Newborn Health Program: Research Summary

Our Approach

Thrive Networks' (formerly East Meets West Foundation) Newborn Health Program works to improve healthcare in low-resource settings through innovation, capacity development, partnerships, and research to help vulnerable newborns survive and thrive. We employ a four-pronged approach: development and provision of cost-effective neonatal medical equipment designed for low resource settings; clinical training of medical providers; training on and support for equipment maintenance; and program monitoring and evaluation. We also conduct ad hoc medical research to assess equipment efficacy and to estimate health outcomes of our interventions. We have a public-private partnership with a social enterprise, MTTS, located in Vietnam, which designs and manufactures low-cost, neonatal medical devices for resource-limited settings.

Clinical Impact

We work to improve clinical outcomes with interventions in respiratory care, infection prevention, neonatal jaundice management, thermal regulation, and basic newborn care. Some clinical impacts include:

- A 75% reduction (from 40% to 10%) in 24-hour mortality from Respiratory Distress Syndrome was achieved after the introduction of the MTTS continuous positive airway pressure (CPAP) machine at the National Hospital of Pediatrics in Hanoi (Ringer, 2008). This success was the impetus for the further development of the Newborn Health Program.

- Preliminary results from a pre-post intervention study analyzing mortality after the adoption of CPAP, hand-sanitizer, training, and ongoing monitoring in six hospitals in Myanmar and the Philippines show solid results: two hospitals in Myanmar had a 35% reduction in mortality in outborn patients weighing more than 2500g; four hospitals (two in Myanmar and two in the Philippines) had a 22% mortality reduction in inborn patients weighing 1000-1499g and a 19% reduction in inborn patients weighing 1500-2499g (Arnolda, preliminary analysis, to be submitted).

- A pilot study in which secondary hospitals in Vietnam were equipped with MTTS LED phototherapy and intensive training in jaundice management resulted in an 83% reduction in patient transfers and 100% elimination of transfers for exchange transfusions to tertiary referral hospitals (Joe, 2012a).

- Analysis of Thrive Networks' jaundice program in four hospitals in Myanmar showed a 33% reduction and a 69% reduction in the need for exchange transfusions for severe jaundice in outborn and inborn patients, respectively (Arnolda, 2015a).

Operational Research / Monitoring and Evaluation

Our M&E and operational research methods include key informant interviews with clinicians and data collection of hours of use on equipment, hospitals statistics, and individual patient treatment data at selected sites. Regular monitoring can reveal challenges in program implementation and helps guide the design of our program interventions. Collection of individual patient data allows us to track changes in clinical outcomes. Highlights include:

- A survey of 60 doctors and nurses in Vietnam revealed that the clinicians did not understand some important standards in infection prevention. These results have been used by the Neonatal Heath Program to design interventions to improve infection prevention in Vietnam (Trevisanuto, 2013).
- A study implemented in two pediatric hospitals in Myanmar analyzed data from 590 infants to determine the major risk factors for admission of infants with severe jaundice (acute bilirubin encephalopathy). The major risk factors included being born at home and having G6PD, a common genetic deficiency (Arnolda, 2015b).
- To further explore risk factors for severe jaundice, the Newborn Health Program is undertaking two case-control studies in Myanmar to inform the development of a comprehensive, evidence-based intervention strategy to address jaundice. These studies will compare a set of infants admitted into hospital for jaundice and determine the clinical, socio-economic, and infrastructural reasons for exchange transfusions (Arnolda, in prep).

Efficacy and Quality of Appropriate Technology

We rigorously evaluate the appropriateness and efficacy of the technologies we use, and work with MTTS to iterate and refine the devices accordingly. The efficacy of this technology and successful integration into hospital systems has been documented, including:

- A study comparing the effects of MTTS CPAP vs Draeger CPAP (an industry standard) on 100 infants implemented at the National Hospital of Pediatrics in Hanoi, Vietnam, showed no significant difference between the outcomes, reflecting the efficacy of the MTTS CPAP (Khu, 2004).
- A quasi-randomized controlled trial at a single Vietnamese hospital compared three LED phototherapy devices, one industry standard single-sided device, the MTTS single-sided device, and the MTTS double-sided Firefly device. The speed of reduction of total serum bilirubin (TSB) within the first six hours after treatment commencement was 75% higher in newborns treated with the MTTS Firefly than the other two devices; results also showed the MTTS single-sided to be favorably comparable to the industry standard (Arnolda, in prep).
- WHO's 2012 report, Local Production and Technology Transfer to Increase Access to Medical Devices, highlighted how Thrive Networks and MTTS involve local users in the design of appropriate neonatal devices to meet local needs. Prototypes are piloted in the field for initial user reviews and testing and then adjusted to meet these needs while ensuring the highest standard of quality and safety (WHO, 2012).
- The MTTS CPAP was featured in WHO's Compendium of New and Emerging Health Technologies, which showcases equipment appropriate for low-resource settings (WHO, 2011).

