



CHIFA Discussion on Newborn Care #1

What is the size of the problem? What do we know about quality of care at different levels?

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LONG EDIT

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With thanks to Every Newborn Action Plan and London School of Hygiene and Tropical Medicine for financial support for this discussion, and to the members of the HIFA working group on Newborn Care:

<http://www.hifa.org/projects/newborn-care>

Background to the discussion: <http://www.hifa.org/news/join-chifa-global-discussion-newborn-care-low-and-middle-income-countries>

See also our blog on the Healthy Newborn Network:

<https://www.healthynewbornnetwork.org/blog/join-3000-child-health-professionals-140-countries-global-discussion-care-small-sick-newborns-low-middle-income-countries/>

METRICS

128 contributions from 41 contributors in 12 countries (Bangladesh, Canada, Ethiopia, Ghana, India, Kenya, Malawi, Nigeria, Rwanda, South Africa, UK, USA). Special thanks to super-contributors Sue Prullage, Rwanda (11 messages), Lily Kak, USA (8) and Ruth Davidge, South Africa (7).

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INTRODUCTION

Each year 2.7 million newborns die; 98% of these deaths in low and middle income countries and more than 80% are small, with preterm infants being most at risk. High levels of facility deliveries globally means that more newborn deaths are occurring within hospitals. Yet over two-thirds of these deaths could be prevented with effective hospital care of small and sick newborns.

Part of this discussion will address how to tackle the major challenge of defining and measuring the content, coverage and quality of care. For years, emergency obstetric care has used clear indicators or 'signal functions' (a core list of life saving interventions) to measure the provision of basic and comprehensive care, which has improved programme standardisation, monitoring, and accountability. Yet for different levels of newborn care, signal functions have not been consistently defined or routinely tracked. ENAP Metrics has developed an online survey (available in English, French and Spanish), and are inviting healthcare professionals in newborn care from all backgrounds to contribute their opinions to help decide which interventions we should measure for small and sick newborns, and at which level of the health system. Learn more and complete the survey here.

<https://www.healthynewbornnetwork.org/blog/launch-enap-inpatient-care-small-sick-newborns-online-survey-world-prematurity-day/>

In any country, how we care for our small and sick newborns is one of the most sensitive indicators of health systems functioning. Major mortality reduction is possible even with basic newborn care, however to reach the SDG target of a neonatal mortality of fewer than 12 per 1000 live births, every country will need to aim to provide more comprehensive newborn care as outlined in The Lancet Every Newborn series and the Every Newborn Action Plan (ENAP), endorsed by all countries in 2014.

This work is being coordinated by a team at London School of Hygiene & Tropical Medicine on behalf of the Every Newborn metrics group, and CHIFA, with involvement from representatives at WHO, UNFPA, UNICEF, Averting Maternal Death and Disability (AMDD), Saving Newborn Lives/Save the Children, and USAID.

1. What is the size of the problem? How many newborns die every day, where, and what are the causes? How many more suffer major morbidity? What are the trends?

Joy Lawn, UK: "Each year 2.7 million newborns die with 98% of these deaths in low and middle income countries, and more than 80% are small, with preterm infants being at greatest risk. Now that 80% of the world's births are in hospitals, more newborn deaths are occurring in hospitals, and over two-thirds of these deaths could be prevented with effective hospital care for small and sick newborns. Major mortality reduction is possible even before adding comprehensive or intensive newborn care BUT to reach the SDG 3 target of a neonatal mortality of fewer than 12 per 1000 live births, every country will have to be on a pathway to providing more comprehensive newborn care as outlined in The Lancet Every Newborn series and the Every Newborn Action Plan, endorsed by all countries in 2014."

Mary Kinney, South Africa: Every year, 15 million babies are born prematurely more than one in ten of all babies around the world. World Prematurity Day [<https://www.healthynewbornnetwork.org/event/world-prematurity-day-2017/>] is a key moment to focus global attention on the leading cause of child deaths under age 5 complications from preterm birth which account for nearly 1 million deaths each year. Without a major push to reduce these deaths, we will not reach the Global Goal, endorsed by 193 countries, to end all preventable newborn and child deaths by 2030.

Mary Kinney, South Africa: Today, UNICEF, WHO and other members of the UN Inter-Agency Group for Child Mortality Estimation (IGME) released the new child mortality data [<http://www.childmortality.org/>] for 196 countries showing that 7,000 newborns die every day. The report [<https://data.unicef.org/resources/levels-trends-child-mortality/>] has a heavy focus newborn mortality because the data reveal that the rate of newborn deaths is not decreasing as quickly as that of children aged one to five. As a result, newborns account for a growing proportion of child deaths with each passing year.

Mary Kinney, South Africa: Healthy Newborn Network (HNN) [<https://www.healthynewbornnetwork.org/>] is an online community dedicated to addressing critical knowledge gaps in newborn health. Easy access to reliable newborn health data is fundamental towards helping decision-makers allocate resources effectively and prioritize implementation efforts to improve access and quality of care for mothers and babies. Newborn Numbers [<https://www.healthynewbornnetwork.org/numbers/>] on HNN aims to improve the understanding and use of data in decision making for newborn health. It includes the global burden of newborn deaths including when, when and why newborns are dying as well as solutions for preventing deaths and resources available for action on newborn health. The page hosts the most centralized and trusted location for accessing the latest global, regional and national estimates related to newborn health. By synthesizing information gathered from the major global resources, such as Global Health Repository, the UN Inter-agency Group for Child Mortality Estimation and papers published in The Lancet, Newborn Numbers includes mortality estimates, cause of death data, coverage of care for key

newborn-health related interventions, contextual indicators, human resources and financing indicators. The interactive data visualization tool, a new feature on HNN, allows users to easily and quickly make graphs with over 50 newborn-related indicators. The multi-dimension query functionality of the tool makes it easy to select multiple indicators and countries from cross-country comparisons. You can also download a sub-set of data into excel to create your own graphs. The heat maps visually demonstrate cross country comparisons of indicators. With the release of the new mortality estimates today, we will be updating these resources in the coming weeks. Access Newborn Numbers at: <http://www.healthynewbornnetwork.org/page/newborn-numbers>

Mary Kinney, South Africa: 5 key facts about newborn health

1. 2.6 million newborn deaths in 2016 along with 2.6 million stillbirths and 303,000 maternal deaths (estimates for 2015).
2. 46% of children who die under 5 years are newborns. 3 main causes of newborn death—prematurity, complications during childbirth, and neonatal infections.
3. 77% of newborn deaths occur in Southern Asia or sub-Saharan Africa. Five countries accounted for half of all newborn deaths: India, Pakistan, Nigeria, the Democratic Republic of the Congo and Ethiopia.
4. The day a baby is born is the most dangerous day of a child's life in all countries.
5. Over two-thirds of newborn deaths are preventable with known, cost-effective, low-tech maternal and newborn health interventions.

Neil PW: Many thanks to Mary Kinney for highlighting this timely press release from WHO and partners. Read online here: <http://www.who.int/mediacentre/news/releases/2017/daily-newborn-deaths/en/> 7 000 newborns die every day, despite steady decrease in under-five mortality, new report says. At current trends, 30 million newborns will die within first 28 days of life between 2017 and 2030.

Samantha Sadoo (UK): 2014 Lancet Every Newborn series (paper 3)

- Increased coverage and quality of preconception, antenatal, intrapartum, and postnatal interventions by 2025 could avert 71% of neonatal deaths (1.9 million) and 33% of stillbirths (0.82 million) a year.
- Most (82%) of this effect is attributable to facility-based care which, although more expensive than community-based strategies, improves the likelihood of survival.
- Available interventions can reduce the three most common cause of neonatal mortality—preterm, intrapartum, and infection-related deaths—by 58%, 79%, and 84%, respectively.
- 2005 Lancet Neonatal Survival series- At least half of neonatal deaths arise after home births.

Dayo Ajayi-Obe, UK: The burden of disease is great in low income countries. In Lagos State, Nigeria alone, which has an estimated population of 20 million people with 650,00 deliveries annually and an estimated 25350 newborn deaths that is approximately 70 newborn deaths a day. We definitely can't ignore the current role that the different stakeholders play in child birth both from a maternal and new born perspective.

Judith Robb-McCord, USA: Many of you may already know about the Preterm Birth/Low Birth Weight Country Profiles developed by USAID's Every Premie--SCALE project for 25 low-income countries* predominantly in SE Asia and sub-Saharan Africa. For those of you who are interested, you can find the country profiles here. The profiles provide an overview by country of several risk factors related to preterm birth (including adolescent

birth rate, birth interval, hypertension and violence against women), and coverage of reproductive health services and care during pregnancy, birth and the postnatal period. You can also find information regarding select health workforce, health policy, health information and community engagement indicators. The profiles also captured information regarding the inclusion of the 10 WHO Recommendations for improved preterm birth outcomes in national clinical standards for hospital level care. Please browse these country profiles as they paint an interesting picture of where risk around preterm birth lies, strengths and gaps in services across the reproductive and maternal health continuum of care, and the enabling environment for the management of preterm birth and early/small babies by country.

<http://www.everypreemie.org/country-profiles/>

Neil PW, UK:

Data on 25 USAID priority countries are presented. The profiles 'are intended to ignite dialogue in-country and catalyze action around PTB/LBW within maternal and newborn health programming'.

Looking at few examples of country profiles, they are beautifully presented with easy-to-understand infographics. I would find it useful if they could also include a narrative summary of each country's indicators, performance and trends over time, to show how well countries are doing in relation to other countries with similar levels of development. I read that a summary is being developed that may reveal these comparative data.

Another question is: Given that these country profiles only cover USAID priority countries, what potential is there to coordinate with other bilateral agencies (and with global health agencies such as WHO and UNICEF) to produce a more comprehensive set of profiles?

Soofia Khatoon, Bangladesh: The neonatal mortality rate of BD is now 28/1000 live birth. The SDG goal is 12/1000. If the present rate of reduction continue then in 2030 the rate will be 16/1000. So to address the challenge BD has taken National Neonatal Health Programme NNHP as new intervention. In BD the most challenging is that still 60% of delivery occur in home. So it is a big task. The key activities are - The capacity building, facility readiness for providing quality services, quality improvement initiative and community and multisectoral engagement. Promotion of ENC service with BHE and other partners. Today on 12th Nov this programs is launched in BD.

Judith Robb-McCord, USA: While we can continue to learn more about where newborn deaths are occurring, we know that many early/small babies are born at home without the critical care they need; or are released from inpatient care and sent home while still dangerously small and unstable. Service delivery and care limitations (in the facility and at home) and community beliefs that discourage care-seeking behaviors for preterm/LBW babies, can propel these already vulnerable newborns to unnecessary mortality. Community messaging and mobilization can also emphasize that early/small babies can survive and thrive when given the care they need.

Dayo Ajayi-Obe, UK: I would like to raise the question of where are our babies being born? 'A Review article on the current state of neonatal care in Lagos State, Nigeria in 2016' which is not yet published reveals that only 15% of mothers deliver within the public healthcare system, 45% in the private healthcare system and 40% of mothers are delivered by traditional birth attendants. Traditional birth attendants are a heterogeneous group: faith based, auxiliary healthcare workers and traditional spiritualists with no training when it comes to looking after the new born baby. Most of the traditional birth attendants will transfer the babies to the hospital but the state in which they are transferred is poor, hence the high mortality. I

advocate that these traditional birth attendants require training in resuscitation (Helping Babies Breathe) and train them on how to safely transfer babies. I know that the drive is for babies to be born within the hospital setting but accessing healthcare can be complex for various reasons.

Q1 (from NPW): How many babies in LMICs are delivered at home versus primary health centre versus small hospital versus referral hospital?

A1: Mike English: We don't know the answer to this question - or at least no better answer than is available from all the DHS work but we have recently looked at who is accessing care in Nairobi County. Results suggest almost 1 in 5 babies will need some form of facility based / coordinated care here: <http://gh.bmj.com/content/2/4/e000472.article-info>

CITATION: Estimating the need for inpatient neonatal services: an iterative approach employing evidence and expert consensus to guide local policy in Kenya

Georgina A V Murphy, Donald Waters, Paul O Ouma, David Gathara, Sasha Shepperd, Robert W Snow, Mike English
BMJ Global Health 2017

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ABSTRACT

... We worked with local policy makers and experts in Nairobi City County, an area with a population of four million and the highest neonatal mortality rate amongst counties in Kenya, to address this gap, and developed a systematic approach to use available data to support policy and planning. We developed a framework to identify major neonatal conditions likely to require inpatient neonatal care and identified estimates of incidence through literature review and expert consultation, to give an overall estimate for the year 2017 of the need for inpatient neonatal care, taking account of potential comorbidities.

