IMPACT NOW: IMPROVING MATERNAL, NEWBORN AND CHILD HEALTH IN AFRICA THROUGH INNOVATIVE SOLUTIONS

ABSTRACT BOOKLET

THE STELLENBOSCH INSTITUTE FOR ADVANCED STUDY (STIAS)

NOVEMBER 2019

Sponsors

This meeting is sponsored by the **Peter Wall Institute for Advanced Studies**, the **Innovating for Maternal and Child Health in Africa (IMCHA)** initiative and the **Centre for International Child Health**.

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Vision

Innovations in technology, health systems, financing and society have an enormous potential to reduce both maternal, newborn and child mortality.

The vision of the meeting is to push for change and innovative solutions to some of the world's greatest health challenges. We are bringing together global leaders in maternal and child health including researchers, funders, policy makers, and other stakeholders to discuss, network and plan for moving the agenda forward. The sessions will feature key leaders involved in the implementation and evaluation of promising innovations in the African context.

Objectives

The objective is to drive implementation of innovations for impact in reducing mortality in mothers and babies in low to middle income countries (LMICs)Cross cutting themes of the meeting:

- Bridging the maternal-newborn divide
- Prototype to product: how to ensure quality and safety
- Innovative financing
- Digital health
- The science of implementation
- Patient, family and community focused care
- Gender issues in maternal, newborn and child health innovating
- From policy to practice
- Emerging challenges of sepsis in maternal, newborn and child health
- Addressing the rising tide of antimicrobial resistance

Welcome

Welcome to the Impact Now conference! This conference is a follow-up to the MNCH Tech workshop held here at the Stellenbosch Institute for Advanced Studies (STIAS) in February 2017 under the auspices of the Peter Wall Institute of Advanced Studies (PWIAS). This year, we want to acknowledge the renewed financial support from PWIAS as well as that of the Innovating for Maternal and Child Health in Africa (IMCHA) initiative and the British Columbia Children's and Women's Hospital Centre for International Child Health. Thanks as well to STIAS for hosting us in their wonderful facilities. We also want to acknowledge Maggie Woo Kinshella for organizing every detail of this workshop. Without her hard work and devotion, we would not be here today.

This meeting brings together a group of ~ 100 participants from nearly 20 countries mostly in sub-Saharan Africa whose diverse backgrounds include Neonatology, Medical Anthropology, Infectious Diseases, Management and Bioengineering. What unites everyone is a passion to improve Maternal, Newborn and Child health globally. Our objective over the next few days is to foster discussion and new collaborations that help drive implementation of innovations with real-world impact in improving the health of mothers and children in low- to middle-income countries (LMICs). Given the unique group of assembled experts from around the world we hope you use this opportunity to actively participate in discussions and networking – we have plenty of coffee breaks and interactive panel discussions! We look forward to your contributions to the meeting and hope you enjoy your time in Stellenbosch.

We wish you all a pleasant and very productive meeting!

David Goldfarb

Impact Now 2019
Co-Chair

Guy Dumont

Impact Now 2019
Co-Chair

Monday Nov 18 - Day 1: Innovations

TIME	ROOM	SESSION	PRESENTER
8.00 AM – 8:30 AM	Foyer	REGISTRATION	
8:30 AM – 9:00 AM	Auditorium	Opening to Impact Now	
		Welcome by the Canadian High Commission	Jen Cooper, Head of Cooperation (CHC)
		Opening remarks	David Goldfarb (UBC)
9:00 AM –10:00 AM	Auditorium	Bridging the divide for Maternal-Newborn heath – where, what and how in the next decade?	Joy Lawn
10:00 AM – 10:30 AM	Foyer	Coffee break and networking	
10:30 AM – 11:00 AM	Auditorium	Doing more will less	Elizabeth Molyneux (UMCM)
11:00 AM – 11.30 AM	Auditorium	Critical MNCH issues in sub-Saharan Africa	Moderator: Elizabeth Molyneux Panelists: Doreen Ramogola-Masire (UB) Peter von Dadelszen (KCL) Marleen Temmerman (AKU) Niranjan 'Tex' Kissoon (UBC)
11.30 AM – 12:00 PM	Auditorium	Tech talks (5 mins each)	
		Triage MeterPro	Chishamiso Mudenyanga (CHAI)
		NeoGuard	Sona Shah (Neopenda)
		Baby KICK	Guy Dumont (UBC)
		Vscan	Rita Owino (GE Healthcare)
		OXYLink	Roger Rassool (FREOZ)
		Total hemoglobin	Grant Aaron (Masimo International)

TIME	ROOM	SESSION	PRESENTER
12.00 PM – 1:00 PM	Foyer	Lunch and "Meet the developers" round tables	
		NeoGuard	Sona Shah
		Baby KICK	Guy Dumont
		Vscan	Rita Owino
		Smart Discharges	Matthew Weins
		Neotree	Tim Hull-Bailey
		Pocket Doc	Dustin Dunsmuir
		Triage MeterPro	Chishamiso Mudenyanga
		Total Hemoglobin	Grant Aaron
		OXYLink	Roger Rassool
		PRISMS/AIR	Data Santorino
		D-Rev CPAP	Daniel Wald
1:00 PM – 3:00 PM	Auditorium	Prototype to product	Moderator: Kara Palamountain (Northwestern University)
		Introduction	Rebecca Richards-Kortum (Rice University)
		Pumani's story	Suellen Miller (UCSF)
		The story of the non-pneumatic anti-shock garment (NSAG)	Danica Kumara (3rd Stone Design)
		Lessons from bringing successful products to market	Panelists: Rebecca Richards-Kortum, Suellen Miller, Danica Kumara
		Discussion: Pathways to Scale	
3:00 PM – 3:30 PM	Foyer	Coffee break and networking	

