Neonatal Care in Resource-Limited Settings

Danielle Ehret, MD MPH
April 12, 2018
Outline

• Trends in global health
• Quality metrics in global perinatal health
• Vermont Oxford Network (VON) global health initiatives
Learning Objectives

• Recall the contribution of respiratory failure to global neonatal mortality
• Recognize the expertise that RTs bring to global health partnerships
Making the Case for Quality

TRENDS IN GLOBAL HEALTH
2015 MILLENNIUM DEVELOPMENT GOALS

- Develop a global partnership for development
- Eradicate extreme poverty and hunger
- Achieve universal primary education
- Ensure environmental sustainability
- Combat HIV/AIDS, malaria and other diseases
- Improve maternal health
- Promote gender equality and empower women
- Reduce child mortality

THE GLOBAL GOALS
For Sustainable Development

1. NO POVERTY
2. ZERO HUNGER
3. GOOD HEALTH AND WELL-BEING
4. QUALITY EDUCATION
5. GENDER EQUALITY
6. CLEAN WATER AND SANITATION
7. AFFORDABLE AND CLEAN ENERGY
8. DECENT WORK AND ECONOMIC GROWTH
9. INDUSTRY, INNOVATION AND INFRASTRUCTURE
10. REDUCED INEQUALITIES
11. SUSTAINABLE CITIES AND COMMUNITIES
12. RESPONSIBLE CONSUMPTION AND PRODUCTION
13. CLIMATE ACTION
14. LIFE BELOW WATER
15. LIFE ON LAND
16. PEACE AND JUSTICE, STRONG INSTITUTIONS
17. PARTNERSHIPS FOR THE GOALS
Source: Unicef.org
ETHIOPIA REACHES MDG 4

Ethiopia had a 2/3 reduction in under-5 mortality rate

Photo: USAID
Source of data: 2011 Ethiopian DHS
Sustainable Development Goals

3- Good Health and Well-Being

By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12/1,000 live births and under-5 mortality to at least as low as 25/1,000 live births.
Scale of the Problem

Every year:

- 2.7 million newborn babies die from largely preventable causes
- 2.6 million babies are stillborn

4 million births annually

10-hours = 6,000 deaths
A healthy start is central to the human life course, with birth holding the highest risk of death, disability and loss of developmental potential, leading to major societal effects.
World Bank: US NMR 4/1000 live births

99% of neonatal deaths occur in low- and middle-income countries
Up to 80% of deaths in neonatal period related to respiratory failure!

- Preterm (36%)
- Respiratory Distress Syndrome
- Respiratory Failure
- Perinatal Asphyxia (2° apnea)
- Intrapartum (23%)
- Other (8%)
- Congenital (10%)
- Pneumonia (5%)
- Sepsis (15%)
- Tetanus (2%)
- Diarrhoea (1%)

The Lancet 2014; 384:189-205
Neonatal Mortality From Respiratory Distress Syndrome: Lessons for Low-Resource Countries

Oxygen and CPAP applied widely in low resource settings, with appropriate supportive infrastructure and general newborn care, will have the greatest impact on decreasing neonatal mortality.

Expected Survival in Low Resource Countries
Infants with RDS > 1500 grams

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Survival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>No treatment</td>
<td>0%</td>
</tr>
<tr>
<td>Oxygen alone</td>
<td>25%</td>
</tr>
<tr>
<td>Oxygen and CPAP</td>
<td>70%</td>
</tr>
<tr>
<td>Surfactant</td>
<td>85%</td>
</tr>
<tr>
<td>Prolonged ventilation</td>
<td>95%</td>
</tr>
</tbody>
</table>

Access vs. Quality

- **Tetanus toxoid vaccination**: 68%
- **IPTp or ITN**: 37%
- **Antenatal care (24 visits)**: 23%
- **Antibiotics for PPROM**: 48%
- **Skilled birth attendance**: 41%
- **Institutional delivery (clinic and hospital)**: 41%
- **Clean birth practices**: 61%
- **Neonatal resuscitation**: 55%
- **Exclusive breastfeeding at 1 month**: 49%
- **Simple thermal care of neonate**: 49%
- **Oral antibiotics for neonatal infections**: 49%
- **Hospital care of preterm newborns**: 25%