Our estimates suggest that almost 1 in 5 newborns (183/1000 live births) in Nairobi City County may need inpatient care, resulting in an estimated 24 161 newborns expected to require care in 2017. Our approach has been well received by local experts, who showed a willingness to work together and engage in the use of evidence in healthcare planning. The process highlighted the need for co-ordinated thinking on admission policy and referral care especially in a pluralistic provider environment helping build further appetite for data-informed decision making.

Question 2 (NPW): How many newborn deaths occur at each of the above levels of the health system?

ME: Can't answer this question but we have examined data from 12 county hospitals in Kenya for a full year and about 1/3rd of all admissions to hospital in the under 5 age group are now neonates and about 1 in 6 neonatal admissions is to a paediatric ward not a newborn unit.

Akshaya Srikanth Bhagavathula, Ethiopia: The under five mortality rate in [Ethiopia] has also declined from 205 to 145 per 1000 live births between 1990 and 2015. During the same period, neonatal mortality has declined from 61 to 28 per 1000 live births.

2. What do we know about quality of care (QOC) in the home, community and primary health centres? What level of care is available for small and/or sick newborns?

Neil PW: Most newborns die at home:

WHO: Newborns: reducing mortality

Fact sheet, October 2017

Key facts

- In 2016, 46% of all under 5 child deaths were among newborn infants, babies in their first 28 days of life (the neonatal period) — up from 40 % in 1990.
- Globally 2.6 million children died in the first month of life — approximately 7 000 newborn deaths every day with about 1 million dying on the first day and close to 1 million dying within the next 6 days.
- Children who die within the first 28 days of birth suffer from conditions and diseases associated with lack of quality care at birth or skilled care and treatment immediately after birth.
- The main killers of children under 5 in 2016 included preterm birth complications, pneumonia, intrapartum related events, diarrhoea, neonatal sepsis and malaria.
- The vast majority of newborn deaths take place in developing countries where access to health care is low. Most of these newborns die at home, without skilled care that could greatly increase their chances for survival.

Traditional birth attendants

Lily Kak, USA: The question of whether we should train traditional birth attendants to resuscitate newborns was a real dilemma for a global public-private alliance that came together in 2010 with the support of USAID and the American Academy of Pediatrics to roll out Helping Babies Breathe. After much discussion, the alliance made a deliberate decision to focus on improving the capacity and quality of care in health facilities. This meant that our strategy focused on training skilled birth attendants and not traditional birth attendants. We felt that there was a lot of work to be done to ensure that resuscitation skills and equipment were available in all health facilities. With increasing institutional delivery in many countries, closing this quality gap in health facilities is of paramount importance. The issue of training TBAs has long been controversial and an emotional debate; the group decided that it would be more constructive to focus on a non-controversial approach that is likely to have greater impact.

Ochiawunma Ibe, USA: I agree that training traditional birth attendants to perform neonatal resuscitation may not move the dial towards reduced neonatal mortality but as Dayo highlights they are still conducting many deliveries in low resource settings and as such training them to be effective support for mothers prenatally with strong linkages to the health facilities and in situations when their deliveries happen in the community recognizing the danger signs in neonates for referral to the health facilities will go a long way in achieving the outcomes we desire for the newborns. We must make them part of the team though their roles will not be to perform the resuscitation.

Kishwar Azad, Bangladesh, Bangladesh: We had trained TBAs in essential newborn care including Bag and mask resuscitation and aseptic practices. We conducted a RCT in 3I will send the reference later. TBAs in the intervention group were trained in BMV and mouth to

mouth whereas those in intervention group were trained only in MtoM. There was no difference in neonatal mortality.

Kishwar Azad, Bangladesh, Bangladesh: It's true that more than 30% of deliveries in the rural areas in Bangladesh still occur at the hands of TBAs. There is no point in ignoring this fact and say we must not train TBAs. Until such a time that all deliveries are conducted by SBAs, TBAs must be made 'safe' and must know when to refer. Since they are the first point of contact for newborns, they should be familiar with basic resuscitation practices.

Dayo Ajayi-Obe, UK: Lagos State, Ministry of Health has 4012 TBA's on their list of which almost 3000 are registered. The limited number of beds and trained health professionals in the formal health sector remain an issue and even to some extent is a problem even in developed countries. The impact that one group of stakeholder plays on the outcomes of another group of stakeholders cannot be ignored and we must remember we are an ecosystem. As we know a newborn who fails to breath at birth and is starved of oxygen will end up brain damaged.

Dayo Ajayi-Obe, UK: I would like to put a few questions forward: Are we maximizing the potential role that the neonatal ambu bag has in saving newborn lives, (newborns with primary apnoea) in low income resourced countries?. Has a Cochrane review been done on the outcomes of training traditional birth attendants in helping babies breathe? Can we continue to break down the HBB and essential newborn care training to the level of that TBA's can understand so that they can do what is necessary before transferring a sick baby who has a better chance of surviving intact?

Joseph Ana, Nigeria: We have advocated engagement of TBAs, train them, provide them with basic clean kits (and skills to help babies breathe) then monitor their practice. At least until that time when literate health professionals are in abundance and are willing to live and work in those difficult to reach areas that TBAs thrive in.

(Are traditional birth attendants good for improving maternal and perinatal health? Yes BMJ 2011; 342 doi: <https://doi.org/10.1136/bmj.d3310> (Published 14 June 2011)Cite this as: BMJ 2011;342:d3310)

Christabel Enweronu-Laryea, Ghana: It is important that everyone who attends birth is trained in basic neonatal resuscitation e.g. HBB. However, the focus should still be to encourage women to deliver in health facilities and for primary health care (PHC) facilities to refer the 'at risk' foetus to higher levels of care in utero.

Christabel Enweronu-Laryea, Ghana: Resuscitation at birth is not enough for quality health outcome. Quality supportive care in the hours after resuscitation is important to protect the brain from further damage.

Christabel Enweronu-Laryea, Ghana: Such post-resuscitation care is not provided by TBAs and PHC facilities in many sub-Saharan African countries. Also, extra uterine transportation has its challenges because ambulance services (where they exist) are not equipped for newborn transport. These babies arrive to hospitals many hours after resuscitation in very poor conditions. Many survive but with significant disability.

Christabel Enweronu-Laryea, Ghana: HBB, like oxygen, saves lives but improving the quality of life for survivors and families requires a system of care that reduces the risk of

disability. Retinopathy of prematurity is a major cause of preventable blindness in middle income countries. Let us make every effort to ensure that receiving HBB in the community will not be the major cause of neuro developmental disability in low-resource countries in coming years.

Alexander Manu, UK: I believe that if we want to reduce deaths of newborns at home, we must be prepared to improve quality of care at health facilities.

Alexander Manu, UK: My contributions will end with adding that we still need to find mechanisms to reach mothers at home whose babies die because they are not allowed to take them to health facilities or they do not know when newborns fall ill. Women's groups, community health workers, community mobilisation and other mechanisms that are sustainable are warranted.

3. What do we know about QOC in district hospitals and referral hospitals? What level of care is available for small and/or sick newborns?

Mike English, Kenya: Although it is likely that essential services for sick newborns with problems such as prematurity, low weight for age, sepsis, respiratory distress and hypoxia- ischaemia delivered at the level of small and larger "district" hospitals could save many newborn lives work to understand the coverage and quality of such services is uncommon. A team in Kenya working with collaborators from Oxford is trying to understand what gaps exist in the coverage and quality of care in Nairobi City County, Kenya, where neonatal mortality is estimated to be the highest of any county at 39/1000 livebirths. This high NMR is occurring in a setting where over 80% of births are estimated to be in health facilities. The work being conducted is using multiple methods from epidemiology to ethnography and ergonomics. A major issue is the difficulty of providing sustained, high quality nursing care. Something we believe is a largely neglected issue.

To find out more about the studies to assess coverage and quality you can find information here:

<http://bmjopen.bmj.com/content/6/12/e012448>

If anyone wants to examine the tools being used and use them for themselves then they have all been made available here:

<https://globalresearchmethods.tghn.org/methodology-projects/estimating-gaps-provision-and-quality-inpatient-newborn-care/>

Sue Prullage, Rwanda: We just met with the ethical review board in Rwanda yesterday to receive approval to survey the nurses that work in the 50 neonatal units across Rwanda... We are asking about the orientation they received to the neo unit, what equipment they had and was it working. Had they received education surrounding common neo issues. We asked them to identify how comfortable they were in caring for neonatal patient with certain disease entity using a likert scale. Our approach is to identify the gaps in education and to help them develop a workable education program. We also will use the information to develop neonatal nursing competencies for Rwanda. Our team consist of the Council of International Neonatal

Nurses (COINN) and the Chiesi Foundation. The MoH is very supportive as well as the nursing council.

Sue Prullage, Rwanda: Very excited to see these things happening I have worked in Rwanda for 9 years in neo units and have observed that the staffing is terrible and training is minimal. Equipment doesn't make a neo unit

Tom Lissauer, UK: The Royal College of Paediatrics and Child Health has started a programme to improve neonatal care in 12 District Hospitals over the next 2 years. This includes a UK paediatric doctor and nurse spending 6 months in each of the hospitals to provide training and help improve delivery of neonatal care, followed by ongoing mentorship by a trained Rwandan paediatrician and nurse.

Other neonatal training programmes have recently started or are about to begin.

Of course there is a serious shortage of staff. but hopefully the training of many of them will improve, and will hopefully be evident when you do a repeat survey.

Christabel Enweronu-Laryea, Ghana:

1. Faculty: What are the standards of knowledge and skills training (neonatal) for undergraduate and postgraduate trainees in our nursing and medical schools? What is the quality of the output from our institutions? How sustainable are external efforts if we do not improve the quality of training?

2. Accreditation and certification (examination) bodies: Are the standards and approach appropriate for improving neonatal outcome in that setting? Is improving quality of care for newborns a priority?

3. Hospital management teams: What is the evidence that improving quality of care for newborns is a priority? How useful are the monitoring tools?

1. Faculty: What are the standards of knowledge and skills training (neonatal) for undergraduate and postgraduate trainees in our nursing and medical schools?

Answer 1, Sue Prullage, Rwanda: "In many countries the education for undergraduate and postgraduate trainees is minimal and in an infancy phase. What I have seen is that a group of students with minimal experience go through a post graduate program and instead of allowing them to work in a neonatal unit many are recruited to teach the next cohort. This is going to keep the level of attainment at knowledge level only and not advance to advanced applied theory or even as an expert in neonatology. I agree that the quality of training is needed and this may mean a commitment by the university to hire an expert from another country to spend time in their country teaching and helping students move from knowledge to applied knowledge."

1. Faculty: What are the standards of knowledge and skills training (neonatal) for undergraduate and postgraduate trainees in our nursing and medical schools?

Answer 2, Mike English, Kenya: "Most medical training schools I know in East Africa provide a total of 10 weeks paediatric training of which 2 weeks is neonatal care - and often the large numbers of students are not welcome on wards for infection control reasons! Degree nurses in Kenya do 2 weeks neonatal training!"

2. Accreditation and certification (examination) bodies: Are the standards and approach appropriate for improving neonatal outcome in that setting? Is improving quality of care for newborns a priority?

Answer, Sue Prullage, Rwanda: This is something COINN [Council of International Neonatal Nurses] is thinking about and have made inquiries. But before we can move to accreditation and certification we need a commitment from the government that declares there is a neonatal nurse or doctor and develop the competencies needed to be call this. This takes a commitment from the government and nursing councils to really think about and contact other countries as to what is a competent neonatal nurse.

Ruth Davidge, South Africa: The failure to provide specifically allocated and trained nurses to care for sick and small babies is a huge problem and is not adequately addressed in the literature or global recommendations.

Ruth Davidge, South Africa: The allocation of midwives to the care of sick and small newborns will always result in a conflict in priorities particularly in low resource settings as midwives have to choose whether to focus their time on the mother or the baby. Frequently hospitals allocate experienced and trained midwives to the labour ward and allocate junior, inexperienced and untrained nurses to the nursery.

Ruth Davidge, South Africa: It is critical that globally there is increased advocacy that nurses are trained to care for sick and small babies specifically (neonatal nurses) and are permanently (non rotational) allocated to the care of these vulnerable babies.

Sue Prullage, Rwanda: How are the nurses and midwives that already work in neonatal units trained? Comprehensive neonatal care touches the basics of thermoregulation etc. But there are units all over Africa that have donated CPAP machines and IV pumps. Is their understanding and training given around this equipment. Premature babies are being born at less than 1kg500 how has the staff been trained to deal with these infants. Infants with genetic dysfunction are being born in LMIC as well. The same disease entities that touch babies in high income countries are being born in LMIC and what does the staff know about these infants.