TIME	ROOM	SESSION	PRESENTER
3:30 PM – 5:15 PM	Auditorium	Digital health: Solutions for real world problems	Moderator: Mark Ansermino
		Bluebird National AMS program	Darryl Vine (Bluebird)
		Smart Discharges	Matthew Weins (CICH)
		Neotree	Michelle Heys (UCL)
		Pocket Doc	Dustin Dunsmuir (UBC)
		ResApp Cough Analysis	Peter Moschovis (Massachusetts G. Hospital)
		Artermis Platform	Xoliswa Majola (UKZN)
		PRISMS	Data Santorino (MUST)
5:15 PM – 5:30 PM	STIAS	Group photo	All participants
5:30 PM – 7:30 PM	STIAS	Reception	All participants

Tuesday Nov 19 - Day 2: Implementation

TIME	ROOM	SESSION	PRESENTER
8.00 AM – 8:30 AM	Foyer	REGISTRATION	
8:30 AM – 9:15 AM	Auditorium	From evidence to policies and best practices	Marleen Temmerman (AKU East Africa)
9:15 AM –10:00 AM	Auditorium	Science of implementation	Queen Dube (QECH; UMCM)
		Witnessing high infant mortality across Malawi and implementing affordable solutions	
10:00 AM – 10:30 AM	Foyer	Coffee break and networking	

TIME	ROOM	SESSION	PRESENTER
10:30 AM – 12:00 PM	Auditorium	Women's health in context panel	Moderator: Peter von Dadelszen (KCL)
		Best bets to reduce maternal mortality	Justus Hofmeyr (WITS; Fort Hare)
		Scaling up women's health programs: the Botswana experience	Doreen Ramogola-Masire (UB)
		Gender issues in maternal, newborn and child health innovations	Lynette Kamau (APHRC)
		Discussion: Advocating for reproductive health	Panelists: Justus Hofymeyr, Doreen Ramogola-Masaire, Lynette Kamau
12.00 PM – 12:30 PM	Auditorium	Idea pitches	
		Stickerchart to improve treatment adherence in children	A.M. Tutu van Furth (Amsterdam UMC)
		Integrations of mother-infant dyad biometrics (finger prints), geolocation (mapping) and clinical data	Bridget Freyne (University of Liverpool)
		PRiSM (Paediatric Research in Antimicrobial Stewardship and Management) Network	Pui-Ying Iroh Tam (MLW)
		Whatsapp for Bubble CPAP Support	Linda Nyondo-Mipando (UMCM)
		Video OX: Video for sepsis identification	Pascal Lavoie and Guy Dumont (UBC)

TIME	ROOM	SESSION	PRESENTER
12.30 PM – 1:30 PM	Foyer	Lunch and "Innovations" round tables	
		Stickerchart to improve treatment adherence in children	A. Marceline Tutu-van Furth
		Integrations of mother-infant dyad biometrics (finger prints), geolocation (mapping) with routine clinical data collection in the perinatal period	Bridget Freyne
		PRISM Network	Pui-Ying Iroh Tam (MLW)
		Whatsapp for Bubble CPAP Support	Linda Nyondo-Mipando (UMCM)
		Video for sepsis identification	Pascal Lavoie and Guy Dumont (UBC)
1:30 PM – 3:00 PM	Auditorium	A case study in implementation: making the leap into Kangaroo Mother Care (KMC)	
		Introduction to KMC	Moderators: Kondwani Kawaza (UMCM) and David Goldfarb (UBC)
		KMC Trial in Uganda	Melissa Medvedev (UCSF)
		KMC in Malawi: Caregiver perspectives	Linda Nyondo-Mipando (UMCM)
		KMC champions - Improving quality care through mentorship	Tamanda Hiwa (UMCM)
		Discussion: Implementation factors	Panelists: Melissa Medvedev, Linda Nyondo-Mipando, Tamanda Hiwa, Thabiso Mogotsi
3:00 PM – 3:30 PM	Foyer	Coffee break and networking	

Tuesday Nov 19 - Day 2: Implementations

TIME	ROOM	SESSION	PRESENTER
3.30 PM – 4:30 PM	Auditorium	From evidence to implementation	
		Introduction	Moderator: Suellen Miller (UCSF)
		Improving care through innovations	Jesse Coleman (Save the Children)
		Listening to health workers in Malawi: Barriers and enablers in the process of using bubble CPAP	Maggie Woo Kinshella (UBC)
		Improving high quality, equitable health services in Malawi	Ellen Chirwa (Kamuzu College of Nursing)
		Discussion	Panelists: Jesse Coleman, Maggie Woo Kinshella Ellen Chirwa
4:30 PM – 5:15 PM	Auditorium	Debate: "We cannot improve maternal, neonatal and child health without more technological innovations"	Moderator: Bella Hwang (CICH) Pro: Queen Dube (QECH; UMCM) Against: Jeff Pernica (McMaster University)

Wednesday Nov 20 - Day 3: : Emerging challenges of sepsis in MNCH

TIME	ROOM	SESSION	PRESENTER
8.00 AM – 8:30 AM	Foyer	REGISTRATION	
8.30 AM – 10:00 AM	Auditorium	Emerging challenges of sepsis in MNCH	
		Introduction	Moderator: Pascal Lavoie (UBC) and Msandeni Chiume (UMCM)
		Maternal sepsis	Ellen Chirwa (Kamuzu College of Nursing)