Full List of Research Papers and Reports

Research papers

Arnolda, G., et al. (2015a). Evaluation of a simple intervention to reduce exchange transfusion rates among inborn and outborn neonates in Myanmar, comparing pre and post-intervention rates. *BMC Pediatrics, 15*.

Arnolda, G., et al. (2015b). Risk factors for acute bilirubin encephalopathy on admission to two Myanmar national paediatric hospitals. *Maternal Health, Neonatology, and Perinatology. 1*(22).

Bhat, SR., et al. (2015). Keeping babies warm: a non-inferiority trial of a conductive thermal mattress. *Archives of Disease in Childhood Fetal and Neonatal Edition*, *100*, F309–F312.

Trevisanuto, D., et al. (2015). Neonatal resuscitation in Vietnam: a national survey of a middle-income country. *Acta Paediatrica.*

Trevisanuto, D., et al. (2015). Supreme laryngeal mask airway versus face mask during neonatal resuscitation: a randomized controlled trial. *Journal of Pediatrics, 167* (2), 286-291.

Dajer, G., et al (2013). *Time to failure of robust equipment for care of sick neonates in low resource settings.* Paper presented at the Second WHO Global Forum on Medical Devices, Geneva.

Trevisanuto, D., et al. (2013). Reducing neonatal infections in south and south central Vietnam: the views of healthcare providers. *BMC Pediatrics, 13*.

Joe, P., et al. (2012a). *LED program successfully treats neonatal jaundice in Southeast Asia.* Paper presented at the Unite For Sight Global Health & Innovation Conference, Yale University. (Available upon request.)

Joe, P., et al. (2012b). *National training program on neonatal jaundice management and prevention in Vietnam.* Paper presented at the Pediatric Academic Society Annual Meeting. Boston. (Available upon request.)

Fascendini, M., et al. (2010). *LED-phototherapy treatment for neonatal jaundice in Vietnam.* Paper presented at the Global Health Council Conference, Washington DC. (Available upon request.)

Moccia, L., et al. (2010). *Sustainable intensive care units for newborns*. Paper presentated at the First WHO Global Forum on Medical Devices, Bangkok. (Available upon request.)

Ringer, S. (2010). *Breath of Life: reduction of neonatal mortality in Vietnam*. Paper presented at Global Health Council Conference, Washington DC. (Available upon request).

Ringer, S. (2008). International perspectives: enhancement of neonatal care in Vietnam. *NeoReview, 9* (10), 439-446.

Khu, T., et al. (2004). Native-built CPAP research and development at the National Hospital of Pediatrics, Vietnam. *Practical Medicine Magazine of the Ministry of Health-Vietnam, 495*, 1-8. (Available upon request.)

In prep

Arnolda, G., et al. (in prep). Change in exchange transfusion following roll-out of LED phototherapy to tertiary and larger secondary special care baby units in Myanmar.

Arnolda, G., et al. (preliminary analysis, to be submitted). Comparison of MTTS V3000 phototherapy vs GE Lullaby phototherapy vs MTTS Firefly phototherapy.

Arnolda, G., et al. (in prep). How low flow meters and training reduce provision of oxygen, preventing ROP and other oxygen-related toxicity.

Arnolda, G., et al. (preliminary analysis, to be submitted). Mortality in six tertiary hospitals in Myanmar and the Philippines before and after the introduction of advanced respiratory support and bedside alcohol handrub.

Arnolda, G., et al. (undergoing analysis). Retrospective case-control study comparing outborn infants identified as requiring exchange transfusion at a tertiary pediatric hospital in Yangon, Myanmar.

Internal reports

Arnolda, G., et al. (2013). *Change in length of stay of phototherapy patients in Myanmar.*

Arnolda, G., et al. (2013). *Individual CPAP Patient Data in Myanmar: 2013 Internal Report.*

Arnolda, G., et al. (in prep). *Appropriate alcohol gel consumption guide.*

Arnolda, G., et al. (in prep). *Comparison of Benveniste vs MTTS bubble CPAP.*

Arnolda, G., et al. (in prep). *Exploring the use of 'RAM prongs' with MTTS CPAP.*

Arnolda, G., et al. (in prep). *Use of GE Lullaby LED machine in three hospitals in Vietnam.*

Polumbo, J. (in prep). *Parental perceptions and involvement in facility-based care of sick newborns in Vietnam.*

Selected references

Thairu, L. (2013). Innovative newborn health technology for resource-limited environments. *Tropical Medicine & International Health, 18*(1), 117-128.

WHO. (2012). *Local production and technology transfer to increase access to medical devices: addressing the barriers and challenges in low- and middle-income countries.* Geneva.

WHO. (2011). *Compendium of new and emerging health technologies.* Geneva.

WHO. (2010). *Medical devices: managing the mismatch: an outcome of the priority medical devices project.* Geneva.

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