Sue Prullage, Rwanda: In my experience the staff of the neonatal units are not given extensive orientation to all the problems that can be encountered with prematurity and sick infants. The new nurse generally follows another nurse who hadn't been oriented or given didactic related to premature disease. In the US the orientation process is competency based and up to 12 weeks to 1 year in length. In most LMIC the staff is moved around every few months to keep them "well rounded".

Sue Prullage, Rwanda: Wouldn't it be prudent for the stake holders in the lives of the premature infants to have a set of neonatal nurse competencies. Doctor competencies? A statement and commitment to what would be included in neonatal nurse orientation. Shouldn't the hospitals commit to an orientation process and leaving a team of experienced staff?

Alexander Manu, UK: Nonetheless, given the quality of care in these facilities with "skilled attendants", mothers are still not provided all the information they need, or their babies die anyway!

John Osborne, UK: Dear colleagues, as a retired obstetrician gynaecologist I have read with interest the correspondence on neonatal care. I worked in Africa in my youth and have travelled excessively in the African continent. My experience in Africa and as a teaching

hospital consultant in London one thing has always been very clear to me and that is that teamwork is vital. One cannot expect good outcomes if the paediatricians receive babies damaged by intrapartum care. We must strive to improve the obstetric care at the same time as providing the neonatal facilities.

David Southall and Rhona MacDonald: The proposed work outlined by Professor Lawn [*see note below] to identify and then manage life-saving approaches to neonatal care is extremely important and hopefully will follow a similar and effective pathway as that achieved for 'signal functions' in emergency obstetric care.

Following our task-sharing advanced obstetric and advanced neonatal hospital work in Liberia (www.mcai.org.uk/liberia) it is clear in this low income country, where there are so few doctors, that integration of obstetric and neonatal care will have the best outcome for newborn infants.

Two main examples of the most dangerous neonatal conditions that we come across on a daily basis, support the importance of the integration of high quality obstetrics in the prevention and amelioration of neonatal conditions.

Firstly, we are all aware of the importance of the early diagnosis and effective treatment of neonatal sepsis. However, we are being constantly faced with neonates with extreme sepsis immediately after birth, which is often so far advanced that high quality Intravenous antibiotics accompanied by high dependency care are ineffective. Most of these cases of neonatal sepsis arise because of either pre-labour pre-term rupture of membranes (PPROM) or prolonged rupture of membranes (PROM) at term that are not recognised or acted upon early enough by the mother or community clinics as requiring urgent maternal antibiotics and admission to hospital and when appropriate, urgent delivery. In addition, knowing that PPRM or PROM has been present by those caring for the newborn baby must result in urgent antibiotic treatment given to the baby immediately at birth, rather than waiting for symptoms or signs of sepsis. A major understanding of obstetrics by those caring for newborn infants, as well as close communication between obstetricians, midwives and neonatal care practitioners, are vital.

Secondly we are also aware of how difficult it is, especially in low income countries where resources to treat neonates are so seriously limited, to undo the effects of hypoxia ischaemic injury to the fetal brain. Improvements in monitoring the fetus during labour and delivery require highly technical and expensive monitoring systems that cannot either be afforded or adequately used given gross limitations on the availability of suitably trained midwives and doctors in low income countries. Shortage of midwives often means that partograph measurements are also not done regularly. Low cost approaches of trying to identify fetal distress as early as possible in labour that take account of the serious shortage of midwives on the ground are clearly needed and, if effective, would make a major impact on neonatal birth asphyxia as such a major cause of death or permanent brain damage. In Liberia, we are currently piloting such an approach by testing the feasibility of equipping mothers with a way of monitoring their own babies during labour with a simple inexpensive Doppler ultrasound probe. In addition to the standard measurements made as part of the partograph by midwives (frequently not undertaken regularly due to staff shortages), and after suitable training, mothers are asked to monitor their own unborn babies for one minute immediately after the end of each uterine contraction looking for fetal bradycardia. They then call a midwife if they suspect that the fetal heart rate is low and the midwife then intervenes to expedite delivery. In addition to identifying possible fetal distress, we have found that this approach is helping mothers to feel involved with and contributing to the care of their baby before birth.

These examples emphasise the critical importance of integrating obstetric and neonatal care for the best outcomes for both mothers and neonates. We would therefore suggest that the proposed project by the Every Newborn Metrics Group includes signal functions that are traditionally classed as 'obstetric' interventions.

Finally, we have to question the appropriateness of grouping together low and middle income countries with respect to life saving ways of preventing neonatal mortality and morbidity. From our experience on the ground, the differences in origins and mechanisms of death between the two groups are so great that different systems may be needed to create maximum impact.

Elvira Beracochea, USA: South America has had a neonatology center with over 45 years of experience working to improve neonatal outcomes in resource limited settings. Here is the link to their website now sponsored by PAHO: <http://www.paho.org/clap/index.php?lang=en> ... For those called and committed to do make history, South American countries have many lessons to share as well as simple tools and best practices.

Ruth Davidge, South Africa: In Kwa Zulu Natal, South Africa we have developed a standardised neonatal record keeping system and a facility based essential package of neonatal care and assessment tools. These are based in part on systems/tools developed/rolled out by the National DOH. These will be used in all 52 hospitals providing maternity services in the Province...

Claire Keene, UK/Kenya: In response to what other questions we should be asking, another topic to consider is how health systems should categorise their levels of care. It seems to be fairly widely accepted that the minimum level of care includes basic care of the newborn and basic neonatal resuscitation, and that the highest level covers intensive care, mechanical ventilation and more specialised services. But how should the care babies receive between these two ends of the spectrum be categorised, and what care should be provided at which level of hospital? Some questions I have are:

1. What constitutes a newborn unit? Should any facility performing deliveries have a newborn unit that offers standard in-patient care, or should it be restricted to hospitals only?

Sue Prullage, Rwanda: Interesting question. Then we would have to define 'standard in-patient care.' Policies and guidelines would have to be developed as to who can stay or who should be transferred to a higher level of care? Staff would need to be trained in the care of the small baby and all the possibilities of problems that can develop with them.

Claire Keene, UK/Kenya: 2. Should non-NICU inpatient care be categorised as one level or further subdivided into basic and comprehensive care? Should some non-NICU newborn units be able to provide higher dependency care that alleviates the pressure on NICUs? Or should all high dependency care be provided at NICU level only?

Sue Prullage, Rwanda: Once again what is basic versus comprehensive care. In my experience the lines are blurred because of the distance of the basic unit from the higher level of care. Without a true transport system infants would die before reaching the higher level of care. So whatever can be done is done and if the child worsens often the family elect to go on palliative care. Transportation of a neonate is a whole different topic but when we advocate for there to be only higher level of care in the bigger cities this will probably worsen neonatal mortality

Claire Keene, UK/Kenya: 3. What care could realistically be provided in a high dependency unit (CPAP? Exchange transfusion)? Are there pivotal or distinguishing services that define a unit as a specific level of care, for example CPAP defining a high-care unit?

Sue Prullage, Rwanda: Maybe we should go to the higher income country literature that defines the level of care.

Claire Keene, UK/Kenya: 4. Should care be completely regionalised with basic facilities referring to central high level facilities, or should some higher level services be distributed closer to the receiving population? For example, having high dependency units at low level hospitals in rural areas. Should efforts be made to improve transport networks or should poor referral systems be compensated for by providing higher level care at more hospitals? There are explicit guidelines for specific countries, such as the US, UK, Australia, South Africa and India, but it is unclear how these translate to LMIC that don't have their own guidelines and have very different ways of organising their health systems. Explicitly defining levels can help understand what the current capacity of a system is as well as advocate for improvements, and makes planning of resource allocation according to need easier. Uniform definitions can contribute to development of consistent service standards, and clarity allows enforcement. It also helps compare outcomes over time or between hospitals, and can improve the comparability of research. The question is how to define these levels in a low-resource, high-burden context and what the implications might be?

Samantha Sadoo, UK: Standardised measurement of emergency obstetric care has improved tracking and accountability using indicators based on "signal functions", to monitor the availability and use of emergency obstetric care (EmOC) services. However, signal functions to track service readiness to provide inpatient care of small and sick newborns is not consistently defined or routinely tracked. The Every Newborn Action Plan (ENAP) metrics group held an expert focus group in April 2016 that identified 13 core newborn interventions that services should be ready to provide at a basic and advanced inpatient level, and launched an online survey to canvas opinion from healthcare professionals worldwide, with the aim to define signal functions for inpatient care for small and sick newborns (results currently being analysed).

Sue Prullage, Rwanda: I do not think that care should be completely regionalized with basic facilities referring to central high level facilities. As stated before transport alone is often the cause of death for the infant. I think a high dependency unit at low level hospitals in rural areas would be good if the staff and doctors are specially trained in neonatal issues. The transport process could be looked at and guidelines written. The process is at the institution where I practice is to send whatever nurse is available to get the child at the health center. He or she is not trained to anticipate complications, glucose levels are not monitored, they often do not have equipment to treat respiratory distress, IV's are not started and small vulnerable infants go without glucose for hours as they travel to the higher level unit. KMC is sometimes used and sometimes not.

Ruth Davidge, South Africa: I agree transporting is a major issue
The things that should be considered:

1. Increasing the use of skin to skin during transport
2. Teaching the S.T.A.B.L.E course developed by a neonatal nurse - Chris Carlson - aimed at stabilising babies prior to transfer

3. The use of retrieval teams based at central hospitals that can go and stabilise and return with the baby.

Oxygen, Respiratory Care and Retinopathy of Prematurity

Clare Gilbert, UK: The number of ROP blind infants is increasing dramatically in some countries as neonatal care expands, as the above have often not been considered. Lack of ophthalmologists is a challenge in many countries, but new imaging systems mean that members of the neonatal team could

Clare Gilbert, UK: 1. ROP and its risk factors are included in training curricula / in-service training for nurses (and paediatricians and neonatologists) so they understand their role in prevention

2. Adequate equipment to safely deliver and monitor oxygen in delivery rooms and neonatal units is a clear policy objective

3. Those involved in policies re neonatal care work with ophthalmologists who are knowledgeable about ROP, so that it is included across all relevant policies, included screening and treatment of the sight-threatening stages of ROP, which is highly cost effective.

Clare Gilbert, UK: Retinopathy of prematurity (ROP) is a potentially blinding eye condition which affects infants born preterm. ROP is a major cause of blindness in children in many middle income countries and is becoming an increasingly important cause in low and low-middle income countries as neonatal services expand and more preterm babies survive. Recent estimates suggest that in the year 2010, 20,000 preterm infants become blind from ROP, and a further 12,300 survived visually impaired. All regions of the world are now affected. This study also estimated that 848,300 (range 838,400-924,700) preterm infants survive neonatal care and need to be screened, and 53,800 (range 28,800-85,000) infants need urgent treatment every year. Currently only around half of these infants are treated due to lack of services. Full text:

<http://www.hifa.org/sites/default/files/pages/ROP%20for%20chifa%20Nov%209%202017%20C%20Gilbert1.pdf>

Sue Prullage: I agree we need more training on why a neonate would need oxygen versus CPAP. In my experience in the nursery where I work the tendency is to begin with oxygen and not think of CPAP when the infant remains tachypneic yet saturations are within normal limits. It is a similar way that we did things in the US in the 80's we were very liberal with our oxygen and didn't understand the danger. In countries where ophthalmologist are rare and infants are not followed up I would imagine the ROP blindness is higher than we can imagine.

Lily Kak, USA: USAID and the Every Preemie project team are collaborating with several partners, including UNICEF, WHO, Save the Children, University Research Corporation and others to support governments conduct a multi-country situational analysis of inpatient sick newborn and young infant care (0-60 days). The objective of this assessment is to describe the national enabling environment for service implementation and quality of inpatient care. The data collection tools are currently being field tested and will be available for implementation by November. They are intended for use by governments to inform the development of national plans for strengthening inpatient newborn and young infant care.

Lily Kak, USA: There is an increased availability of oxygen for inpatient newborn care; however, special vulnerabilities of newborns mean that they can be harmed as well as helped by oxygen. Because oxygen is so fundamental to high-quality inpatient newborn care, it is natural that increased availability of oxygen is one of the first steps taken into special newborn care. However, in most settings, the delivery systems provide high concentrations of oxygen, which can be toxic - especially to preterm infants. The ability to mix oxygen with air and deliver the exact amount of oxygen needed to keep blood levels of oxygen in a safe range requires routine pulse oximetry for measurement of oxygen levels in the blood and, ultimately, the use of blenders for careful titration of supplemental oxygen concentrations. Staff need an understanding of the potential harm that high levels of oxygen can do to developing eyes and lungs, and staffing ratios must allow providers to monitor their patients frequently. Retinopathy of prematurity, a developmental disorder of the eye in preterm infants, is on the rise in many middle-income countries and is becoming the leading preventable cause of child blindness. As oxygen use becomes more widespread, its introduction should be safe and should be accompanied by screening for retinopathy of prematurity among preterm infants treated with oxygen.