*The Lancet 2014; 384:189-205*
QUALITY METRICS IN GLOBAL PERINATAL HEALTH
Figure 2. Measurement status of priority contacts and evidence based interventions across the continuum from pregnancy to childhood.
Every Newborn Action Plan
Indicators

- WHO Quality of Care indicators for Maternal Newborn Child Health (MNCH) care in facilities
  - Action focused
  - Important
  - Operational
  - Feasible
  - Simple and valued
# 5 Core Newborn Health Indicators

## #1

<table>
<thead>
<tr>
<th>Core Indicators</th>
<th>Numerator</th>
<th>Denominator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of health facilities with maternity services that have <strong>functional bag &amp; masks</strong> (2 neonatal mask sizes) in the delivery area</td>
<td># of health facilities with maternity services that have functional bag &amp; masks (2 neonatal mask sizes) in the delivery area</td>
<td>Total # of health facilities with maternity services</td>
</tr>
</tbody>
</table>
# 5 Core Newborn Health Indicators

## #2

<table>
<thead>
<tr>
<th>Core Indicators</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Proportion of newborns who <strong>received all four elements of essential newborn care</strong>- 1. Immediate and thorough drying 2. Immediate skin-to-skin contact 3. Delayed cord clamping 4. Initiation of breastfeeding in the first hour</td>
<td># of newborns who received all four elements of essential newborn care</td>
<td>Total # of live births in the health facility</td>
</tr>
</tbody>
</table>
#3

<table>
<thead>
<tr>
<th>Core Indicators</th>
<th>Numerator</th>
<th>Denominator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of health facilities where <em>Kangaroo Mother Care</em> is operational, by level of facility</td>
<td># of health facilities where Kangaroo Mother Care is operational, by level of facility</td>
<td>Total # of health facilities with maternity services</td>
</tr>
</tbody>
</table>
# 5 Core Newborn Health Indicators

## #4

<table>
<thead>
<tr>
<th>Core Indicators</th>
<th>Numerator</th>
<th>Denominator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility <strong>neonatal mortality rate</strong> disaggregated by birth weight: &gt; 4000 g, 2500-3999 g, 2000-2499 g, 1500-1999 g, &lt; 1500 g</td>
<td># of neonatal deaths by categories of birth weight: &gt; 4000 g, 2500-3999 g, 2000-2499 g, 1500-1999 g, &lt; 1500 g</td>
<td>Total # of live births in the health facility segregated by birth weight</td>
</tr>
</tbody>
</table>

World Health Organization, CMNH International Conference on MNH, May 2014
5 Core Newborn Health Indicators

#5

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Proportion of health facilities offering maternity services that have Baby-Friendly Hospital Initiative (BFHI) certification and recertification not older than two years</td>
<td># of health facilities offering maternity services that have Baby-Friendly Hospital Initiative (BFHI) certification and recertification not older than two years</td>
<td>Total # of health facilities with maternity services</td>
</tr>
</tbody>
</table>
Core Newborn Indicators - WHO and ENAP

Core Indicators
Proportion of health facilities with maternity services that have functional bag & masks (2 neonatal mask sizes) in the delivery area

What are we measuring?

Facility Readiness?
If yes, ..... Clean? Available? #? Space?

Knowledge and Skills of Staff?
Availability of Staff?
What babies are resuscitated?

World Health Organization, CMNH International Conference on MNH, May 2014

Core Newborn Indicators - WHO and ENAP

Core Indicators

Proportion of health facilities with maternity services that have **functional bag & masks** (2 neonatal mask sizes) in the **delivery area**

*How are we measuring?*

- Once?
- Once a shift?