TIME	ROOM	SESSION	PRESENTER
		Pediatric sepsis	Tex Kissoon (UBC)
		Neonatal sepsis	Kondwani Kawaza (UMCM)
		Discussion: Emerging challenges of sepsis in MNCH and how to address the rising tide of antimicrobial resistance	Panelists: Ellen Chirwa, Niranjan 'Tex' Kissoon, Kondwani Kawaza, Pui-Ying Iroh Tam
10.00 AM – 10:30 AM	Foyer	Coffee break and networking	
10.30 AM – 11:45 AM	Auditorium	Pediatric Sepsis CoLab	
		What is the Pediatric Sepsis CoLab?	Moderators: Mark Ansermino and Niranjan 'Tex' Kissoon
		Panel Discussion (speaker introductions)	Elvis Suiyven (Cameroon Association of Critical Care Nurses), John Appiah (Komfo Anokye Teaching Hospital), Angela Dramowski (Stellenbosch University), William Macharia (AKU)
		Group discussion: Q&A	Panelists: Elvis Suiyven, John Appiah, Angela Dramowski, William Macharia)
11:45 PM – 12:00 PM	Auditorium	Closing remarks	David Goldfarb and Guy Dumont
12:00 PM – 1:30 PM	Foyer	Lunch	
	Breakout room	Side meeting of the UBC- Malawi Kamuzu Hospital project (closed meeting)	
1:30 PM – 5:30 PM	Auditorium	NEST 360 neonatal sepsis diagnostics TPP working group workshop (by invite only)	

Day 1 - Innovations

Bridging the divide for Maternal-Newborn heath – where, what and how in the next decade?

Joy Lawn

Professor Joy Lawn (@joylawn) is a champion for women's global health research leadership and world renowned for developing the evidence-base to measure and reduce the global burden of 2.5 million neonatal deaths, 2.6 million stillbirths, and 15million preterm births. Professor Lawn is an African-born, British-trained paediatrician and perinatal epidemiologist with 30 years' experience including global estimates, and the design and evaluation of large -scale maternal, newborn and child care services, particularly in sub-Saharan Africa. She is Professor of Maternal, Reproductive and Child Health at the London School of Hygiene & Tropical Medicine (LSHTM) as well as Director of LSHTM's MARCH (Maternal Adolescent, Reproductive & Child Health). She has published >250 peer-reviewed papers, co-led several Lancet series, and played a lead role many UN reports including the Every Newborn Action Plan and Born Too Soon. She is also co-leading a number of global studies including Rice Nest 360, and PI for several large trials of kangaroo mother care. Professor Lawn was recently elected as a member of the prestigious U.S. National Academy of Medicine (NAM).

Doing more will less

Elizabeth Molyneux

Professor Elizabeth Molyneux helped uplift Malawi's health services alongside her husband, Malcolm, through decades of clinical research, care of patients and training new generations of Malawian doctors. Professor Molyneux is the former Head of the Paediatric Department at the University of Malawi College of Medicine and Queen Elizabeth Central Hospital (QECH) in Blantyre. Elizabeth and Malcolm Molyneux moved to Malawi in 1974 to work in a mission clinic, then at the national hospital and continued to largely live and work in Malawi until retirement. She set up an accident and emergency unit and halved inpatient child mortality through simple emergency triage procedures and improved staff training. She also led important clinical research for meningitis and more recently has been focusing on the problem of childhood cancer in Malawi and was instrumental in developing appropriate and successful treatment for endemic Burkitt lymphoma. She instituted the practice of Kangaroo Mother Care at QECH, including raising the money and overseeing the construction of the Kangaroo Care Unit. Additionally, she has helped to develop a number of neonatal innovations for low-resource settings, including the low-cost bubble CPAP device with Rice University. She is currently leading the Clinical Users and Service Technician Training for the Rice Nest 360 project and is a Co-Principal Investigator on the "Integrating a neonatal healthcare package for Malawi" IMCHA project. She received the Order of The British Empire (OBE) for services to medicine in Africa in 2007, an Honorary Fellowship of the Royal College of Paediatrics and Child Health in 2008, a Pioneer Award from the Society of Doctors in 2008, and the William Rutherford International Award in 2009.

Prototype to product

Pumani's Story

Acute respiratory infections are the leading cause of global child mortality and respiratory conditions associated with premature birth contribute to about 30% of neonatal death. In developed health systems, such conditions can be treated using bubble Continuous Positive Airway Pressure (bCPAP), a therapy that delivers pressurized flow to an infant to prevent air sac collapse and makes breathing easier. However, the typical bCPAP setup used in such settings costs anywhere from $6,000, making it inaccessible to most health facilities in developing countries. As such, the standard of care in resource-constrained settings for babies in respiratory distress is usually low-flow oxygen therapy, which on its own is inadequate.

In partnership with Queen Elizabeth Central Hospital, Baylor College of Medicine, and 3rd Stone Design, Rice 360° has developed a low-cost, high-performance bubble CPAP system to treat infants with respiratory distress syndrome in the developing world. A clinical trial of the bCPAP device at the Queen Elizabeth Central Hospital in Blantyre, Malawi showed that the device significantly improved the survival of neonates in respiratory distress. At a significantly lower price point, the Pumani CPAP has also been proven to deliver therapeutic pressures and flows comparable to bubble CPAP systems used in the United States.

blurb taken from https://www.rice360.rice.edu/bcpap

Rebecca Richards-Kortum

Bioengineer Rebecca Richards-Kortum (@kortum) is passionate about the development of low-cost, high-performance technologies for remote and low-resource settings to address to address global health inequities. A Professor of Bioengineering at Rice University, she is the Malcolm Gillis University Professor and the Founder and Director of the Rice 360º Institute for Global Health. She has partnered with hospitals in Rwanda, El Salvador, Brazil, Botswana, China and Malawi and her work has led to the development of 40 patents.

