How will the 2015 neonatal resuscitation guidelines change my practice?

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Financial Disclosure

I have no relevant financial relationships with any commercial interests.
How will the 2015 neonatal resuscitation guidelines change my practice?

• Emphasizing maintenance of normal newborn temperature
• Adopting new approaches to
  – Delayed cord clamping
  – Management of meconium in the amniotic fluid
  – Administration of oxygen to preterm infants
  – Monitoring of heart rate
• Enhancing team communication, skills performance, and outcomes in resuscitation
NRP resuscitation algorithm

Neonatal Resuscitation Algorithm—2015 Update

- Preparation
- Teamwork
- Communication
- Temperature
- Cord clamping
- Meconium mgmt
- ECG monitoring
- Supplemental O₂

**Targeted Preductal Spo₂ After Birth**

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Targeted Spo₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60%–65%</td>
</tr>
<tr>
<td>2</td>
<td>65%–70%</td>
</tr>
<tr>
<td>3</td>
<td>70%–75%</td>
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<tr>
<td>4</td>
<td>75%–80%</td>
</tr>
<tr>
<td>5</td>
<td>80%–85%</td>
</tr>
<tr>
<td>10</td>
<td>85%–95%</td>
</tr>
</tbody>
</table>
Temperature

Hypothermia is common – especially in small or preterm infants

N=8782 infants < 1500 grams

Miller S et al. J Perinatology 2011; 31:S49
Temperature

hypothermia is associated with mortality and morbidity in premature infants

• Temperature < 36⁰C at birth is an independent risk factor for death in premature infants
  – Evidence from 36 observational studies
  – Low quality evidence upgraded to moderate due to effect size, dose-effect relationship, single direction of evidence

• Hypothermia is associated with morbidities
  – Respiratory distress
  – Metabolic derangements - hypoglycemia
  – Intraventricular hemorrhage
  – Late-onset sepsis

Laptook AR et al Pediatrics 2007119:e643
Temperature

Hypothermia and hyperthermia are associated with mortality and morbidity in premature infants

N = 9833 infants < 33 weeks

Lyu Y et al. JAMA Pediatrics 2015; 169(4)
Temperature

Strategies to maintain newborn temperature in the delivery room
36.5-37.5°C at <32 weeks gestation

- Radiant warmer and plastic wrap with a cap
- Increased room temperature (23-25°C)
- Thermal mattress or warm blankets
- Warmed, humidified resuscitation gases
Temperature

maintaining newborn temperature during and/or after resuscitation/stabilization

Skin-to-skin contact for infants > 30 weeks gestation results in

• less hypothermia compared with swaddling in a crib (7 RCTs)
• Less hypothermia and temperature instability compared with incubator care (2 RCTs)
Umbilical cord clamping

“It is true that many advances have been made in medicine in the past 100 years, but immediate clamping of the cord is certainly not one of them.” - Duckman S et al. Am J Obstet Gynec 1953; 66:1214

25-60% of the circulating volume of the fetoplacental unit resides in the placenta

20-40 mL/kg = normal transfusion from placenta to neonate

Hutton EK, Hassan ES. JAMA 2007; 297:1241
Umbilical cord clamping
placental transfusion and onset of respirations

Residual placental blood volume and change in hematocrit among infants not breathing (stippled) and breathing (solid black) before cord clamping

Philip AG & Teng SS. Biol Neonate 1977; 31:219
Umbilical cord clamping

benefits of delayed cord clamping among premature infants

• Decreased PVH/IVH
• Improved cardiovascular stability
  – Blood pressure during stabilization
  – Blood volume
  – Need for transfusion
• Decreased necrotizing enterocolitis

  but

• Higher mean serum bilirubin and use of phototherapy

CoSTR 2015
Umbilical cord clamping

delay clamping for term and preterm infants who do not require resuscitation

• Delay cord clamping for >30-60 seconds for term and preterm newborns
  – Place skin-to-skin on abdomen
  – Begin initial steps

• Insufficient evidence if baby is not vigorous

• No delay if placental circulation disrupted (abruption, avulsion)
New paradigm for cord clamping?

resuscitation with cord intact at level of placenta
Umbilical cord clamping

“We suggest against the routine use of cord milking for infants born at 28 weeks gestation or less because there is insufficient published human evidence of benefit.”
Management of meconium

• Re-examination of existing evidence on mortality and/or meconium aspiration syndrome (MAS)
  – 1 RCT showing no benefit of tracheal suction in nonvigorouse infants
  – Conflicting evidence from multiple observational studies

Gregory GA et al. J Pediatr 1974; 85:848
Management of meconium

Routine tracheal suction no longer recommended for non-vigorous infants with meconium stained fluid

- Routine management with suction prior to PPV
- MSAF remains a risk factor that requires presence of a team member with intubation skill
Supplemental oxygen

Initial FiO$_2$ for PPV

- $\geq 35$ weeks’ GA = 21%
- $< 35$ weeks’ GA = 21-30%

Targeted Pre-ductal SpO$_2$ After Birth

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<th>Time (min)</th>
<th>Targeted SpO$_2$</th>
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</table>
30% v. 90% oxygen in extremely low GA infants (<28 weeks)
saturation targets 75% at 5 and 85% at 10 min

Escrig R et al. Pediatrics 2008; 121:875
30% v. 90% oxygen in extremely low GA infants (24-28 weeks)