*Who assesses breathing?*

- 24/7?
- Involve parents?
- Include < 28 weeks?
VON GLOBAL HEALTH INITIATIVES
Vision

To establish a worldwide community of practice dedicated to ensuring that every newborn infant and family achieves their fullest potential

1200+ Newborn Units in 34 Countries
Ethiopia

- Population: 105 million
- Median Age: 18 years
- Literacy: 57% males, 41% females
- Fertility rate per woman: 5 rural, 2 urban
- Delivery in health facility: 20% rural, 79% urban (97% Addis Ababa)
- Access to mobile phone: 43% rural, 89% urban
- Internet access: 15%
- 0.03 physicians/1,000 people (36x more in US)

Ref: CIA World Factbook, 2016 Ethiopian Demographic Health Survey
Ethiopian Health Tier System

- Specialized Hospitals (3.5 – 5.0 million)
  - General Hospital (1.0 – 1.5 million)
- Health Centers (40,000)
  - Primary Hospital (60,000 – 100,000)
  - Health center (15,000 – 25,000)
  - Health Post (3,000 – 5,000)
- Urban
- Rural

- Tertiary Level Health Care
- Secondary Level Health Care
- Primary Level Health Care
Tikur Anbessa Specialized Hospital

- Established in 1964
- More than 891 beds
- 17 departments
- Neonatology fellowship - 3 (VON)
Newborn Services Rapid Health Facility Assessment

- Purpose: allow a rapid assessment of newborn care services to determine the capacity of facilities at any level to provide care for well and sick newborns
- Completed in September 2015 by Neonatology staff at Tikur Anbessa Hospital

https://www.healthynewbornnetwork.org/resource/newborn-services-rapid-health-facility-assessment/
Service Availability

• 24/7 Skilled Birth Attendance – YES
  – Staff present, schedule observed
• Neonatal Resuscitation - YES
• Corticosteroids for preterm labor - YES
• Kangaroo Mother Care – YES
• Basic Emergency Obstetric Care (BEmOC)- YES
<table>
<thead>
<tr>
<th>Equipment &amp; Supplies – Delivery Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Newborn bag &amp; mask - YES</td>
</tr>
<tr>
<td>• Resuscitation table - YES</td>
</tr>
<tr>
<td>• Infant scale - YES</td>
</tr>
<tr>
<td>• Soap or hand disinfectant - YES</td>
</tr>
<tr>
<td>• Towel for drying - NO</td>
</tr>
</tbody>
</table>
Equipment & Supplies

- Injectable gentamicin - YES
- PMTCT drug - YES
- Corticosteroids - YES
- Injectable uterotonic - YES
- Magnesium sulfate - YES
Documentation

• Up-to-date delivery register - YES
Additional Optional Indicators

• **Monitoring postnatal care** – **NO**
  – No evidence of looking at service data for monitoring of postnatal care for newborns (reports, wall graphs, charts)

• **Review deaths or near misses** – **YES**
  – Regular review of maternal and newborn deaths or “near misses”
Limitations of Tool

• Service availability
  – 24/7 “skilled birth attendance” focuses on conducting deliveries, not caring for newborns

• Equipment & supplies
  – “observed, functioning, accessible in DR within 1-min”
    – unable to comment on supply vs. demand

• Documentation
  – Birth outcome and weight recorded, unable to assess accuracy of information

• Optional indicators
  – Data reviewed vs. quality improvement
Tikur Anbessa Specialized Hospital
Set Up of the Delivery Ward

- Has **5 delivery rooms**, one bed each
- **One operation theater** for C/S delivery with one resuscitation table and radiant warmer
- **350 – 400 deliveries/month**
- **Delivery** is conducted by obstetric **residents**, interns or midwives.
- Neonatal **resuscitation** is conducted by midwives (trained in Helping Babies Breathe)
Delivery Ward
Resuscitation Area

- 2x2 meters
- 5-10 meters from delivery rooms
- No visible clock
- Oxygen tank outside room
Equipment for Resuscitation
NICU Family Involvement
Technical Aspects of Oxygen Care

- Oxygen Protocols
- Blenders
- Compressed air
- Oxygen Concentrators
- Oxygen in DR and NICU
- Pulse Oximeters
- Pulse Oximeter Sensors
- Blood Gases
- ROP Screening
Social Aspects of Oxygen Care

• Enough trained staff
• Empowered nurses
• Physician and Nursing Leadership
• Teamwork
• Coordination with Obstetrics
• Communication on rounds
• Round the clock coverage
• Culture and beliefs about oxygen care
Current Global Health Initiatives