She is also the author of the textbook Biomedical Engineering for Global Health published by Cambridge University Press (2010) as well as more than 315 refereed research papers and 13 book chapters. In 2016, she became the first Houston scientist, the first Houston woman and the first Rice faculty member to win a coveted "genius grant" from the MacArthur Foundation and leads NEST360, a multi-institutional initiative to halve neonatal mortality in Africa. She was selected by the State Department as a U.S. Science Envoy in June 2018 and will inducted into the prestigious National Inventor Hall of Fame in May 2019.

Prototype to product

The story of the Non-pneumatic Anti-Shock Garment

The Non-pneumatic Anti-Shock Garment/NASG is a first-aid device which maintain the pulse and blood pressure of a woman with heavy bleeding related to childbirth. Bleeding is the leading cause of death among childbearing women. While there are some ways to prevent bleeding after birth, and some treatments for severe bleeding, the main treatments for the heaviest bleeding, which causes shock and death are blood transfusions or surgery. These are generally only available to women in higher resourced settings or women with access to sophisticated health facilities. The NASG helps women suffering severe hemorrhage and shock survive delays in receiving definitive treatments.

The NASG works by applying pressure around the lower body of women with hemorrhage. The NASG is made up of 6 segments of stretchy neoprene which fastens with very strong Velcro. The principle of how it works can be compared to compressing a water balloon. When the balloon is compressed in one area, all of the water goes to the other area. In the case of the bleeding woman, applying the NASG to the lower body will decrease the bleeding in the lower body, and expand the amount of blood in the top of the body, where the heart, lung, and brains are. Almost as soon as it is applied, a woman, who may have been unconscious and unresponsive due to shock, will be revived. Her pulse and blood pressure will become normal and she will be able to survive long delays in reaching proper care. Application is easy, and nearly anyone, regardless of having medical training or not, can be rapidly taught to apply it.

The first device developed for medical purposes was a pneumatic (inflatable) device, the PASG, which was used during the Vietnam war to help soldiers survive helicopter transport. In the 1990s, the National Aeronautics and Space Administration (NASA) developed the NASG, for civilian trauma. In 2004 Dr. Suellen Miller, University of California, San Francisco and Dr. Paul Hensleigh, Stanford University, along with international colleagues embarked on clinical trials to demonstrate that this device decreased maternal deaths by 50%. This led to successful integration of the NASG, now trademarked the LifeWrap, into international guidelines.

Currently the LifeWrapTM is used in over 36 countries. However; the uptake, acceptance, and scale-up should be accelerated in order to save more mothers.

The story of the Non-pneumatic Anti-Shock Garment

Suellen Miller

Professor Suellen Miller is a globally recognized expert in international maternal health and pioneered studies of the Non-pneumatic Anti-Shock Garment (NASG) for the management of obstetric hemorrhage in low- and middle-income countries. Professor Miller is Director of the Safe Motherhood Program and Professor in the University of California San Francisco Department of Obstetrics and Gynaecology and has been practicing as a certified nurse-midwife since 1977. She conducts both qualitative and quantitative research, mainly in lower resourced settings, primarily focused on maternal survival and maternal health. Her studies include contraceptive research in Africa and Asia, misoprostol clinical trials in Tibet and India, the clinical trials of the Non-pneumatic Anti-Shock Garment (NASG), and the continuum of maternal care in Peru, Dominican Republic, Bangladesh, Nigeria, Egypt, Ethiopia, Zambia, Zimbabwe, Timor Leste, and Tanzania, among other reproductive and sexual health projects and programs. The author of over 100 peer-reviewed journal articles, Professor Miller is co-author of “Beyond Too Little Too Late, Too Much Too Soon,” in the Lancet 2016 Maternal Health Series, a co-author of the Hesperian Foundation’s “A Book for Midwives” and wrote, directed and narrated a training video for Pathfinder International, “Saving Mother's Lives: Community and Clinical Action to Address Post-Partum Hemorrhage.”

Lessons learned bringing successful products to market

Danica Kumara

A self-described medical device enthusiast, Danica Kumara is the Director of Product Management at 3rd Stone Design and leads the commercialization and distribution efforts on numerous global health products including the Pumani bubbleCPAP. Danica has extensive experience having worked for over 10 years with a dozen global health devices products on the markets in sub-Saharan Africa, South and Southeast Asia. In her previous roles,she led the launch and up of a package of newborn care technologies in Southeast Asia including warming therapy, jaundice management and respiratory support products. She has extensive knowledge and on the ground experience with all aspects of product management from needs finding, development, regulatory, product launch, uptake and ongoing sales and support. Danica received her Project Management Certificate from University of California, Berkeley in 2017, her MA in Educational Leadership from Michigan State University and her BA in Global Studies at California State University – Monterey Bay.

Featured technologies and innovations

For Pumani, see above
For NSAG, see above

Digital Health

Bluebird National AMS program
Smart Discharges
Neotree
Pocket Doc
ResApp Cough Analysis
Artermis Platform
PRISMS

Tech Talks

Triage MeterPro
NeoGuard
Baby KICK
Vscan
OXYLink
Total Hemoglobin

Others in “Meet the Developers”

D-Rev CPAP
Augmented Infant Resuscitator (AIR)