Ruth Davidge, South Africa: In South Africa we are focusing on developing care at lower levels as transport is a problem with often lengthy delays and there is inadequate capacity in central hospitals. We are developing capacity for delivering nCPAP at rural hospitals. This is supported by monthly visits from a consultant paediatrician and bimonthly visits from the specialist team.

Sue Prullage, Rwanda: As for the hospitals far from the capitol transfer of a critically ill infant isn't often done because of the long hours of transport and keeping the baby stable during that time. They often are left to die in the district hospitals. It takes a different education to transport a critical ill infant. In these same hospitals often these critical ill infants are transported from the health center in respiratory distress, cold and hypoglycemic. Basic neonatal care stuff. This is a huge issue and affects the neonatal mortality that we so want to decrease.

Lily Kak, USA: It is my pleasure to forward the new oxygen advocacy resources shared by Bonnie Keith from PATH... Scaling up access to oxygen delivery is one of the most effective, and critical, actions that decision-makers can take to improve health outcomes, particularly for vulnerable populations such as newborns, children, and pregnant women. Despite the urgent need, however, this issue is not always prioritized. The reasons for this are many - including limited data, perceptions about costs, a lack of understanding of the impact on health outcomes, and the complexity of integration across the health system. PATH announces the release of a new suite of evidence-based resources to enable country-based advocates to engage national decision-makers, policy influencers, and champions and drive discussion to improve the functionality and reliability of lifesaving oxygen delivery systems. OXYGEN IS ESSENTIAL: [<http://sites.path.org/oxygen-therapy-resources/oxygen-primer/>] A Policy and Advocacy Primer helps ADVOCATES and DECISION-MAKERS understand the need for increasing access to oxygen, and how it can be done?even within contexts with limited resources. It provides the data, messages, and resources to help understand the planning, policies, and technologies involved in oxygen delivery scale-up. The materials are useful to anyone who wants to learn about scaling up access to oxygen and integrating oxygen delivery across national and subnational policies, programs, and health budgets. The primer is unbranded and customizable, allowing advocates and decision-makers to use these resources in the way that best suits their needs.

Sarah Moxon, UK: It is well-known that preterm infants are at higher risk of childhood morbidities (including adverse visual, hearing and neuro-developmental outcomes). The lower the gestational age at birth, the higher the risk of difficulties. Most premature infants, especially those <34 weeks, will require facility based care for survival, including thermoregulation, respiratory support (oxygen, continuous positive airway pressure), treatment of specific complications (feeding, seizures, jaundice) and prevention and treatment of infections. Many of these interventions carry a risk of harm when not performed with safe equipment or by trained staff. This is increasingly apparent in middle-income settings, where we have seen an increase in impairments in survivors of neonatal care, especially where complex care has been scaled up without due attention to the quality of care, as quantified in the Beyond Newborn Survival series in 2013

<https://www.nature.com/articles/pr2013202> This has come up in some of the posts by Claire Gilbert on retinopathy of prematurity and safe oxygen therapy in the past few weeks.

Jaundice

Kojo Ahor- Essel, Ghana: I will want to make mention of the seemingly lack of training/knowledge about neonatal jaundice among health workers as well as the communities. Many babies are dying or developing permanent disabilities which are preventable. We will have to increase education on this topic, especially in the remote, hard-to-reach communities.

I Abdulkadir, Nigeria: In Nigeria similar situation abound, however several researchers locally have worked on neonatal jaundice in different regions and states in the country. 3 years ago a group of researchers (from Zaria, Jos, Kano, Lagos, and Asaba) worked under the name Stopping Kernicterus in Nigeria with collaborators including Slusher and Wennberg from the US. Their yet unpublished work, which won the global health innovative award 2016, showed how maternal education and early access to care remarkably reduced incidence of Kernicterus. These group of researchers developed several tools for education of mothers and different categories of health workers... My take will be that harnessing these works and properly situating the different components into the current health care system so that appropriate relevant interventions are implemented at appropriate levels of health care will go along way to address the issue. Key among such intervention is educating mothers and health care workers.

Sepsis and Group B strep

Marti Perhach, USA: Thank you, Neil, for posting the info below! [*see note below] As a group B strep stillbirth mom and cofounder of Group B Strep International (GBSI), I'd like to add about the importance of educating all pregnant women and new parents as to the signs and symptoms of group B strep disease (GBS) in babies. As most of you probably know. GBS is a leading cause of sepsis and meningitis worldwide. Unfortunately, many of the GBS stories on our website could have had much better outcomes with something as simple as health care providers having a conversation with their pregnant patients to call if they had any vaginitis symptoms, urinary tract infection symptoms, an unexplained fever or low or no fetal movement and, also, to give new parents a list of signs of GBS infection to watch out for in their newborn BEFORE they leave the hospital. (Other types of infection could also cause the same symptoms so even more reason to be alert.)

Marti Perhach, USA: It's also important for perinatal health care providers and emergency room personnel to know the symptoms and not be dismissive of parents' concerns which

sadly happens sometimes. We have the honor of a GBS mom contributing the audio clip of her son, Aayan, making the grunting/groaning sound that is a common yet often unrecognized sign of GBS meningitis (and possibly meningitis from other causes as well). It's available on our website at <https://www.groupbstrepinternational.org/recognize-the-symptoms-of-infection.html> along with a downloadable list of signs in English (Spanish and French soon!) Our GBS brochure is linked from the top of this page: <https://www.groupbstrepinternational.org/more-about-gbs-and-how-to-help-protect-your-baby.html>

Marti Perhach, USA: I also wanted to add that GBSI sponsors October as Prenatal-onset GBS Disease Recognition Month <https://www.groupbstrepinternational.org/-what-is-group-b-strepprenatal-onset-3.html> and February as International Prenatal Infection Month <https://www.groupbstrepinternational.org/downloadable-prenatal-infection-prevention-materials.html>.

Cliff O'Callahan, USA: I was struck by how different the epidemiology of neonatal sepsis is in East Africa where GBS is practically never seen. Something to be aware of because teaching medical staff there, and making policy around screening etc, needs to be reflective of the local epidemiology.

Sarah Moxon, UK: We'd like to draw attention to a new set of global estimates of the burden of Group B Streptococcal disease for women, stillbirths and children that is being released today... According to these estimates the highest burden in neonatal and infant GBS cases and deaths is indeed in Africa. There has also been a blind spot for measuring stillbirths due to GBS and the mother herself as GBS is a cause of severe sepsis, especially postpartum... Important for all of us to note the "inverse data law" where the highest burden falls on the most vulnerable yet the least data are collected to address that burden. <http://bit.ly/GBSburden>

Nick Spencer, UK: Many thanks Sarah for introducing us to the concept of the "inverse data law" - an important extension of the "inverse care law". So many of the discussions about information and services in low income countries fail to properly account for the ways in which the most vulnerable are doubly disadvantaged by higher risk of disease combined with higher risk of lack of services and information.

Dave Woods, South Africa: Interpreting the publication of Group B Streptococcal-associated perinatal deaths is confusing as colonisation of the infant is not the same as infection. Of mothers who are colonised with GBS it is estimated that only 1% of the infants will become clinically infected while 10% will become infected if chorioamnionitis is present. If the mother has a good antibody response the fetus and newborn infant will be largely protected. However some women do not mount a response limiting the benefit that could be offered by a vaccine. The vaginal colonisation rate in South Africa is very high while the rate of positive blood cultures in the infants is much lower. Hence the association may not reflect cause and effect. This makes the use of prophylactic penicillin problematic. GBS colonisation of the mother may be a marker of many other health and sociological risk factors.

[Neonatal encephalopathy](#)

Matthew Ellis, UK: I have spent part of my career trying to answer the question 'How many more (newborns) suffer major morbidity?'

I recall a WHO position statement when I set out on this journey which suggested it was a number equal to those that died. This is definitively not the case!

In the course of a PhD studying the prevalence of stillbirth, neonatal encephalopathy and its outcome I learnt that in a low intervention setting (a large South Asian maternity hospital) far more infants died due to perinatal adversity than survived severe or even moderate neonatal encephalopathy.

Matthew Ellis, UK: When all such studies were systematically reviewed and modelled more recently see *Pediatric Research* DOI:10.1038/pr.2013.206 the 'global' conclusions were as follows... Neonatal encephalopathy (NE) may be due to various causes. Given 50 million home births, almost all without skilled care and the limitations around recognition and prompt intervention for fetal compromise, even when it occurs in a LMIC health facility, the major contributing factor is intrapartum hypoxic injury.

The first estimates of NE related to intrapartum events and subsequent outcomes are as follows....

- Our modeled NE incidence suggests 1.15 million babies were affected in 2010, down from 1.60 million in 1990 (0.9% annual reduction).
- Of these babies with NE, 865,000 survived of which 233,000 (UR 163342,000) had moderate-severe impairment and 181,000 (UR 82319,000) had mild cognitive or motor impairment.
- The severity of NE among incident cases is similar across high- vs. low-income settings; but the case fatality rate is much higher for severe NE in high mortality (92%) compared to low mortality (77%) settings.
- GBD2010 estimated that in the year 2010 there were 6.9 million years lived with disability (YLDs) associated with intrapartum-related NE impairment (accounting for 12% of DALYs). DALYs attributed to intrapartum-related NE accounted for 2.4% of the total GBD. Using consistent methods for 1990 and 2010, DALYs attributed to intrapartum-related NE dropped from 60.6 M in 1990 to 50.2 M in 2010, a 17% drop in the number of DALYs and a 21% drop in the rate of DALYs taking into account a higher number of births in 2010.

Matthew Ellis, UK: In comparison national estimates of causes of neonatal deaths are now undertaken routinely and suggest three-quarters of a million intrapartum related neonatal deaths worldwide. Intrapartum stillbirths have not been systematically counted in global metrics, but recent estimates suggest 1.2 million deaths.

Matthew Ellis, UK: In settings without widespread availability of maternal and newborn care, the NE-related neonatal Case Fatality Ratio is high, and the numbers of disabled survivors are fewer than previously believed when estimates were based on data from high-income countries. The low impairment rates in contexts without neonatal intensive care are promising for the scale-up of basic neonatal resuscitation programs.

Matthew Ellis, UK: However rates of impairment are highest in middle-income countries where neonatal intensive care was more recently introduced, but quality may be poor. Applying the 'first do no harm' rule of medicine it is incumbent on us all to ensure when we intervene in the neonatal period we do so with the whole package of intensive care rather than simply part of the technology and expertise required to achieve a good outcome.

Dave Woods, South Africa: "While it is well known that the decreased uterine blood flow during prolonged or frequent contractions is usually the cause of the fetal hypoxia, maternal

management often consists of giving the mother supplemental oxygen rather than stopping the contractions. The latter provides an opportunity to arrange transport or plan further intervention. To address fetal monitoring in a primary care setting and apply fetal resuscitation (turn the mother on her side and stop contractions with oral nifedipine) we have written a small booklet (Fetal Heart Rate Handbook) that others may find useful. It can be read off our website (www.bettercare.co.za)"

Thermal support

Lily Kak, USA: Thermal support for small and sick newborns has commonly been addressed with mechanical means of warming. Radiant warmers are available in many facilities, but in most countries, babies experience both cold stress and overheating because of inadequate temperature control. Non-functioning or absent temperature probes to regulate heater output were the most common reason. Two or more babies were also observed on a single radiant warmer or in a single incubator. Skin-to-skin care offers a preferable option for thermal support, even for babies receiving special care in an inpatient setting.

Breastfeeding

Lily Kak, USA: In all special newborn care units, maternal breast milk is the preferred source of nutrition. But only in exceptional units are mothers directly involved in feeding their infants if they are unable to suckle. Although mothers are encouraged to supply milk for their hospitalized infants, there is little early support for lactation (use of IV fluids may be prolonged), maternal presence in the unit is highly variable, and seldom is there an individualized feeding plan and daily growth monitoring with adjustment of intake as needed. Access to donor breast milk is very limited, so providers are forced to develop their own solutions when mother's milk is insufficient or not available.

