

## Clinical Technical Update Global Neonatal Health Status and Strategies

AAFP Global Health Workshop 2017  
Martha C. Carlough, MD MPH  
UNC/CH School of Medicine



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FAMILY PHYSICIANS  
STRONG MEDICINE FOR AMERICA

### Objectives:

- Review current neonatal global statistics and progress
- Discuss evidence based strategies for reducing neonatal morbidity and mortality
- Address cross-cutting issues necessary for expanding coverage of strategies

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### Definitions:

- Perinatal = 28 weeks of pregnancy through the first week of life
- Neonatal = birth to 28 days
  - Early period = 0-7 days
  - Late period = 7-28 days
- Preterm = gestation <37 weeks
- Low birth weight = birth at <2500g
- Stillbirth = death of fetus after 22 weeks gestation (but before birth)
- Neonatal mortality rate = # deaths in first month of life/1000 live births
- Infant mortality = # deaths in the first year of life/1000 live births

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### Data Sources:

- STRONGEST – civil registration system (birth certificates) – obviously problematic in situations of unrest, disaster, or limited resources
- COMMONLY – retrospective household surveys (e.g. DHHS)
- VALIDATION – health facility records – challenging with misclassification of stillbirths, underreporting of early neonatal deaths

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### Global Statistics:

- Largest current data base - WHO global analysis of 193 countries between 1990-2009<sup>1</sup>
- Combination of civil registration methods and statistical modeling
- 4.6 million deaths in 1990 vs. 3.3 million in 2009
- Global reduction of NMR by 28%<sup>2</sup>
  - 33.2/1000 live births to 23.9/1000 live births
  - Average reduction of 1.7% per year

1. Oestergaard et al. 2011  
2. UN Interagency Report 2011

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### Percent change in NMR in last 20 years



Figure 7. Changes in NMRs between 1990 and 2009. The map illustrates the change in NMR between the years 1990 and 2009 for each of the 193 countries estimated for.

Oestergaard et al. 2011

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## 2014 Update:

- 2.9 million neonatal deaths/year  
– 15,000 per day; 10 each MINUTE
- **PLUS** 2.6 million stillbirths/year
- Appears to have leveled off in the last three years with little significant change
- Neonatal mortality represents 45% of all under five child mortality

Lawen JE, et al. The Lancet Every Newborn Study Group: Progress, priorities and potential beyond survival. Lancet Every Newborn Series, May, 2014.

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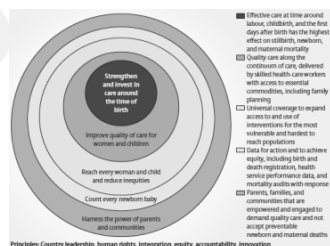
## The not so good news....

- Neonatal Mortality Rate actually increased in the last decade in eight countries (five of which are in Africa...)
- >50% of neonatal deaths in five countries –India, Nigeria, Pakistan, China and DRC
- These countries correlate with countries with low SBA coverage at birth as well (40% of maternal mortality occurs during childbirth) - **SURVIVAL CONVERGENCE**

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## Every Newborn Action Plan



Lancet series, 2014

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## Timing of neonatal death

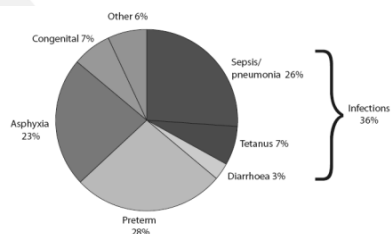
- Seventy five percent of neonatal deaths occur in the 1<sup>st</sup> week of life
- At least 50% of deaths occur on the first day of life
- Statistically this makes the day of birth the riskiest day of life in many countries



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## Causes of neonatal death



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## Causes of neonatal death

- 80% of deaths due to three causes:
  - Sepsis/infection (22-26%)
  - Preterm birth (27-34%)
  - Birth asphyxia (23-25%)



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## Neonatal Sepsis

- Neonatal sepsis is bacteremia (infection in the blood stream) causing hemodynamic compromise or shock
- 1.2 million neonatal deaths each year are due to sepsis or pneumonia.
- Sources: maternal infection (systemic or in utero), hospital acquired, and environment acquired
- Although classified as early (within 72 hours) vs. late sepsis it doesn't matter THAT much in terms of symptomatology and treatment. <sup>1</sup>
- Globally in situations where NMRs are the highest, sepsis is responsible for up to 50% of neonatal deaths and 10% of child deaths overall. <sup>2</sup>

<sup>1</sup> Shane, A et al. 2017  
<sup>2</sup> Lawn, JE et al. 2009

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## Interventions with Evidence: Reducing Sepsis