Day 2 - Implementation

From evidence to policies and best practices

Marleen Temmerman

Obstetrician-gynaecologist and Professor Marleen Temmerman (@MamaDaktari) is a strong global voice for women's health and rights, fighting against the unacceptable burden of preventable maternal deaths she has encountered during her work across many parts of the world. Currently, Dr Temmerman is the Chair of the Department of Obstetrics and Gynaecology, and as Director of Women's Health and Research in the Faculty of Health Sciences at the Aga Khan University East Africa located in Nairobi, Kenya. Between 2012-2015, she was the Director of the Department of Reproductive Health and Research (RHR) at the World Health Organization (WHO), in Geneva, to identify and address priorities for research to improve women's health from a rights- based perspective. Between 2007-2012, Dr Temmerman was elected as a Senator in the Belgian Parliament where she was member of the Commission on Social Affairs, and chair of the Commission on Foreign Affairs. In that capacity, she was a member of the European Parliamentary Forum and chair of the HIV/AIDS Advisory Group of the Inter-Parliamentary Union. Since 1995, she is professor Emeritus at Ghent University in Belgium where she is also the Founding Director of the International Centre of Reproductive Health (ICRH) at Ghent University with sister organisations in Kenya and Mozambique, and a large global collaborative network. She has a strong academic background with over 500 publications and books in the area of women's health (Hirsh index 80), many PhD students in Europe, Africa, Latin-America and China, and several awards and honours, including the Outstanding Female Scientist Award from European & Developing Countries Clinical Trials Partnership in 2016.

Science of implementation: Witnessing high infant mortality across Malawi and implementing affordable solutions

Queen Dube

As Consultant Pediatrician and Head of Pediatrics and Child Health at Queen Elizabeth Central Hospital (QECH), the largest tertiary unit in Malawi, Queen Dube (@_qdube) has been identifying challenges in neonatal care as well as developing and implementing innovative technology solutions, in collaboration with Rice University. Dr Dube teaches medical students and conducts research on neurodevelopment, innovative neonatal technologies and neonatal infections and currently serves as the principal investigator of the Antibiotics Against Childhood Diarrhea study, co-principal investigator on the ASPIRE study and co-investigator on the I-KMC trial. Dr Dube was one of the physician partners at QECH who oversaw the clinical aspects of Rice 360°'s Pumani CPAP clinical study funded by a Saving Lives at Birth seed grant in July 2011. Dr Dube is a co-PI on NEST360, a multi-institutional initiative to halve neonatal mortality in Africa, which was selected as one of four finalists in the MacArthur Foundation's $100 million grant competition, 100&Change. Dr Dube is a co-investigator and the Policy and Decision-Making principal investigator for the "Integrating a neonatal healthcare package for Malawi" IMCHA project, an initiative to strengthen lifesaving newborn interventions through implementation science.

Women's health in context

Justus Hofmeyr

Obstetrician Justus Hofmeyr is identifying women's health research priorities in low-resource areas where improved healthcare is most needed. The Effective Care Research Unit (ECRU) was established by Dr Hofmeyr as a research unit of the University of the Witwatersrand, Johannesburg, South Africa in 1988 and relocated to the Frere and Cecilia Makiwane Hospital in East London, South Africa in 2000 to find new and novel ways to improve pregnancy outcomes relevant to women and their babies in low-resource settings.

ECRU continued to function as a Wits University Unit, in collaboration with University of Fort Hare, Walter Sisulu University and the Eastern Cape Department of Health. The Unit, which has a close working relationship with the WHO, specializes in research, mainly large randomized trials, in hypertensive disorders in pregnancy, excessive bleeding after delivery, unintended pregnancies, and hormonal contraception/HIV. As the principal investigator for the PRE-EMPT Calcium and Pre-eclampsia study, he led a WHO collaboration randomized controlled trial in South Africa, Zimbabwe and Argentina to determine whether calcium supplementation before and in early pregnancy reduces pre-eclampsia. He is an honorary Professor at the University of the Witwatersrand and has published some 340 papers in peer-reviewed journals including some 50 Cochrane systematic reviews, 25 textbook chapters and 8 audiovisual teaching programmes. He is co-editor of the Cochrane Pregnancy and Childbirth Group and Regional Editor of The WHO Reproductive Health Library. He was awarded the DSc (University of the Witwatersrand (2013) for his body of research on misoprostol for labour induction and postpartum haemorrhage.

Doreen Ramogola-Masire

Obstetrician-gynaecologist, Dr. Doreen Ramogola-Masire is passionate about preventing cervical cancer and improving patient care in Botswana. Trained in obstetrics and gynaecology before pursuing subspecialities in Perinatal Medicine and Cervical Cancer at the University of Cape Town, Dr Ramogola-Masire is an associate professor in the Department of Obstetrics and Gynaecology and the Acting Dean of the Faculty of Medicine at the University of Botswana. She is also the Deputy Dean of Research and Graduate Studies, a new office that she was responsible for setting up to further develop capacities in the Faculty of Medicine. She was instrumental in setting up of the comprehensive national cervical cancer prevention programme under the Botswana Ministry of Health and Wellness (MOHW), of which the roll out of the national HPV vaccination for adolescent girls in 2015 was the most substantial achievement. Dr Masire is a member of the National HIV guidelines committee, and serves in the national HIV specialists group and provides expert obstetrics HIV-related support to clinicians around the country. Prior to joining the university of Botswana, Dr. Ramogola-Masire was appointed In-Country Director of the Botswana-U Penn Partnership in January 2009, and also serves as the Lead Physician for the Women's Health Program. She has over 50 academic publications, and has been recognized for her distinguished contributions with the 2013 American Society for Clinical Pathology (ASCP) Patient's Advocate Award, and recognized in the African Society for Laboratory Medicine (ASLM) Celebration of African Women in Science and Global Health 2016.

Women's health in context

Lynette Kamau

Health policy communicator, Lynette Kamau (@Lynnmukuhi), brings together research teams, decision-makers and stakeholders to make a difference in improving maternal and child health outcomes in East Africa. She is the Senior Policy and Communications Officer at the African Population and Health Research Center (APHRC) and leads the East Africa Health Policy and Research Organization, a consortium of three organizations, APHRC; East, Central, Southern Africa – Health Community; and Partners in Population and Development– Africa Region as part of the Innovating for Maternal and Child Health in Africa (IMCHA) Initiative. Lynette has over eight years' experience in policy engagement, communications, and project management in the research and humanitarian sectors including with the International Committee of the Red Cross (ICRC) regional delegation in Nairobi where she initiated a roundtable forum with journalism lecturers from Kenyan universities to discuss the challenges in the coverage of conflict and situations of violence by national media and how they can be addressed at curriculum level. Lynette has a Master's in International Studies and a Bachelor's degree in Development Communication, both from the University of Nairobi.