Hygiene and infection control

Lily Kak, USA: In most newborn special care units there is an area for handwashing with soap and water - although not all hospitals and health centers caring for small and sick newborns have a source of running water. In many units, more attention is devoted to wearing shoe covers and cover gowns than to enforcing handwashing for health workers, mothers, and other family members. Crowding, with multiple babies sharing cots and radiant warmers also promotes the spread of infection. Some facilities are making their own waterless hand cleaner and positioning it at each bedside in the newborn care unit. Further work to identify barriers to handwashing among health care providers, mothers, and other family members can lead to customized strategies to improve hand hygiene. WHO's multimodal strategy to improve the patient safety climate can be a foundation for improving handwashing for infection prevention in newborn care areas. New guidelines are available for disinfection (reprocessing) of resuscitation equipment. Crowding requires more system-level analysis of underlying factors, such as limitations in workforce and available equipment or beds for Kangaroo Mother Care.

Family-centred care

Lily Kak, USA: Many NICUs and SNCUs do not have an open-door policy except when the mother is needed for breastfeeding her stable baby. But some countries - such as Canada and India - are changing the paradigm of neonatal intensive care and integrating parents into the care team largely due to the evidence and advocacy of dynamic physicians from these countries. Does every country need a champion to advocate for such family-centered care? Does every country need to generate evidence on the approach? Are countries ready for such

a paradigm-shift or is this approach more appropriate in certain contexts and not in others? Any comments from the experts?

ME: Hi Lily, I think countries are ready for a paradigm shift but I am not sure the partner and programme and research communities are! What we need for such a paradigm shift is long term engagement with national institutions (spanning government, education, health care training centres, and professional associations) to build and sustain locally owned initiatives. There is so little coordination across groups each with its own targets and timelines that really changing cultures is going to take much longer than it might (and even if all was perfect it would take time!).

Sarah Moxon, UK: In Northern European countries (Sweden, for example) neonatal units have been fully reconstructed to home families at the centre of the unit, and nurses and doctors to work around them. Highly complex procedures are performed with very small and sick babies in skin-to-skin position. The entire workforce and system is set up to work around the family's needs. This extreme of family centered care no doubt relies on a health system that is well-equipped and resourced. I am also convinced that investment in training, team work and support infrastructure have been fundamental to the great success of this approach (although would love to hear from colleagues on this). As a nurse myself, I know that it is an entirely different skill to teach a parent of a sick child to do something than it is to do it yourself, as it involves confidence and trust. It takes time to build this into health system function.

Sarah Moxon, UK: However, this does not mean that family centred care has to be prohibitively costly, nor that resources are the only limiting factor. In fact, as with examples of successful kangaroo mother care programmes, costing evidence suggests that following initial 'start up' costs, there are long term cost saving benefits to the family centred approach. However, we should not assume that this paradigm shift to family centred care is easily achieved without investment and attention to the health system and culture.

Sarah Moxon, UK: In most settings there are forms of resistance to family-centered care. It was not long ago in the UK that mothers on the neonatal unit were perceived as jeopardising ward cleanliness and as a potential nuisance to the order and functioning of the ward. Mothers were frequently not allowed into neonatal units. Fortunately, this has now changed in the UK, but remains the case in many settings. In some of my work with colleagues in Asian countries that are working on introducing family-centered care, we have discussed newer fears of litigation cases from parents coming into neonatal wards and suing for perceived malpractice. Nurses have expressed concerns that they would be policed by parents and criticized for the care that they are providing. In other settings, perhaps where nurses may already feel disenfranchised, parents can seem a 'threat' to the nursing role. Many hospital managers simply state " we are too crowded already, where on earth will we fit everyone?"

Sarah Moxon, UK: I am convinced that there are creative and innovative ways that different settings have overcome some of these challenges and would love to hear more examples from CHIFA colleagues.

Sarah Moxon, UK: Family centred care is part of a more humanised, respectful approach to neonatal care with ample evidence that it has positive benefits for all involved. Champions are critical, but an entire health systems approach is required to change the culture of care-giving.

Ruth Davidge, South Africa: In my province we have a policy guiding hospitals on the provision of lodger facilities for mothers (and where possible fathers) of babies and children in hospital. Hospitals are required to provide accommodation and meals at least for all breast feeding mothers and up to half of their number of paediatric beds.

Ruth Davidge, South Africa: Fathers are permitted 24hr access to their children (although some hospitals still only allow them during visiting hours!) and sibling visiting is encouraged. In the neonatal units mothers are encouraged to practice skin to skin care as often as possible (at least once per day) until baby is ready for 24 hr KMC [*] and assist with all feeds, bathing of baby, cleaning the incubator daily and administering oral medication. We are also considering their role particularly in KMC of observing and recording observations for their baby.

Ruth Davidge, South Africa: However there is still resistance and one specialist objected to their presence during the morning as they would be in the way during the round. Involvement with decision making is limited and access to medical records and participation on the round is still a way off.

Sarah Moxon, UK: Lodging facilities seem an essential part of providing family centered-care. In some countries I have worked, programmes that provide meals for mothers are critical. This is especially the case for kangaroo mother care where mothers often need to be away from home (and family) for significant periods of time. I have seen some of these programmes supported by local charities as the hospital could not fund this fully (e.g. in Malawi). Regardless of the setting, amenities for mothers and families are really essential. In London, I have seen lots of creative ways to allow parents to stay near the hospital - parent "hotels" (which are not unlike student accommodation - really quite basic, but comfortable) near the hospital with voucher systems for local food outlets (for example). At one hospital, to get around the crowding issue, we had the transitional care ward designed with beds that folded up into the walls and were pulled down at night so that the space issue was solved during the day. I also like that you mentioned the involvement of wider members of the family - even siblings, I've found this to be really helpful too. It is interesting that often the greatest resistance is to parents presence on ward rounds. I have seen this before too. I'd be interested to hear from colleagues on this.

Alison Taylor, UK: Family centred care has been extensively studied within both children's and neonatal nursing and the ideas that Sarah describes are well established in many UK hospitals. There can also be an assumption that FCC is 'naturally' practised in low income settings as seen by the presence of many (predominantly) mothers staying on children's wards and neonatal units - but this can often be more reflective of poor staffing. True family centred care should be about working with families, not despite them, to meet their child's needs and not simply accommodate parental presence and wishes. I am shocked that there continues to be a persisting attitude in some areas that parents are seen as a 'nuisance' e.g. on ward rounds. At the other end of the spectrum, expert parents who are caring for a child with complex and ongoing needs can end up becoming an unpaid member of the nursing team when it is assumed without discussion that they will lead (and want to do so) every aspect of care for their child. The focus and associated language within family centred care needs to change from that of permission, involvement and inclusion to that of negotiation, partnership and empowerment of children (where appropriate) and their families. This definitely extends to siblings as Sarah says, who (despite this being much studied) are still sometimes

marginalised. That said, critics of the family centred care model have pointed out that despite the best of intentions, the rights, interests and voice of the child can sometimes be overlooked in favour of those of the family. It can be very difficult to get the balance right.

Sue Prullage, Rwanda: In my experience and I wonder if others in LMIC countries have the same experience the families do not want their babies to go to the neonatal units. Is it the cost? Is it the disruption of the family dynamics? Or is it a feeling of hopelessness that the baby will die anyway even after spending time at the neonatal unit.

Samantha Sadoo, UK: I think it is a combination of the above, alongside the need for the mother to be at home to care for other children and look after the household, so that the father can continue going to work. Also, health centres often do not have adequate facilities for parents to be able to stay. Even where there is accommodation that is free, there are additional expenses such as food (more expensive than cooking at home) which they cannot afford. There may be also some stigma attached to their baby being on the neonatal unit and therefore labelled as 'sick', and concern related to the side effects/ incorrect perceptions of medical interventions such as NG tubes and oxygen? Also in my personal experience, parents often are not involved in the care of the baby on the unit, and communication with the medical team is lacking; perhaps this also contributes to a negative experience, discouraging them from wanting their babies to be admitted?

Sarah Zadik, UK: I am a retired UK GP/family doctor. Before I became a GP I worked in neonatal medicine in Ghana. As a GP I was aware of the effects of post-natal depression on mother-child bonding and both physical and psychosocial development of the child. Mothers of pre-term babies are at increased risk of post-natal depression. Involving these mothers, and fathers, in the care of the premature baby, giving them encouragement and family support may alleviate the postnatal depression, which helps the baby to thrive. This does not need any expensive equipment and in the long run is just as important as the technical care in the neonatal unit.

Follow-up care

Sue Prullage, Rwanda: The Rwandan Neonatal Guidelines recommend a 2 week post discharge follow-up for weight and then they are to be followed at the health centers. An organized follow-up program is important. We have it at the hospital where I work in Rwanda, but have difficulty in getting the families to return. Most will come for 1 follow-up, but very few will come for 2 or 3 follow-up visits. The only time they will come is when they realize their baby is not developing as they should and then we have no real services to help them. We refer to physical therapy if they can't sit or walk. But the children that do not meet the social and language developmental milestones we have nothing to offer them. This just demonstrates that neonatal care is multi-faceted and all of this needs to be addressed as we talk about scaling up care for premature infants.

Christabel Enweronu-Laryea, Ghana: Thank you so much for sharing this article from Rwanda. It calls for deep reflection. The quality of life of survivors is dependent on the quality of the whole continuum of care. For low-resource settings prevention of severe disability is our best option as there are limited resources for children with disability. Effective post hospital discharge follow up remains a challenge for us in sub-Saharan Africa. Inadequate location address system makes tracing parents who do not return for follow up difficult. Human resource limitations especially in district hospitals limits local post-discharge care and transportation costs to larger hospitals is a burden for families etc...

It would be helpful to know what other developing countries are doing to improve the quality of follow-up care for preterms and other babies discharged from their neonatal units.

Social determinants of health

Nick Spencer, UK: High quality neonatal care cannot overcome the basic social and economic drivers of high rates of preterm births, SGA, and neonatal mortality or the problems of development and thriving of infants born preterm as shown by Sarah Moxon and Melissa Gladstone. Maternal malnutrition and low education, both closely associated with chronic poverty, increase the risk of preterm birth and SGA. Poverty also plays a key role in increasing the risk of morbidity, poor development and growth among surviving preterm infants.

4. In what ways are health workers empowered/disempowered to provide adequate quality of care for newborns? (For example in relation to: skills, equipment, information/ data, systems support, medicines, incentives/ salaries, communication facilities)

Lily Kak, USA: First, Do No Harm: the First Step in Improving the Quality of Small and Sick Newborn Care: As institutional delivery increases in most countries, a growing number of newborns have access to facility-based care. However, this has not necessarily translated into significant reductions in maternal or neonatal mortality because of gaps in quality of care provided in the facilities. During a series of visits to multiple countries by a USAID team to learn about sick newborn care programs, several cross-cutting themes related to sick newborn care emerged. Below are our observations on four important areas of clinical service delivery that are relevant to most, if not all newborns: oxygen and respiratory care, thermal support, infection management/prevention, and feeding.

Lily Kak, USA: USAID and Every Premie SCALE have produced a series of Do No Harm technical briefs covering the above four major areas of clinical service delivery for small and sick newborns. Each of these gives examples of ways that unintended harm can result during special newborn care and provides updates on current recommendations and clinical guidelines. Each brief also includes potential action steps to improve care and health outcomes - at the level of policy makers, program planners/implementers, facility managers/administrators, and health care providers. We encourage countries to use these briefs to advocate and implement high quality care for small and sick newborns.

<http://www.everypreemie.org/donoharmbriefs/>

4.1 Skills/Training

Sue Prullage, Rwanda: In many countries the education for undergraduate and postgraduate trainees is minimal and in an infancy phase. What I have seen is that a group of students with minimal experience go through a post graduate program and instead of allowing them to work in a neonatal unit many are recruited to teach the next cohort. This is going to keep the level of attainment at knowledge level only and not advance to advanced applied theory or even as an expert in neonatology. I agree that the quality of training is needed and this may

mean a commitment by the university to hire an expert from another country to spend time in their country teaching and helping students move from knowledge to applied knowledge.

Sue Prullage, Rwanda: Before we can move to accreditation and certification we need a commitment from the government that declares there is a neonatal nurse or doctor and develop the competencies needed to be call this. This takes a commitment from the government and nursing councils to really think about and contact other countries as to what is a competent neonatal nurse.

Nkuranga John Baptist, Canada: I wish to re-emphasize the need for capacity building, address knowledge gaps and skills transfer to health care workers who are taking care of those babies. To my knowledge we don't know what is considered as variability gestation age in the lowest resource countries. In many places in Sub-Saharan Africa babies born at 32 weeks gestation are considered non-variable [?non-viable - NPW, moderator] and counted among still birth, we know its not entirely lack of resources but knowledge gaps across the spectrum of health care givers (Obstetricians, Paediatricians, general physicians, midwives, nurses, but also health facilities administrators). We can make significant change if only all efforts involve all those involved in perinatal-neonatal care.

