://circ.ahajournals.org/content/132/16_suppl_1/S204.full.pdf+html (ILCOR CoSTR)