Idea pitches

Stickerchart to improve treatment adherence in children

Integrations of mother-infant dyad biometrics (finger prints), geolocation (mapping) and clinical data

PRiSM (Paediatric Research in Antimicrobial Stewardship and Management) Network

Whatsapp for Bubble CPAP Support

Video OX - Video for sepsis identification

Day 3 - Emerging challenges of sepsis in maternal, newborn and child health

Emerging challenges of sepsis in MNCH and how to address the rising tide of antimicrobial resistance

Ellen Chirwa

Professor Chirwa is a Registered Malawian Nurse Midwife and graduate of the University of Illinois at Chicago, where she earned her PhD in Nursing in 2007. She joined Kamuzu College of Nursing in 1990 and has mainly been teaching midwifery and reproductive in undergraduate and postgraduate programs. Professor Chirwa has been involved in various academic leadership initiatives in the college including: development of undergraduate, masters and doctoral nursing and midwifery curricula, and establishment of the World Health Organization Collaborating Centre for Interprofessional Education and Collaborative Practice. She has been vice principal of Kamuzu College of Nursing from November 2008 to February 2016. In March 2016 she became acting principal up to June 2017.Her research interests lie in quality improvement in maternal and neonatal health and HIV prevention among married couples. She has published in local and international journals including Malawi Medical Journal, African Journal of Midwifery and Women's Health, Journal of the International AIDS Society, and Reproductive Health. She has received research funding from National Institutes of Health Fogarty International Centre, UNICEF, IDRC, and NORAD.

Niranjan 'Tex' Kissoon

Niranjan Kissoon is Professor, BC Children's Hospital and UBC Global Child Health, Department of Paediatrics and Emergency Medicine University of British Columbia. Niranjan Kissoon is Past President of the World Federation of Pediatric Intensive and Critical Care Societies (WFPICCS); Professor, Pediatric and Surgery at the University of British Columbia (UBC) in Vancouver, Canada. He holds the UBC BC Children's Hospital Endowed Chair in Acute and Critical Care for Global Child Health is Vice Chair, Global Alliance for Sepsis (GSA), co-Chair, World Sepsis Day, International Pediatric Sepsis Initiative, and the Pediatric Surviving Sepsis Campaign Guideline Committee. In recognition of his achievements, Dr. Kissoon was awarded the 2013 Distinguished Career Award by the AAP for his contribution to the society and discipline; in 2015 he was awarded the SCCM Master of Critical Care Medicine Award and the BNS Walia PGIMER Golden Jubilee Oration Award in India. In 2016 Dr. Kissoon received the UBC Canada Distinguished Achievement Award for Overall Excellence and in 2019 Dr. Kissoon has for the 8th time received a Presidential Citation from the Society of Critical Care Medicine for outstanding contributions to the Society (this was previously awarded to him in 2001, 2003, 2012, 2013, 2014, 2017 and 2018). In 2018 Dr. Kissoon received the UWI Distinguished Service Award and was also the Recipient of the 2020 Drs. Vidyasagar and Nagamani Dharmapuri Award presented by the Society of Critical Care Medicine (SCCM) for exemplary and pioneering achievements in the care of critically ill and injured infants and children.

Kondwani Kawaza

Neonatologist Kondwani Kawaza is improving newborn care through Africa-focused research in Malawi. He is a consulting pediatrician and neonatologist at Queen Elizabeth Central Hospital, the largest tertiary facility in Malawi, where he is also the Research Head of the Pediatrics Department. As the first and only neonatologist in Malawi, he has helped lead a joint research study to design and implement a low-cost continuous positive airway pressure (CPAP) machine used to help babies with respiratory distress breathe. This study was conducted in partnership with Rice 360º Institute for Global Health, University of Malawi, Baylor College of Medicine, and 3rd Stone Design. Dr Kawaza also lectures at the College of Medicine, University of Malawi, and teaches medical students. Before his training as a pediatrician and neonatologist, Dr Kawaza was the Chief Medical Officer of Likuni Mission Hospital in central Malawi for three years between 2004-2007. He has been involved in 19 publications of innovative Malawi focused research, was an author in the “Care of the infant and newborn in Malawi (2017): the COIN Course Manual” published by University of St Andrews, and currently serves on the editorial board of the Malawi Medical Journal. Dr Kawaza currently the principal investigator for the “Integrating a neonatal healthcare package for Malawi” IMCHA project, an initiative to strengthen lifesaving newborn interventions through implementation science, as well as a co-investigator on Rice NEST 360 and co-leading the WHO Immediate Kangaroo Mother Care (i-KMC) study in Malawi.

Pui-Ying Iroh Tam

Dr.Pui-Ying Iroh Tam has been based full-time in Malawi since 2016, where she heads the Paediatrics and Child Health Research Group at the Malawi-Liverpool Wellcome Trust Clinical Research Programme (MLW). She is a clinician-researcher and paediatric infectious diseases specialist who works as a consultant paediatrician in Queen Elizabeth Central Hospital,the tertiary-level government referral hospital for the southern region of Malawi.

In addition to her work mentoring Malawian clinician-researchers, her research deals with respiratory tract infections and the intersection with diarrhoeal disease, antimicrobial resistance, sepsis and antimicrobial stewardship.