Saturation targets
75% at 5 minutes and 85% at 10 min

↓ oxidative markers
day 1 and 3 with low oxygen

↓ inflammatory markers
days 1-21 with low oxygen

ECG monitoring of heart rate

achieving rapid, accurate measurement

• ECG superior to pulse oximetry
  – 5 non-randomized studies

• ECG superior to auscultation
  – 1 non-randomized study

Katheria A et al. Peiatrics 2012; 130:e1177
Van Vonderen JJ et al. J Pediatr 2015;166:49
Kamlin CO et al. Resuscitation 2006; 71:319
ECG monitoring of heart rate

Initial HR assessed by auscultation

- PPV begins, consider electronic cardiac monitor
- Resuscitation anticipated or chest compressions begin, electronic cardiac monitor is preferred method
New paradigm for ECG monitoring of heart rate?
Bundles of interventions
improving the outcome of preterm infants

• Maintain normal temperature
  – Without drying, cover in food-grade plastic wrap or bag and use a hat and thermal mattress or other adjunct

• Use a 3-lead cardiac monitor (chest or limb leads) for rapid and reliable continuous HR

• Initiate ventilation with low supplemental oxygen (21-30%)

• If PPV, use a device with PEEP

• Consider CPAP immediately after birth as an alternative to routine intubation and surfactant administration.
Teamwork and communication

Preparation before resuscitation

– Assessment of perinatal risk
– Assembly of appropriate personnel
– Structured check of equipment and supplies
– Standardization of behavioral skills for effective teamwork and communication
# Teamwork and communication

## Practice technical skills *plus* behavioral skills

<table>
<thead>
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<th>Behavioral Skills</th>
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<tbody>
<tr>
<td>General physical examination</td>
<td>Know the environment</td>
</tr>
<tr>
<td>Management of thermoregulation</td>
<td>Anticipate and plan</td>
</tr>
<tr>
<td>Suctioning</td>
<td>Assume the leadership role</td>
</tr>
<tr>
<td>Positioning</td>
<td>Communicate effectively</td>
</tr>
<tr>
<td>Tactile stimulation</td>
<td>Distribute workload optimally</td>
</tr>
<tr>
<td>Bag mask ventilation</td>
<td>Allocate attention wisely</td>
</tr>
<tr>
<td>Intubation</td>
<td>Utilize all available information</td>
</tr>
<tr>
<td>Chest compressions</td>
<td>Utilize all resources</td>
</tr>
<tr>
<td>Delivery of medications</td>
<td>Maintain professional behavior</td>
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Teamwork and communication

NRP Microsimulation/eSim
What has not changed
Veni, Venti, Vici

“Ventilation of the lungs is the single most important and most effective step in cardiopulmonary resuscitation of the compromised newborn.”
Changes in practice - 2015

**Concepts**
- Promoting physiologic transition
  - Normal temperature
  - Delay in cord clamping
  - Low supplemental O2
  - Expectant management of meconium in all infants
- Improving monitoring
  - ECG
  - Temperature
- Functioning and communicating as a team

**Actions**
- Support and record temperature
- Provide initial steps during delayed cord clamping
- Blend oxygen for all preterm deliveries
- Improve heart rate monitoring
- Measure and evaluate outcomes of resuscitation
  - Meconium
  - Temperature
- Practice skills – psychomotor and behavioral
2015 Neonatal Resuscitation Consensus on Science and Guidelines

*Pediatrics* link:  
http://pediatrics.aappublications.org/content/136/Supplement_2

*Circulation* link:  
http://circ.ahajournals.org/content/132/16_suppl_1.toc

*Resuscitation* link:  

ILCOR Scientific Evidence Evaluation links:  

http://www2.aap.org/nrp
What’s new about the Textbook of NRP?

1. Foundations
2. **Preparing for Resuscitation**
3. Initial Steps of Newborn Care
4. Positive-pressure Ventilation
5. **Alternative Airways**
6. Chest Compressions
7. Medications
8. Post-resuscitation Care
9. Resuscitation and Stabilization of Babies Born Preterm
10. Special Considerations
11. Ethics and Care at the End of Life
How to achieve provider status

• Self-study the textbook as needed
• Pass the online examination (all 11 lessons)
• Complete at least 3 online eSimulation practice scenarios
• Meet the objectives of the in-person Provider course
Path to becoming an instructor

Beginning January 1, 2017 NRP instructor candidates must

• be physicians, registered nurses, respiratory care practitioners, or physician assistants with experience in the hospital care of newborns in the delivery room

• have current maternal-child educational or clinical responsibility within a hospital setting

It is recommended that NRP instructors and instructor candidates have ongoing delivery room experience.
Path to becoming an instructor

1. Possess a current NRP provider card for all lessons
2. Apply online through the AAP
3. Review Instructor Toolkit content and complete the online instructor course
4. Pass the NRP online instructor examination
5. Designate an eligible NRP instructor mentor
6. Co-teach 2 provider courses with your instructor mentor
7. Participate in at least one “debrief the debriefer” session with your instructor mentor
Online Instructor Toolkit

• All instructional resources in one location (keyword searchable)
• Replaces the NRP Instructor Manual
• No NRP Instructor DVD to purchase
• No additional fee to access the instructor course, eSimulation, and the online examination for instructors (includes continuing education credits)
• A webinar for NRP instructor mentors available anytime
• Downloadable PDFs of most commonly used documents and checklists for use in NRP Provider courses
• Podcasts by neonatal resuscitation experts
• Continuously updated educational materials and new resources throughout the life of the 7th Edition