- **BREASTFEEDING – probably THE most important “intervention”**
- Exclusive breastfeeding reduces neonatal mortality by a projected 55 %
- Following WHO recommended breastfeeding practices would prevent >6000 neonatal deaths/day
- Delayed breastfeeding initiation even by 24 hours increases risk of neonatal death by 2.4X

Edmond, et al. 2006

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## Interventions with Evidence: Reducing Sepsis

- Symptom based treatment of sepsis
  - “Culture-independent diagnostics” – US term
- Treatment of maternal infections in pregnancy (UTI, STI and malaria)
- Maternal antibiotics for preterm rupture of membranes
- Chlorhexidine gel applied to the umbilical stump of the newborn
- Behavior change for hygienic care of the newborn

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## Symptom based treatment

- Global reality is that many newborns die from sepsis at home, without any care
- Presence of any one of seven simple signs/symptoms has a relatively high sensitivity (85%) and specificity (75%) for sepsis
  - difficulty feeding, convulsions, movement only when stimulated, respiratory rate >60 min, severe retractions, temp <37.5 or >38.5
- Can be used in an algorithm by non-physician clinical workers to identify sepsis

Young Infant Clinical Signs Study Group. 2008

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## Neonatal sepsis

- Symptom based home treatment supported by the IMNCI protocols
- Neonates are not brought to facilities, even when ill – postnatal visits and active surveillance is needed
- SATT trial (Pakistan) - >2700 newborns with presumed sepsis; those treated with simplified at home regimen (PCN and Gentamycin) did as well as those admitted for more “complex” care
- Gentamycin Uniject
  - Initial injectible dose
  - Transition to oral antibiotics

Mir F. et al. Lancet 2017

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## Umbilical cord care

- Nepal study - 4% chlorhexidine gel applied to stump with 24% reduction in neonatal mortality
- More important in out of hospital birth
- Now replicated in Pakistan and India
- Chlorhexidine gel is now in birth packs in 7 countries

Mullany et al. 2006

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## Malaria

- IPTp (Intermittent Preventive Treatment of Malaria) reduces LBW due to malaria by 29% and neonatal mortality due to malaria by 31% in countries with high prevalence.
- The use of insecticide treated nets (ITNs) reduce LBW due to malaria by 20% and stillbirths due to malaria by 32%
- 6 trials have demonstrated IPTi with 3 doses of SP (sulfadoxine/pyremethamine) in the first year of life results in 30% reduction in malaria episodes and 15% reduction in anemia, but not a statistically significant benefit of neonatal death reduction
- Still not widely accepted integrated – need better drug choices with growing SP resistance, more experience with integration.

Grobstein, 2007

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## Neonatal Tetanus Reduction

- Largely, tetanus is a success story
  - 7% of neonatal deaths in 2005 vs. 1% in 2012
- The provision of TT vaccine antenatally has reduced global tetanus by 2/3rds since the 1970s
- Why so successful? – combination of low tech/safely administered technology, high coverage, continuous surveillance
- There are 40 countries where tetanus is still common, usually among the poorest quintiles of the population

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## Preterm birth

- THE leading cause of neonatal death in developed countries
- Preterm birth rates have not significantly improved in the last 20-30 years and in some situations (such as the US!) have actually gotten worse
- “Indicated” preterm birth due to complications of pregnancy have increased and the birth rates among those at highest risk (lower SES and AA and Hispanic young mothers) have increased.

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## Prematurity and neonatal death: direct and indirect causes

- Preterm birth is a contributor to other causes of neonatal mortality because of the susceptibility of preterm infants
  - Temperature instability/hypothermia
  - Sepsis
  - Feeding difficulties and malnutrition



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## Preterm birth

- Most preterm births are “late preterm” (33 to 37 weeks gestation)
- Low birth weight (LBW) births of <2500g may be small babies (growth restricted) or preterm.
- 80% of ALL neonatal deaths are to infants born at low birth weight
- Stunting starts in the womb...
- Interestingly, the LBW term births are more common in Asia, and preterm births more common in Africa. This is probably due to the heavier burden of malaria, HIV and other infectious diseases

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## Preterm births: Interventions

- Use of antenatal steroids (for mother) if there is suspected preterm labor at known gestation <37 weeks
- Antibiotics for preterm prelabor rupture of membranes (PPROM)
- Early cord clamping (2-3 minutes) for infants at risk to reduce anemia
- Early initiation of breastfeeding and skin to skin contact
- Controversial in low income countries
  - progesterone administration antenatally to women at risk
  - cervical cerclage for women with a demonstrated shortened cervical length (<25 mm)

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## Birth Asphyxia

- A "fuzzy" term – WHO defines as "a newborn who fails to initiate or maintain regular breathing at birth"
- Clinical condition indicating need for resuscitation, but not specific to cause or necessarily predictive of outcome
- In contrast to developed countries, initial mortality of severely asphyxiated babies in low income countries is high and long term survival after birth asphyxia is low
- If an infant survives, may manifest as neonatal ischemic encephalopathy, and related conditions (e.g. cerebral palsy)