Abstracts

Triage MeterPro

Submitted by - Chishamiso Mudenyanga

The Triage MeterPro is a portable device that is easy to operate even by personnel with little technical background. It requires 100uL of plasma samples for testing for the Placenta Growth Factor (PLGF) hormone. The test takes 15 minutes with tests that have external incubation taking less time to test. This gives the Triage MeterPro the capacity to process as much as 20 tests in an hour.

To ensure that there is quality control, the device comes with a device-specific quality control cartridge that is enables the Triage to verify its laser, calibration and alignment before testing patients' samples can resume. In addition the devices has a memory that can be configured with the frequency of testing quality control samples that are essential to verifying the performance of the device. In both cases the quality control cartridge and samples are mandatory and the device will give an alert if they are pending before patient samples can be tested.

Experts endorse the PLGF test done on the Triage MeterPro as an important new marker for early onset preeclampsia. The PLGF test is specific to the underlying pathophysiology of preeclampsia and diagnoses the presence of a progressive and potentially dangerous condition. PLGF is more specific than most tests and is abnormal before many of the downstream and non-specific features of preeclampsia appear.

In terms of low resource settings, the Triage MeterPro has the advantage of being powered by 4 AA size batteries hence making it operable even when there is no reliable power supply.

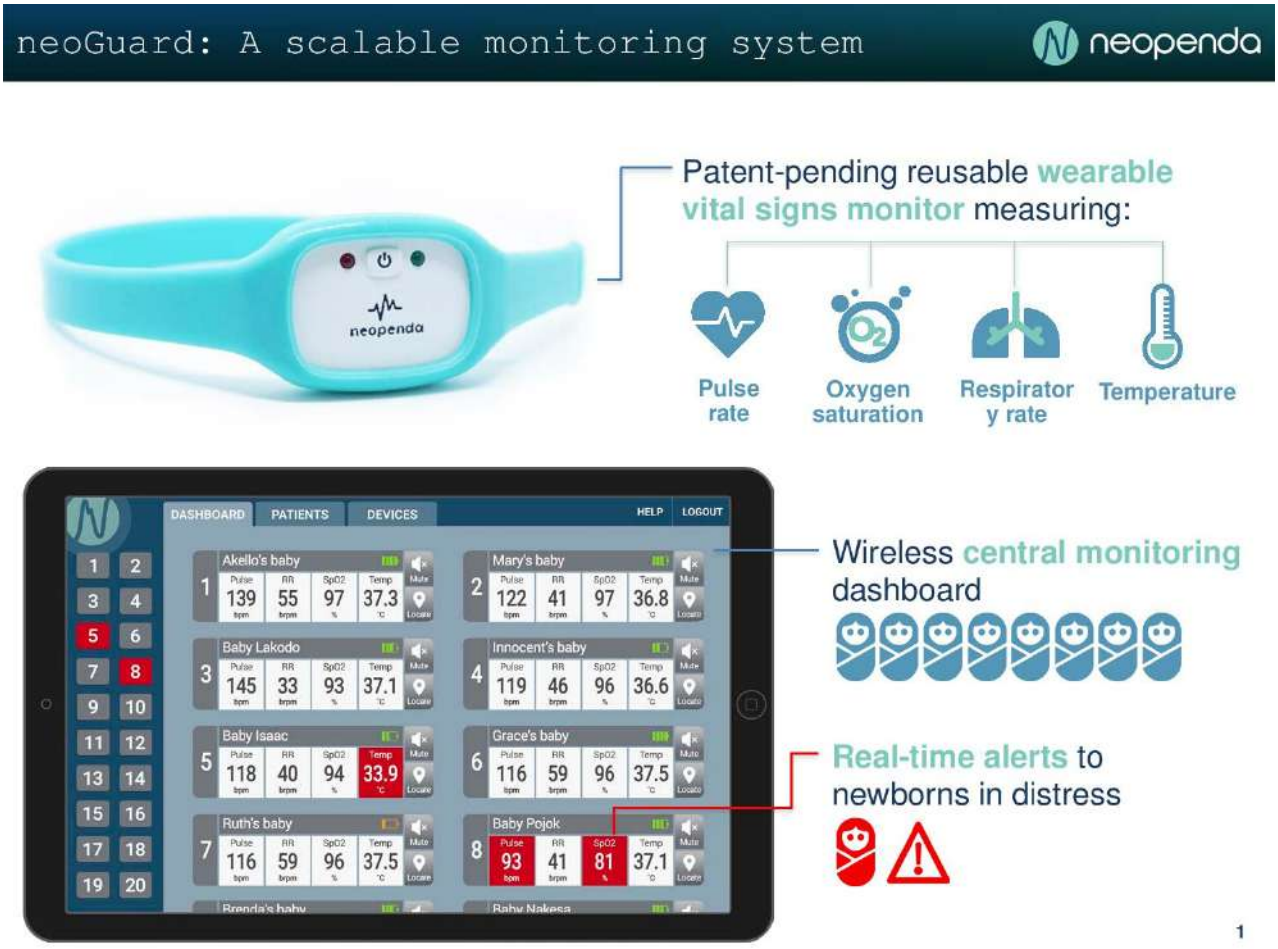
Two publications from Mozambique work using the Triage MeterPro are available as follows;

1. Evaluation of the diagnostic performance of the PLGF tests.
doi: 10.1161/HYPERTENSIONAHA.116.08547
2. Impact of implementing the PLGF tests.
https://doi.org/10.1016/j.preghy.2017.12.005