Sue Prullage, Rwanda: I agree we need trained doctors and nurses in the neonatal unit. I would advocate for trained neonatal nurses. I am a pediatric and neonatal nurse practitioner and I can say the training was very different. If we want neonatal nurses their training would be specific to gestational differences and the first 2 years of life. If we try to roll neonatology into pediatric training then have to include up to 18 years of life. This will take away from neonatal training time.

Sue Prullage, Rwanda: It would be beneficial if the WHO would say that nurses and midwives that work in neo units should be trained as neo nurses. Unfortunately their stand for LMIC is that a nurse should be trained as a generalist so they can be utilized all over the hospital. I understand this is a huge commitment and will take time to accomplish but it is just in layer that needs to be addressed to attack neonatal mortality.

Deborah van Dyke, USA: Global Health Media Project developed the Small Baby Series to bring to life many life-saving practices such as how to keep premature babies warm with skin-to-skin care, and how to feed them with a cup or feeding tube before they're strong enough to breastfeed. The series consists of 27 short teaching videos. Five are designed specifically for mothers to demystify the needs of premature infants and help them care for their babies both in the hospital and at home. Since their release earlier this year, 10,000 copies of the small baby videos have been downloaded. The content was developed in partnership with the American Academy of Pediatrics (AAP) to complement the Essential Care for Small Babies (ECSB) training program based on the latest WHO guidelines. The videos are available in English, French and Spanish, with other languages now in the pipeline. Please contact us if you would like to narrate the videos in your local language. The videos can be watched on our website where they are also available for free download: <https://globalhealthmedia.org/videos/smallbaby/>. The full package of ECSB educational materials can be obtained from AAP: <https://internationalresources.aap.org/> or from Laerdal Global Health: <http://www.laerdalglobalhealth.com/doc/2574/Essential-Care-for-Small-Babies>

Neil PW: See full newsletter here: <http://mailchi.mp/gntmedia/ny4olrlwj7-1825025?e=524d12f15b>

We use The Safe Delivery App [<http://www.maternity.dk/safe-delivery-app/>] in Liberia, which provides skilled birth attendants direct and instant access to evidence-based and up-to-date clinical guidelines on basic emergency obstetric and neonatal care. The app leverages the growing ubiquity of mobile phones to provide life-saving information and guidance through easy-to-understand animated instruction videos, action cards and drug lists. It can also serve as a vital training tool and equips birth attendants - even in the most remote areas - with a powerful on-the-job reference.

Sarah Moxon, UK: The nursing workforce is a critical issue for those of us supporting the global Every Newborn Action Plan. Led by UNICEF, we published a series of papers in 2015 on the health system bottlenecks to scaling up newborn care using data from 12 countries collected through national stakeholder workshops <https://bmcpregnancychildbirth.biomedcentral.com/articles/supplements/volume-15-supplement-2>

Sarah Moxon, UK: Even in high income settings, where we have good data on staff ratios and recommended nurse patient ratios based on level of neonatal care, we are more than aware of the problem of reducing the nurse to patient ratio in neonatal care. A recent study published in the British Medical Journal <http://fn.bmj.com/content/fetalneonatal/101/3/F195.full.pdf> by Watson, Modi et al showed that there is an increase in the unit mortality rate when a decreased proportion of intensive care days was provided with one-to-one nursing. This study provides evidence to support the claim that tertiary-level neonatal units with higher levels of one-to-one nursing provision have reduced mortality rates. Previous studies have also showed that a nurse cannot care for more than the recommended ratio of infants without inevitably delaying their treatment http://adc.bmj.com/content/archdischild/96/Suppl_1/A36.1.full.pdf Other studies have shown that additional patients per nurse is associated with a decrease in daily weight gain.

Sue Prullage, Rwanda: I agree staffing is a huge issue in neonatal units in LMIC countries. Sometimes the nurses work 3-4 nurses to 40 patients. Terrible staffing. If we do one-to-one care I advocate that if the nurse is not trained as a neonatal nurse just doing one on one is not going to help. These issues are multifocal and I am happy there are many people trying to help with the issues.

Ruth Davidge, South Africa: In our country we are being asked to justify the need for neonatal training as the belief is that a midwife or paediatric nurse has sufficient training to manage a baby. Currently the paediatric nurse training contains no neonatal content. The midwifery training includes a limited neonatal component which focuses on the well baby, resuscitation, identification of risk factors and problems and immediate management. This is inadequate for long term management of sick and small babies.

Dave Wood, South Africa: Where it is not affordable nor practical to send experienced mentors to assist with training in under resourced countries, much can still be achieved by enabling the local staff to manage their own continuing education provided appropriate learning material is made available. In South Africa we have successfully provided this opportunity to over 100 000 midwives and doctors in the past 25 years. The material can be bought or read on-line from www.bettercare.co.za

Yvonne Mrs Chief Igweh, UK: LittleBigSouls continues to work in support of the life saving efforts of clinicians and all involved in Neonatal Health and Care.. in South Africa.

Lily Kak, USA: I don't think countries will be prepared to introduce a new cadre of neonatal nurses because of the widespread shortage of health providers in general, and of midwives and nurses in particular... It is time now to conduct a systematic assessment to understand the landscape that will inform countries about their human resource needs and how to strengthen it. With this in view, WHO is conducting an online multi-country Midwifery Educator Survey among all those who teach midwifery skills to care for women and newborns, including midwives, doctors, and nurses. The survey seeks to understand who cares for sick and small newborn babies and where they are cared for, how students are taught about caring for sick and small newborns, including what clinical skills are needed and what they should do to ensure the experience of the parents during these stressful times is positive. I hope that someone from WHO elaborates on this important activity and shares the status of survey.

Lily Kak, USA: USAID and UNICEF and multiple partners are supporting a separate multi-country situational analysis to determine facility readiness and quality of care for small and sick newborns and young infants. This activity will also provide useful information about neonatal nursing capacity and needs in 2018. We hope that all this information will galvanize countries to do more to strengthen the capacity of those who care for newborns. No longer should issues of training, deployment, task-shifting, etc, among the carers of sick newborns be ad hoc.

Nkuranga John Baptist, Canada: There are efforts being made to train as many health care givers as possible but from my experience on job training may not necessary translate into skills retention, even for those who retains the skills may not necessarily put the skills into practice and overall such training may not create a practice change which saves life or improve quality. Is there evidence on the best way to inform practice change?

Joseph Ana, Nigeria: We recently completed a six-month pilot of implementing PACK (Practical Approach to Care Kit) Nigeria guide in three states, one from a geo-political zone in Nigeria. The pilot involved 354 frontline staff in 51 PHCs (Junior Community Health Extension Workers; Community Health Extension Workers; Community Health Officers/Nurses/Midwives; Medical Officers). To effect the positive change in practice including use of the guide during consultations (90% of users reported using the guide in all consultations), reduce polypharmacy, reduce inappropriate testing, increase confidence in diagnosis and treatment overall, the PACK implementation plan has 4-Pillars ensuring that the guide is just not circulated to staff and they are not supported, rather following handing out the guide to each staff, they are introduced to three other Pillars/interventions: educational outreach model training, health facility strengthening (infrastructure, equipment, test kits and medicines), and Monitoring and Evaluation. All the four pillars are implemented in tandem. The educational outreach model meant onsite inservice training of the staff on how to use the guide and maximise the effects of its evidence based content. The training took place in each facility every two weeks, the interval giving the staff the opportunity to implement what they learnt before the next case training.

Joseph Ana, Nigeria: All the participants in our pilot (100%) reported that this model of training in their facility (onsite inservice training) involving their immediate work colleagues is better than existing off-site training (which took them out of their facilities to a central venue, often very far away) in several respects including ensuring that all staff have the

opportunity to attend the training and update their knowledge and skills (unlike the off-site training that usually means that only the managers / senior staff attend update training and they hardly share the knowledge when they return to the facility).

David Cundall, UK/Nigeria: Nigeria Health Care Project is a small UK faith-based charity that has been supporting primary health care in rural areas of Nigeria for 25 years. For the past 6 years we have developed training in newborn resuscitation and care. We train nurses, midwives and community health extension workers in Abia, Benue and (once) Ekiti States...

David Cundall, UK/Nigeria: We adapted Maternal and Child Health Advocacy International/ David Southall's NLS-based resuscitation training developed in the Gambia (similar to HBB but without the non-evidence-based emphasis on suction) and make good use of Medical Aid Films neonatal resuscitation video to reinforce learning. Global Health Media's short videos are brilliant (thanks Deb!) as an adjunct to training on other aspects of newborn care at the health centre and small hospital level. We really like our 3-4 day course but recent evaluation showed that retention of resuscitation skills and knowledge is not good - not surprising as the same is true in the UK unless staff are resuscitating babies regularly. Therefore we have equipped Nigerian training facilitators with laptops with pre-loaded teaching materials so they can run small group sessions at health centres and use the opportunity for participants to practice their resuscitation skills on the same occasions.

David Cundall, UK/Nigeria: Dave Woods et al's PEP materials from South Africa are great for people at registered nurse level but would need substantial modification for this Nigerian context. My understanding is that WHO's Essential Newborn Care and Kangaroo Mother Care courses both require a clinical facility with substantial numbers of deliveries/babies. I have not seen evidence of these (or HBB) being 'rolled out' beyond the teaching hospitals in Nigeria (but we only have links with a few places) Our intention is to tighten up on the way NHCP training is delivered so it consistently evaluates well as being appropriate, reproducible and effective with staff working in rural health centres and small hospitals.

Health information systems

Mike English, Kenya: I wanted to pick up on an important and much neglected issue, that of having simple but reliable information systems. In many low-income countries sick newborns do not have their own medical record or patient number if they are sick from the time of birth they are admitted under the mother's patient number. This makes gathering statistics on sick newborns extremely difficult. Also systems in a number of places that are part of the DHIS2 system do not have modules for capturing data from newborn units as they have not traditionally been recognised as specific inpatient units. This typically means there are no data on admissions to or deaths in NBUs and thus no way to understand how, for example, mortality by weight group (eg. those 1.5 to 2.0 kg) varies. As people become more interested in newborn care they are suddenly trying to add lots of quality of care indicators to proposed neonatal registers dramatically increasing the data collection workload usually for nurses who are already overstretched. Yet there is typically no investment in the system and people that will be required to analyse and use such data. Efforts to improve newborn data must be in health information systems and not just in creating ever larger registers.

Medicines

Samantha Sadoo, UK: Many units experience a consistent lack of essential medications, or poor quality supplies. Parents are often requested to buy their baby's medication at the pharmacy to bring back to the ward. Improving information technology to manage logistics could improve needs-based forecasting of supplies, although this is often non-existent in many settings, and doesn't solve the issue of inadequate funding. Other issues include a lack of a formulary or guidelines regarding the use and prescription of such medications, as well as an inadequate supply of accessory equipment such as cannulas and syringes to administer them.

Profiles

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CHIFA profile: Soofia Khaton is Professor of Paediatrics at Shaheed Suhrawardi Medical College & Hospital, Sher-e Bangla Nagar, Dhaka, Bangladesh. Presently she is working as secretary general of Bangladesh Breastfeeding Foundation, Vice President of Bangladesh Neonatal Forum, Executive member of Bangladesh Paediatric Association, Bangladesh Perinatal Society, Bangladesh Society of Neurology & Disability. Professional interests include: Solving neonatal problems & improving breast feeding situation in Bangladesh. soofia_icmh AT yahoo.com

CITATIONS

1. Save the Children Champions Toolkit (2nd edition)
https://www.healthynewbornnetwork.org/hnn-content/uploads/SNL-Champions_Toolkit_final-wforms_web2.pdf
Toolkit Forms (editable)
https://www.healthynewbornnetwork.org/hnn-content/uploads/SNL-Champions-Toolkit_final2-wformsLinks.pdf
Save the Children guidance on impact stories
<https://www.healthynewbornnetwork.org/hnn-content/uploads/Impact-Stories-Guidance.pdf>

2. CITATION: Neurodevelopmental outcomes for high-risk neonates in a low-resource setting

Kate M Milner, Trevor Duke, Andrew C Steer, Joseph H Kado, Lanieta Koyamaibole, Rakei Kaarira, Kelera Namudu, Susan Woolfenden, Anne E Miller, Kathryn E Oâ€™Heir, Eleanor F G Neall, Gehan Roberts

<http://dx.doi.org/10.1136/archdischild-2017-312770> [restricted access]

Abstract

Worldwide, most neonates who survive prematurity and serious illness reside in low-resource settings where developmental outcome data and follow-up care are limited. This study aimed to assess in Fiji, a low-resource Pacific setting, prevalence and risk factors for moderate to severe neurodevelopmental impairment (NDI) in early childhood among high-risk neonates compared with controls. Retrospective cohort study comparing long-term outcomes for high-risk neonatal intensive care unit patients (n=149) compared with matched term, normal birth weight neonates (n=147) discharged from Colonial War Memorial Hospital between November 2008 and April 2010. NDI was defined as one or more of cerebral palsy, moderate to severe hearing or visual impairment, or global developmental delay using Bayley Scales of Infant and Toddler Development Third Edition (ie, score <70 in =1 of cognitive, language or motor domains). At median (IQR) age 36.1 (28.3, 38.0) months, prevalence of moderate to severe NDI % (95% CI, n) in high-risk and control groups was 12 (5 to 17, n=13) and 5 (2 to 12, n=5), respectively, an increased risk ratio (95% CI) of 2.7 (0.8 to 8.9). Median gestational age (weeks (median, IQR)) in the high-risk group was 37.5 (34-40) weeks. Among high-risk neonates, gestational age, birth weight, asphyxia, meningitis and/or respiratory distress were significantly associated with risk of NDI. Prevalence of NDI was high among this predominantly term high-risk neonatal cohort compared with controls. Results, including identified risk factors, inform efforts to strengthen quality of care and models of follow-up for high-risk neonates in this low-resource setting.