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## Birth Asphyxia: Neonatal resuscitation

- Basic neonatal resuscitation and care in facilities could avert as many as 30% of immediate neonatal deaths (and an additional 5-10% of deaths due to prematurity)
- Community health workers **may** have an estimated effect of 20% reduction of immediate neonatal death by practicing basic resuscitation skills in out of hospital deliveries
- A study from Tanzania demonstrated a RR reduction of 0.47 for immediate neonatal death after neonatal resuscitation training (Helping Babies Breathe)<sup>1</sup>
- A recent survey of 6 African countries revealed that only 2-12% of personnel conducting births had any neonatal resuscitation training and 8-22% of facilities had basic equipment for resuscitation.<sup>2</sup>
- **This assumes skilled attendance at birth**

<sup>1</sup> Mwaema, et al. 2013  
<sup>2</sup> Walk, et al. 2009

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## Global estimates of newborn resuscitation input needed



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## Highlights of Evidence Based Guidelines for Newborn Resuscitation

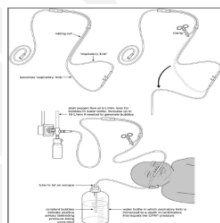
- Room air (which is about 21% oxygen) is as effective as 100% oxygen for the resuscitation of most infants at birth. Establishing effective ventilation is KEY
- Routine suctioning of the trachea with meconium is unnecessary and provides no benefit (*no longer a part of initial NRP...*)
- Infants born preterm benefit from 2-3 minute delay in cord clamping; evidence unclear if this benefits all infants
- Continuous positive airway pressure (CPAP) is recommended as an alternative for infants who need airway support

Brett, M. et al. Lancet 2017

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## Bubble Continuous Pressure Airway Ventilation (CPAP) with nasal cannula



- Low tech, high yield
- Ghana RCT (Wilson et al.) Mean decrease in RR of 16 breaths/min
- Malawi observation study (Walk et al.): Survival of 82% in HIV+ children patients with ARI

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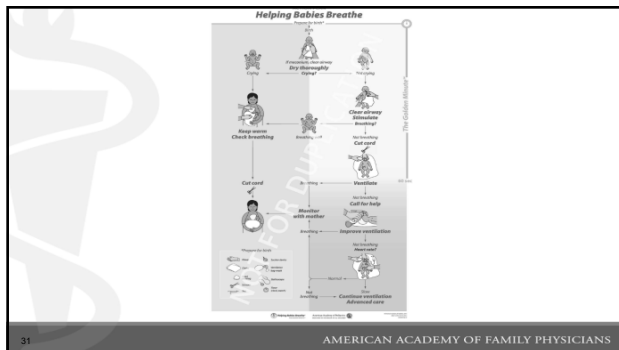
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## Neonatal resuscitation curricula

- There are two globally appropriate resources currently available which fold in together
  - **WHO Basic Newborn Resuscitation Guidelines (2012)**
  - **Helping Babies Breathe™** (AAP, 2016)
    - Low tech, low cost clinical simulation model (NeoNatalie™) and educational materials – flip chart, basic "action plan" structured around the "golden minute". Mentoring model of education

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### Which babies should be resuscitated?

- Babies who do not cry
- Babies who do not breathe at all
- Babies who are gasping 30 seconds (Helping Babies Breathe – 60 seconds) after birth
- This needs to be SIMPLE – assessment based on breathing alone....

WHO, 2010

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### Helping Babies Survive

- Began with **Helping Babies Breathe** neonatal resuscitation. The HBB curriculum includes scientific updates to harmonize with 2015 ILCOR Consensus on Science with Treatment Recommendations, and the 2012 WHO Basic Newborn Resuscitation Guidelines.
- **Helping Babies Breathe** teaches the initial steps of neonatal resuscitation to be accomplished within *The Golden Minute* to save lives and give a better start to many babies who struggle to breathe at birth.
- **Essential Care for Every Baby (ECEB)** teaches health care providers essential newborn care practices to keep all babies healthy from the time of birth to discharge from the facility.
- **Essential Care for Small Babies** builds on the skills taught in Essential Care for Every Baby, guiding providers on the specialized care small and preterm babies need.

AAP, 2016

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### Neonatal resuscitation

- Teach in conjunction with obstetric care – doesn't take place in a vacuum and often the same providers are involved
- Usually there are signs that resuscitation may be needed and planning for resuscitation and place of delivery is critical.
- Facility based **neonatal resuscitation** training may reduce **stillbirth rate** by up to 30%<sup>1</sup>
- Less robust (but still positive) outcomes for CHWs and neonatal resuscitation outside of facilities<sup>2</sup>
- Availability of appropriate and easily cleaned equipment and supplies is a barrier, even after training.