- Helping Babies Breathe training for all OB and pediatric staff - Plan for DR Resuscitation Team
- Ethiopian Neonatal Network (Feb 2018)
- Neonatology Fellowship (Sept 2018)
- Advanced Practice NICU Nursing Program (Sept 2018)
Global Neonatal Database

Vermont Oxford Network (VON) Global Neonatal Database

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>first name, last name, gender, date of birth, date of admission, birth weight, gestational age, Apgar score, mode of delivery, anesthesia, complications, diagnosis, treatment, outcome, follow-up information, etc.</td>
</tr>
</tbody>
</table>

REDCap

Vermont Oxford Network (VON) - Ethiopian Pediatric Society (EPS)

**Data Collection Form**

**Record ID 11**

**Demographics**

- **Name**: [must provide value]
- **Card Number**: [must provide value]

**Applications**

- Calendar
- Data Entry, Reports, and Stats
- Data Import Tool
- Data Collection Tool
- Logging
- Field Comment Log
- File Repository
- User Rights and Roles
- Data Quality
- API and API Playground
- REDCap Mobile App

**Help & Information**

- Help & FAQ
- Video Tutorials
- Suggest a New Feature

If you are experiencing problems, please contact your REDCap Admin or support team.

**Vermont Oxford Network**

VON Logo

**Video**: Basic data entry
St. Paul’s Hospital Millennium Medical College

Team Leaders:
Mahlet Abayneh
Danielle Ehret

NICU Nursing team celebrating
1st month of data collection
Pilot Results- Global Neonatal Database

- 898 infants admitted in 6-months
- 25% referrals (transported in) from >73 sites
- 59% with ≥ 4 prenatal care visits
- 25% with preterm labor, 14% Abx, 14% ANS
- 77% of deliveries with HBB-trained providers
- 16% received BMV
- 69% temp measured w/in 1-hr (avg 35.8° C)
Pilot Results- Global Neonatal Database

- BW 2550g (IQR: 1865g, 3035g)
- GA 38 weeks (IQR: 35 wk, 40 wk)
- 35% of admissions premature (< 37 weeks)
- 41% with respiratory distress on admission
  - 10% MAS, 9% perinatal asphyxia, 7% HIE
  - 49% treated with oxygen
  - 26% treated with CPAP
  - 0% treated with caffeine, surf, ventilator
- 11% died (prematurity 58%, infection 18%, asphyxia 8%), 3% transported
- 10% discharged home with weight < 1500g
VON Global Neonatal Database

Temperature measured within one-hour of admission?

<table>
<thead>
<tr>
<th>Total Count (N)</th>
<th>Missing</th>
<th>Unique</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,636</td>
<td>14 (0.8%)</td>
<td>3</td>
</tr>
</tbody>
</table>

Counts/frequency: Yes (1,293, 79.0%), No (273, 16.7%), Unknown (70, 4.3%)

If measured, first temperature on admission:

<table>
<thead>
<tr>
<th>Total Count (N)</th>
<th>Missing</th>
<th>Unique</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>StdDev</th>
<th>Sum</th>
<th>Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,286</td>
<td>254 (22.1%)</td>
<td>82</td>
<td>0.00</td>
<td>41.3</td>
<td>35.79</td>
<td>1.82</td>
<td>46,026.50</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Lowest values: 0.00, 32, 32, 32
Highest values: 30.5, 30.5, 30.5, 41.2, 41.2
VON Global Neonatal Database

Monthly Reports to Create Run Charts

% admission temperature measured

Median Admission Temp (°C)
Ethiopian Neonatal Network

Inaugural ENN meeting February 2018
Ethiopian Neonatal Network
We all have two jobs

Making improvement happen also requires ... unshakeable belief in the idea that everyone in healthcare really has two jobs when they come to work every day: *to do their work and to improve it*.

Take-home Points

• Recall the contribution of respiratory failure to global neonatal mortality- *Up to 80%*!
• Recognize the expertise that RTs bring to global health partnerships- *invaluable*!
Thank You!

Danielle Ehret, MD MPH

Dehret@vtoxford.org