3. Below are extracts from a new post on the Maternal Health Task Force

<https://www.mhtf.org/2017/10/19/facilitators-and-barriers-to-engaging-communities-in-maternal-and-newborn-health-programs>

Several community-based interventions have achieved impressive results, driving increases in the utilization of maternal and newborn health services, improvements in the quality of care and even reductions in maternal mortality. Involving community members throughout the process of designing, implementing and evaluating maternal and newborn health interventions is critical to the success and sustainability of programs...

Read the full, open access paper, Factors affecting effective community participation in maternal and newborn health programme planning, implementation and quality of care interventions.'

<https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-017-1443-0>

4. CITATION: Andi L Shane, Pablo J Sánchez, Barbara J Stoll. Neonatal sepsis. [Seminar] The Lancet. Volume 390, No. 10104, p17701780, 14 October 2017

[http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(17\)31002-4/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)31002-4/fulltext) [restricted access]

SUMMARY: Neonatal sepsis is the cause of substantial morbidity and mortality. Precise estimates of neonatal sepsis burden vary by setting. Differing estimates of disease burden have been reported from high-income countries compared with reports from low-income and middle-income countries. The clinical manifestations range from subclinical infection to severe manifestations of focal or systemic disease. The source of the pathogen might be

attributed to an in-utero infection, acquisition from maternal flora, or postnatal acquisition from the hospital or community. The timing of exposure, inoculum size, immune status of the infant, and virulence of the causative agent influence the clinical expression of neonatal sepsis. Immunological immaturity of the neonate might result in an impaired response to infectious agents. This is especially evident in premature infants whose prolonged stays in hospital and need for invasive procedures place them at increased risk for hospital-acquired infections. Clinically, there is often little difference between sepsis that is caused by an identified pathogen and sepsis that is caused by an unknown pathogen. Culture-independent diagnostics, the use of sepsis prediction scores, judicious antimicrobial use, and the development of preventive measures including maternal vaccines are ongoing efforts designed to reduce the burden of neonatal sepsis.

5. Neil PW: Where do newborns die? The Lancet has just published data from India that help to answer this question, at least from the perspective of urban versus rural populations. 'This study is, to our knowledge, the first to directly quantify cause-specific time trends for child deaths in India from 2000 to 2015. The variation in mortality rates by sex, urban and rural areas, and poorer and richer states also provides a crude assessment of the effect of the National Health Mission programmes. Our analyses show substantial declines in mortality rates at ages 159 months from pneumonia, diarrhoea, mmeasles, and acute bacterial sepsis or severe infection and among neonates in rates from infection, birth asphyxia or trauma, and tetanus. However, mortality rates for prematurity or low birthweight *rose* [my emphasis] (mostly comprising term births with low birthweight) modestly in rural areas and poorer states.'

Indeed, the actual data could arguably be better portrayed as a *substantial* rather than a modest rise in mortality: 'Prematurity or low birthweight mortality rates rose in rural areas (from 13.2 per 1000 livebirths in 2000 to 17.0 per 1000 livebirths in 2015) and in poorer states (from 11.3 per 1000 livebirths in 2000 to 17.8 per 1000 livebirths in 2015), but fell in urban areas and in richer states.'

A linked Comment notes: 'The large and sustained difference in mortality rates for those younger than 5 years and newborns between rural and urban areas of India should be a point of concern for other low-income and middle-income countries, especially those with large rural populations.'

PAPER: Changes in cause-specific neonatal and 159-month child mortality in India from 2000 to 2015: a nationally representative survey

Million Death Study Collaborators

Published: 19 September 2017

DOI: [http://dx.doi.org/10.1016/S0140-6736\(17\)32162-1](http://dx.doi.org/10.1016/S0140-6736(17)32162-1)

The Lancet, Volume 390, No. 10106, p1972-1980, 28 October 2017

[http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(17\)32162-1/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)32162-1/fulltext)

COMMENT: Child mortality: the challenge for India and the world

Shams El Arifeen et al.

Published: 19 September 2017

DOI: [http://dx.doi.org/10.1016/S0140-6736\(17\)32469-8](http://dx.doi.org/10.1016/S0140-6736(17)32469-8)

The Lancet, Volume 390, No. 10106, p1932-1933, 28 October 2017

6. This new paper in *The Lancet Global Health* indicates a high prevalence of cerebral palsy in Uganda. It's not clear what proportion of cases might have been prevented with better intrapartum and newborn care. However, the authors note (paradoxically) that improvements in newborn care in LMICs, especially for preterm infants, 'will probably increase the number of preterm children with cerebral palsy; this pattern occurred in North India during 2009'.

CITATION: Prevalence of cerebral palsy in Uganda: a population-based study
Angelina Kakooza-Mwesige, Carin Andrews, Prof Stefan Peterson, Prof Fred Wabwire Mangen, Prof Ann Christin Eliasson, Prof Hans Forssberg.

Published: 25 October 2017

Open Access

Lancet Global Health 2017

DOI: [http://dx.doi.org/10.1016/S2214-109X\(17\)30374-1](http://dx.doi.org/10.1016/S2214-109X(17)30374-1)

SUMMARY

Background: Few population-based studies of cerebral palsy have been done in low-income and middle-income countries. We aimed to examine cerebral palsy prevalence and subtypes, functional impairments, and presumed time of injury in children in Uganda.

Methods: In this population-based study, we used a nested, three-stage, cross-sectional method (Iganga-Mayuge Health and Demographic Surveillance System [HDSS]) to screen for cerebral palsy in children aged 2–17 years in a rural eastern Uganda district. A specialist team confirmed the diagnosis and determined the subtype, motor function (according to the Gross Motor Function Classification System [GMFCS]), and possible time of brain injury for each child. Triangulation and interviews with key village informants were used to identify additional cases of suspected cerebral palsy. We estimated crude and adjusted cerebral palsy prevalence. We did 2 analyses to examine differences between the group screened at stage 1 and the entire population and regression analyses to investigate associations between the number of cases and age, GMFCS level, subtype, and time of injury.

Findings: We used data from the March 1, 2015, to June 30, 2015, surveillance round of the Iganga-Mayuge HDSS. 31 756 children were screened for cerebral palsy, which was confirmed in 86 (19%) of 442 children who screened positive in the first screening stage. The crude cerebral palsy prevalence was 2.7 (95% CI 2.23–3) per 1000 children, and prevalence increased to 2.9 (2.43–6) per 1000 children after adjustment for attrition. The prevalence was lower in older (8–17 years) than in younger (<8 years) children. Triangulation added 11 children to the cohort. Spastic unilateral cerebral palsy was the most common subtype (45 [46%] of 97 children) followed by bilateral cerebral palsy (39 [40%] of 97 children). 14 (27%) of 51 children aged 2–7 years had severe cerebral palsy (GMFCS levels 4–5) compared with only five (12%) of 42 children aged 8–17 years. Few children (two [2%] of 97) diagnosed with cerebral palsy were born preterm. Post-neonatal events were the probable cause of cerebral palsy in 24 (25%) of 97 children.

Interpretation: Cerebral palsy prevalence was higher in rural Uganda than in high-income countries (HICs), where prevalence is about 1.82–3 cases per 1000 children. Children younger than 8 years were more likely to have severe cerebral palsy than older children. Fewer older children than younger children with cerebral palsy suggested a high mortality in severely affected children. The small number of preterm-born children probably resulted from low preterm survival. About five times more children with post-neonatal cerebral palsy

in Uganda than in HICs suggested that cerebral malaria and seizures were prevalent risk factors in this population.

7. Maternity Waiting Homes: A Viable Solution for Rural Women?

Posted on November 8, 2017

By: Sarah Hodin, Project Coordinator II, Women and Health Initiative, Harvard T.H. Chan School of Public Health

<https://www.mhtf.org/2017/11/08/maternity-waiting-homes-a-viable-solution-for-rural-women/>

Distance to a health facility has long been discussed as a key barrier to maternal health care utilization in rural areas, and researchers have explored innovative models for improving access. One of these models is the use of maternity waiting homes (MWHs), residential facilities located near a maternity clinic where pregnant women—often those at high risk of developing obstetric complications—can go during their third trimester and await labor and delivery. MWHs existed in rural areas of Northern Europe, Canada and the United States in the early 20th century and were introduced soon thereafter in other areas including Cuba, Nigeria and Uganda...

The use of MWHs has been linked to reductions in maternal and perinatal mortality in Ethiopia, Ivory Coast, Liberia and Zimbabwe. However, due to a lack of strong evidence in this area, researchers have not been able to conclude definitively that MWHs lead to fewer maternal deaths. Furthermore, some studies have found that MWHs did not result in a higher proportion of facility-based deliveries, indicating that the success of MWHs often depends on the local context...

The comment that 'researchers have not been able to conclude definitively that MWHs lead to fewer maternal deaths' is of interest. Is there evidence that MWHs lead to fewer newborn deaths?

8. CITATION: Mapping under-5 and neonatal mortality in Africa, 200015: a baseline analysis for the Sustainable Development Goals

Nick Golding et al

Lancet, Volume 390, No. 10108, p21712182, 11 November 2017

DOI: [http://dx.doi.org/10.1016/S0140-6736\(17\)31758-0](http://dx.doi.org/10.1016/S0140-6736(17)31758-0)

9. Sarah Moxon, UK: Less detailed information on longer term outcomes of preterm babies is available from lower-income settings, where special care facilities are increasingly being scaled up. I was therefore pleased to see this recent cross-sectional study on the health, nutrition, and development of children born preterm and low birth weight in rural Rwanda <https://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-017-0946-1> and wanted to share it with CHIFA readers.

The study looks a cross section of children discharged from a special care unit in rural Rwanda - a unit that provides thermoregulation (incubator and KMC), oxygen therapy, IV fluids, phototherapy and assisted feeding. The study carried out home visits to children aged 1-3 years and looked at a range of health and development markers signs of chronic and acute conditions, anthropometry, developmental stage (including motor skills, communication and social skills). The study findings are important (although not unexpected)

showing high rates of abnormal health status, including signs of anaemia, respiratory disease, feeding difficulties, poor nutritional status and poor development.

Follow up programmes, early intervention (which is standard practice in higher income settings) and support services for parents of preterm survivors are needed for children born preterm to support them to thrive this is standard practice in higher income settings.

In Rwanda, I know that steps are being taken to address this need. I've been lucky enough to visit some of the Partners in Health-Inshuti Mu Buzima supported facilities myself in the past few years. What really struck me about these facilities was the potential scalability of the approach to follow up and support for survivors of preterm birth. The follow-up programme was nurse and social worker led, with developmental checks for the infants and young children following well-designed pictorial checklists. Simplified tools and monitoring systems had been developed for following up of the preterm babies after discharge from the special newborn care unit.

Comment (Neil PW): I was especially interested to read the results... The statistic that jumps out (for me) is that more than two-thirds of these infants had abnormal developmental screening. Indeed, the authors note in the full text: 'The large number of children who could not be traced may lead to underestimation of mortality, malnutrition, and abnormal development in this study', suggesting the real figure could be even higher. Does anyone have figures from high-income countries as well as from other low-income countries, for us to compare outcomes across countries?

The question then is: What aspects of antenatal, intrapartum, neonatal, or post-neonatal care are primarily leading to such poor outcomes?

10. Melissa Gladstone, UK/Malawi: Our paper from Malawi

<http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001121> demonstrates the high prematurity rate in a community based setting and the poor outcomes in terms of both development and growth of these premature children who were mainly born late-preterm. Those who were born earlier did not survive.