1. Lee, et.al. 2011  
2. Engmann, et.al. 2009

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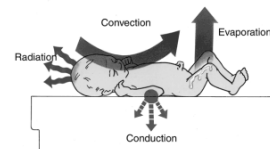
### Hypothermia

- An important cause of neonatal death (direct and indirect)
- Preterm infants with limited ability to vasoconstrict and preserve temperature are at significantly higher risk; though with seasonal variations of temperature ALL infants are at risk
- Various behavioral practices, both at home and in hospitals, put neonates at serious risk
  - lack of drying and wrapping, early bathing, delayed breastfeeding.

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### WHO “warm chain”

- Babies lose heat to the environment quickly.....
- TEN interlinked procedures for all babies, wherever they are born



WHO, 2007

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## WHO “warm chain”

1. Warm delivery room (>25 C)
2. Immediate drying
3. Skin-to-skin contact
4. Breastfeeding
5. Postpone bathing at least 6 hours
6. Appropriate clothing and bedding
7. Mother and baby kept together
8. Warm transportation – ??? plastic bags/wraps covering body/extremities\*
9. Warm place for resuscitation
10. Training/awareness raising for all attendants

\*Oatley, HR, Blencowe H and JE Lawn. Journal of Perinatology. 2016

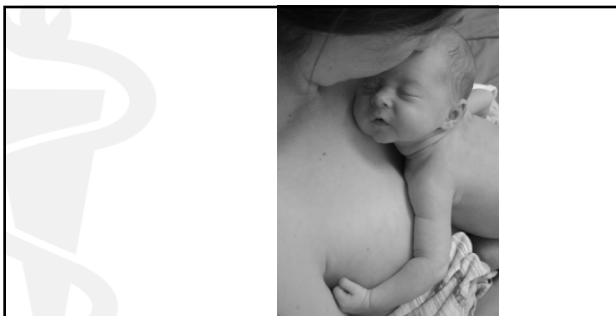
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## Kangaroo Mother Care

- Uninterrupted use of adult body heat (skin-to-skin contact) in order to maintain the newborn's body temperature
- Exclusive breastfeeding
- Promotes physical growth and extra-uterine adaptation
- Increases the mother's confidence, ability and involvement in the care of a small newborn

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## Nutrition and Newborns

- Stunting starts in the womb
- Preterm birth is a “nutritional emergency” - often successful feeding starts too late
- Rapid early growth is associated with improved cognitive outcomes in infants born preterm OR at low birth weight
- Breastmilk is BEST, but might not be all that is needed to accelerate growth – need more info on increasing caloric content safely

Harding, J. et.al. Advances in nutrition of the newborn infant. Lancet 2017.



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Caring for Newborns and Children in the Community
A Training Course for Community Health Workers

Caring for the newborn at home

COUNSELLING CARDS

unicef

World Health Organization

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## Stillbirth

- The global # of stillbirths is almost equivalent to the # of neonatal deaths
- At least 2.6 million third trimester stillbirths; about a third of which occur during labor
- Intrapartum stillbirth rate 25x higher in low income countries than high income countries
- Research around stillbirth is poorly developed
- Often stillbirths are incorrectly documented (e.g. no birth weight recorded, or an early neonatal death and failed resuscitation is coded as a stillbirth)
- Stillbirths are still not included in WHO Global Burden of Disease reporting - **LACK VISIBILITY.....**

Lawn, et.al. 2011

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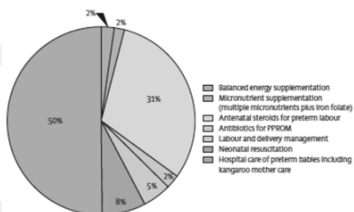
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## Global Stillbirth Rate (2011)





### Estimated effect of interventions: Preterm-related deaths

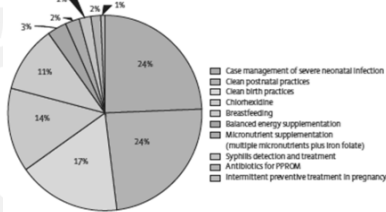


Bhutta, et.al. Lancet 2017

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### Estimated effect of interventions: Infection-related deaths



Bhutta, et.al. Lancet 2017

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### Bottlenecks and Gaps

- Staffing and training of health care providers who are responsible for newborn care
- Effective approaches to behavior change in neonatal care at the household level (including identifying illness and early care seeking)
- Expansion of low tech, protocol driven community based care for "small babies" (preterm and LBW) and sepsis
- Better understanding on the role of nutrition and appropriate maternal and neonatal nutrition for those at risk
- Better ways to monitor health system performance for improvement

Dickson K et.al. Lancet Every Newborn Study Group. Lancet 2017

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### Questions, comments?



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