I think we really need to concentrate on improving feeding, nutrition and developmental stimulation in these kids - possibly concentrating more specifically on them through programmes such as the Care for Child Development, but also thinking hard about how we support the mums in terms of feeding methods - I think too often they are expected to somehow manage exclusive expressed breast feeding - not easy, with little support - particularly when back at home when they have many other responsibilities and things to manage.

11. Lincetto Ornella, Switzerland: It is true, it is time to focus not only on the survival of preterm babies but also on the quality of survival for them and their families... Please find attached an article with data from developed countries. [The full text can be accessed free of charge (after free registration) on the Lancet website here:

[http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(08\)60136-1/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(08)60136-1/fulltext)

CITATION: Lancet. 2008 Jan 19;371(9608):261-9. doi: 10.1016/S0140-6736(08)60136-1.

An overview of mortality and sequelae of preterm birth from infancy to adulthood.

Prof Saroj Saigal, FRCP[C] Correspondence information about the author Prof Saroj Saigal Email the author Prof Saroj Saigal, Prof Lex W Doyle, FRACP

ABSTRACT: Survival rates have greatly improved in recent years for infants of borderline

viability; however, these infants remain at risk of developing a wide array of complications, not only in the neonatal unit, but also in the long term. Morbidity is inversely related to gestational age; however, there is no gestational age, including term, that is wholly exempt. Neurodevelopmental disabilities and recurrent health problems take a toll in early childhood. Subsequently hidden disabilities such as school difficulties and behavioural problems become apparent and persist into adolescence. Reassuringly, however, most children born very preterm adjust remarkably well during their transition into adulthood. Because mortality rates have fallen, the focus for perinatal interventions is to develop strategies to reduce long-term morbidity, especially the prevention of brain injury and abnormal brain development. In addition, follow-up to middle age and beyond is warranted to identify the risks, especially for cardiovascular and metabolic disorders that are likely to be experienced by preterm survivors

12. Neil PW: This news item is from the WHO Regional Office for Africa website. Full text here:

<http://www.afro.who.int/news/whos-africa-nutrition-report-highlights-increase-malnutrition-africa>

It is notable that the 69-page full text of the report

([http://www.afro.who.int/sites/default/files/2017-](http://www.afro.who.int/sites/default/files/2017-11/Nutrition%20in%20the%20WHO%20African%20Region%202017_0.pdf)

[11/Nutrition%20in%20the%20WHO%20African%20Region%202017_0.pdf](http://www.afro.who.int/sites/default/files/2017-11/Nutrition%20in%20the%20WHO%20African%20Region%202017_0.pdf)) does not mention preterm birth/prematurity. We know, however, from the Rwanda research highlighted by Sarah Moxon that '46.5% of [such] children had feeding difficulties and 39.5% reported signs of anemia; 78.3% of children were stunted and 8.8% wasted'.

13. Below are extracts from a blog from the Maternal Health Task Force. Full text here:

<https://www.mhtf.org/2017/11/17/preterm-birth-a-critical-issue-for-the-mother-baby-dyad/>

Preterm Birth: A Critical Issue for the Mother-Baby Dyad

Posted on November 17, 2017

By: Sarah Hodin, Project Coordinator II, Women and Health Initiative, Harvard T.H. Chan School of Public Health

According to World Health Organization (WHO) estimates, prematurity is the leading underlying cause of death in children under five years, with over one million babies dying each year worldwide due to complications of preterm birth. For those who survive, the consequences of being born too soon can continue throughout the life course, impacting individuals, families and communities...

The rates of prematurity are rising around the world. Of the 15 million babies born preterm every year, 60% occur in Africa and South Asia. A baby's risk of death due to prematurity depends largely on where he or she is born: In high-income countries, 50% of babies born at less than 28 weeks survive, while half of babies born at 32 weeks die in low-income countries. Moderate or late preterm babies can often be cared for effectively with simple, low-cost, evidence-based methods requiring limited technology, such as kangaroo mother care and feeding support.

Although the causes of preterm birth are complex, risk factors include maternal smoking and substance abuse, adolescent pregnancy, infections like syphilis, Group B streptococcus and malaria, pre-eclampsia, bleeding in pregnancy and premature rupture of membranes. High quality preconception and prenatal care are key factors in preventing preterm delivery...

While administering antenatal corticosteroids has been promoted as an effective way to prepare preterm babies' immature lungs for life outside the womb in case of imminent preterm birth, the treatment is debated for its implementation challenges, including insufficient support for managing side effects...

14. UNICEF has just published a new report that provides useful data on newborns (and older children):

CITATION: Levels and Trends in Child Mortality Report 2017

by Lucia Hug, David Sharrow, Yuhan Sun et al.

United Nations Children's Fund et al., October 2017

https://www.unicef.org/publications/files/Child_Mortality_Report_2017.pdf

Some key points:

In the context of monitoring child survival, the United Nations Inter-agency Group for Child Mortality Estimation (UN IGME) updates child mortality estimates annually.

This report presents the group's latest estimates of under-five, infant and neonatal mortality up to 2016, and assesses progress at the country, regional and global levels. For the first time, the report also provides mortality estimates for children aged 5 to 14.

The largest number of newborn deaths occurred in Southern Asia (39 per cent), followed by sub-Saharan Africa (38 per cent). Five countries accounted for half of all newborn deaths: India, Pakistan, Nigeria, the Democratic Republic of the Congo and Ethiopia.

The neonatal mortality rate fell by 49 per cent from 37 (36, 38) deaths per 1,000 live births in 1990 to 19 (18, 20) in 2016.

Children face the highest risk of dying in their first month of life, at a rate of 19 deaths per 1,000 live births. By comparison, the probability of dying after the first month but before reaching age 1 is 12 and after age 1 but before turning 5 is 11.

Progress is slower in reducing neonatal mortality rates than in reducing mortality rates in children aged 159 months. While neonatal mortality declined by 49 per cent, the mortality in children aged 159 months declined by 62 per cent from 1990 to 2016.

Comment (NPW): What this report does *not* tell us is:

How many babies in LMICs are delivered at home versus primary health centre versus small hospital versus referral hospital

How many newborn deaths occur at home versus primary health centre versus small hospital versus referral hospital

How many deaths might have been prevented with better antenatal and/or neonatal care and many other of our 'unanswered questions'

Evidence from the vast literature (1,2) for several decades and local clinicians (3) have shown repeatedly that bilirubin-induced mortality resulting from severe neonatal jaundice is an important cause of mortality in Nigeria.

A. Olusanya BO, Osibanjo FB, Mabogunje CA, Slusher TM, Olowe SA. The burden and management of neonatal jaundice in Nigeria: A scoping review of the literature. Niger J Clin Pract. 2016 Jan-Feb;19(1):1-17.

<http://www.njcponline.com/article.asp?issn=1119-3077;year=2016;volume=19;issue=1;page=1;epage=17;aulast=Olusanya>

B. Olusanya BO, Ogunlesi TA, Slusher TM. Why is kernicterus still a major cause of death and disability in low-income and middle-income countries? Arch Dis Child. 2014 Dec;99(12):1117-21.

<http://adc.bmj.com/content/99/12/1117>

C. Olusanya BO, Ezeaka CV, Ajayi-Obe EK, Mukhtar-Yola M, Ofovwe GE. Paediatricians' perspectives on global health priorities for newborn care in a developing country: a national survey from Nigeria. BMC Int Health Hum Rights. 2012 Jul 2;12:9.

<http://bmcinthealthhumrights.biomedcentral.com/articles/10.1186/1472-698X-12-9>

25 unanswered questions

Dear CHIFA colleagues,

Thank you for your wonderful contributions so far. During the course of this discussion CHIFA members from Canada, Ghana, Kenya, Rwanda, South Africa, UK and USA have raised 25 questions (or groups of questions). I list these questions below. Special thanks to Sue Prullage, Rwanda, who has responded to seven already (10,11,12,18,19,20,21). The rest remain largely unanswered. Can anyone help to answer any of the following?

1. NPW: How many babies in LMICs are delivered at home versus primary health centre versus small hospital versus referral hospital? (at global, national or local level)
2. NPW: How many newborn deaths occur at each of the above levels of the health system?
3. NPW: What more do we know about newborn deaths at global and national levels? Which countries are doing better than others of comparable levels of income?
4. NPW: How many deaths might have been prevented with better antenatal care?
5. NPW: How many deaths might have been prevented with better basic newborn care?
6. NPW: How many deaths might have been prevented with better (for those who get it) comprehensive newborn care?
7. NPW: For every newborn death, there are many more babies who are born with severe disability, including hypoxic brain damage, often leading to enormous suffering for the child and family. How much of this disability could have been prevented by better basic (and/or comprehensive) care?
8. NPW: And what about the trends in newborn deaths and morbidity? We hear that newborn deaths are going down year on year, but progress is much slower than with under-5 mortality. Why?
9. Lily Kak, USA: Does every country need a champion to advocate for such family-centered care? Does every country need to generate evidence on the approach? Are countries ready for such a paradigm-shift or is this approach more appropriate in certain contexts and not in others? Any comments from the experts?
10. Christabel Enweronu-Laryea, Ghana: Faculty: What are the standards of knowledge and skills training (neonatal) for undergraduate and postgraduate trainees in our nursing and medical schools? What is the quality of the output from our institutions? How sustainable are external efforts if we do not improve the quality of training?

11. Christabel Enweronu-Laryea, Ghana: Accreditation and certification (examination) bodies: Are the standards and approach appropriate for improving neonatal outcome in that setting? Is improving quality of care for newborns a priority?
12. Christabel Enweronu-Laryea, Ghana: Hospital management teams: What is the evidence that improving quality of care for newborns is a priority? How useful are the monitoring tools?
13. Nkuranga John Baptist, Canada: Even in developed countries Quality improvement initiatives have dramatically reduced morbidity among extreme preterm neonates, the Canadian Neonatal Network (CNN) through EPIQ projects) has shown there is so much to do with evidence based quality improvement. Within the context of low-income countries, how best to initiate and integrate such initiatives considering local realities?
14. Nkuranga John Baptist, Canada: An example of WHO 10 recommendations for preterm survival, how many countries have implemented them as a standard of care?
15. Nkuranga John Baptist, Canada: You may well be aware of Antenatal corticosteroid controversies in low income countries, why didn't they work as expected in reference to high income countries?
16. NPW: 'An estimated 20,000 infants [worldwide?] had severe visual impairment or blindness with almost half as many again with mild or moderate impairment.'
17. Dayo Ajayi-Obe, UK: Are we maximizing the potential role that the neonatal ambu bag has in saving newborn lives, (newborns with primary apnoea) in low income resourced countries?. Has a Cochrane review been done on the outcomes of training traditional birth attendants in helping babies breathe? Can we continue to break down the HBB and essential newborn care training to the level of that TBA's can understand so that they can do what is necessary before transferring a sick baby who has a better chance of surviving intact?
18. Claire Keene, UK/Kenya: What constitutes a newborn unit? Should any facility performing deliveries have a newborn unit that offers standard in-patient care, or should it be restricted to hospitals only?
19. Claire Keene, UK/Kenya: Should non-NICU inpatient care be categorised as one level or further subdivided into basic and comprehensive care? Should some non-NICU newborn units be able to provide higher dependency care that alleviates the pressure on NICUs? Or should all high dependency care be provided at NICU level only?
20. Claire Keene, UK/Kenya: What care could realistically be provided in a high dependency unit (CPAP? Exchange transfusion?)? Are there pivotal or distinguishing services that define a unit as a specific level of care, for example CPAP defining a high-care unit?
21. Claire Keene, UK/Kenya: Should care be completely regionalised with basic facilities referring to central high level facilities, or should some higher level services be distributed closer to the receiving population? For example, having high dependency units at low level hospitals in rural areas. Should efforts be made to improve transport networks or should poor referral systems be compensated for by providing higher level care at more hospitals?
22. Dayo Ajayi-Obe, UK. Where are our babies being born?
23. Ruth Davidge, South Africa: I have to ask how much employing neonatal nurses would cost in comparison to the cost of litigation let alone ongoing management of neonatal morbidity and loss of life?
24. NPW: Where do newborns die?
25. Sue Prullage, Rwanda: In my experience and I wonder if others in LMIC countries have the same experience the families do not want their babies to go to the neonatal units. Is it the cost? Is it the disruption of the family dynamics? Or is it a feeling of hopelessness that the baby will die anyway even after spending time at the neonatal unit.

Testimonials

Nkuranga John Baptist, Canada: It has been indeed a great learning month understanding all initiatives that goes on around the world trying to help improve Neonatal care, thank you each one of you for contributions made and resources shared.