NeoGuard

Submitted by - Sona Shah

An estimated 2.5 million neonatal deaths occurred globally in 2017, almost all in low-and-middle income countries (LMIC). Nearly 75% of these deaths could have been averted through early detection and timely access to high quality care by skilled medical workers. Many hospitals across LMIC are faced with critical shortages in both healthcare workers and functional medical equipment that are necessary to deliver adequate newborn care. Gold-standard equipment on the market is prohibitively expensive, and furthermore fails to meet constraints such as power supply, durability, and maintenance in low-resource settings. An informal needs assessment by the Neopenda team found that the average nurse-to-baby ratio in special care baby units was 13 newborns per nurse, and only 4% of newborns were monitored with continuous multiparameter vital signs monitors. Consequently, newborns in distress often go unnoticed, their health deteriorating every moment and the likelihood of effective intervention declining. To enable more responsive and effective management of sick newborns in resource constrained health facilities, Neopenda has developed neoGuardTM , a wearable vital signs monitor for neonates. Our reusable smart headband continuously measures four critical vital signs (pulse rate, respiratory rate, oxygen saturation, and temperature), and data from multiple devices are wirelessly displayed on a tablet in real time. Health workers are alerted when vitals go outside the healthy range, so that they can attend to newborns in distress immediately and give them the best chance to survive and thrive.



Baby KICK

Submitted by - Guy Dumont, Shayeste Vefaghnematollahi and Peter von Dadelszen

Fetal movement is an important indicator of fetal well-being. As decreased fetal movement can be a sign of fetal distress, we developed KICK, a non-invasive wearable monitoring device to objectively assess fetal movement. Indeed the novelty of this device is that it moves away from a traditional subjective assessment of fetal movement to an objective, quantitative, and yet low-cost measure of fetal movement without resorting to expensive and less available monitoring modalities such as ultrasound imaging, Doppler velocimetry or cardiotocography. The wearable consists of a piezo-sensitive belt equipped with eight piezoelectric sensors and an accelerometer wirelessly connected to a phone or tablet. This device can be used to record the frequency and amplitude of fetal movements perceived passively and non-invasively on the surface of the mother's abdomen for a period of up to one hour while she is lying or seating in a reclining position. It can be worn for extended periods compared to the time of ultrasound screening, which is commonly used, for visualizing fetal movements in order to decrease outcomes such as stillbirth, perinatal mortality and neonatal morbidity.

We are looking to recruit 1000 women with low-risk singleton pregnancies at King's College London Hospital. All women will undergo routine examinations such as blood pressure, diabetes and other standard measures to determine they are indeed low-risk, before being considered for an observational study. Combination of the detection algorithms of the device, clinically-relevant fetal movement indices and hardware configuration of the device will refine the accurate capture of fetal movement.

This low-cost, non-invasive wearable belt could potentially reduce negative outcomes such as stillbirth, perinatal mortality and neonatal morbidity in low to middle income settings and could potentially be used for long-term home monitoring.

Once the device is validated, it will provide objective measurements that will be useful in all clinical settings. In more-developed settings, KICK's negative predictive performance to rule out perinatal risk will reduce the burden of antenatal fetal surveillance. In less-resourced settings, it may be used to guide interventions such as referral to comprehensive emergency obstetric facilities and decisions around timing of delivery.

GE Healthcare's Vscan Access: Assessing Risk and Expanding Reach of uality Antenatal Care

Submitted by - Rita Owino

Globally, maternal and newborn health remain two of our most pressing priorities. From the MDGs to the SDGs, global progress has been made, but despite these advances, many countries still need to reduce pregnancy-related mortality. To help meet this need, GE made a commitment to the UN and invested our global R&D capabilities to develop essential maternal and newborn health technologies suited for low-resource settings.

Vscan Access is GE's innovative ultrasound device designed for primary healthcare workers — including midwives, nurses, and clinical officers — to help expand the reach of quality antenatal care (ANC) to women who need it most.

With Vscan Access, caregivers at the primary healthcare level can:
Conduct ANC exams that may result in the early detection of potentially life-threatening pregnancy complications
Estimate gestational age and track fetal growth to help manage pregnancies

GE sought to rethink ultrasound from the ground up. GE engineers and a global team of designers, public health experts, and social scientists conducted three years of iterative field research in more than 20 countries. Insights from patients, midwives, and Ministry of Health officials guided the human-centered design of Vscan Access to help fulfil 4 critical needs:

1. Simplicity- Making ultrasound easy to learn and use.
- Intuitive touchscreen with gesture-based control
- Local language capability
- Streamlined workflows, clinical protocols, and automated controls
- Guide the critical "keep or refer" decision

2. Durability - Made to move and built to last in tough environments.
- Damage-resistant screen and drop-tested dust-proof exterior
- Low power consumption and surge protection for voltage spikes
- Battery-powered and lightweight for portability

3. Clinical Utility - Innovative apps to educate women and increase right referrals.
- Scan Coach tool to help optimize scan plane and probe position
- Growth tracking software to display fetal development
- eLearning videos to help guide patients toward proper pregnancy care

4. Affordability - Enabling Ministries of Health to achieve national scale-up. Package includes:
- Comprehensive training program
- Local service support with three-year warranty
- GE Healthcare program management and M&E

GE Healthcare's Primary & Referral Care – Africa Initiative

GE through its Primary and Referral Care – Africa initiative, has over 3-years' experience in building midwives' capability to deliver 19 limited obstetric ultrasound service (LOUS) programs across 7 countries. Through these programs, more than 1,500 midwives and frontline healthcare workers who routinely administer ANC services have been trained.

FREO2 Low-Pressure Oxygen Storage (LPOS)

Submitted by - Roger Rassol

In a well-resourced setting the standard of care has always assumed that the administration of therapeutic oxygen for inhalation, a life-saving treatment, will be available. However, despite the World Health Organization (WHO) listing oxygen as an essential medicine, it remains in limited supply in most Low and Middle-Income Countries (LMICs), especially in remote settings.

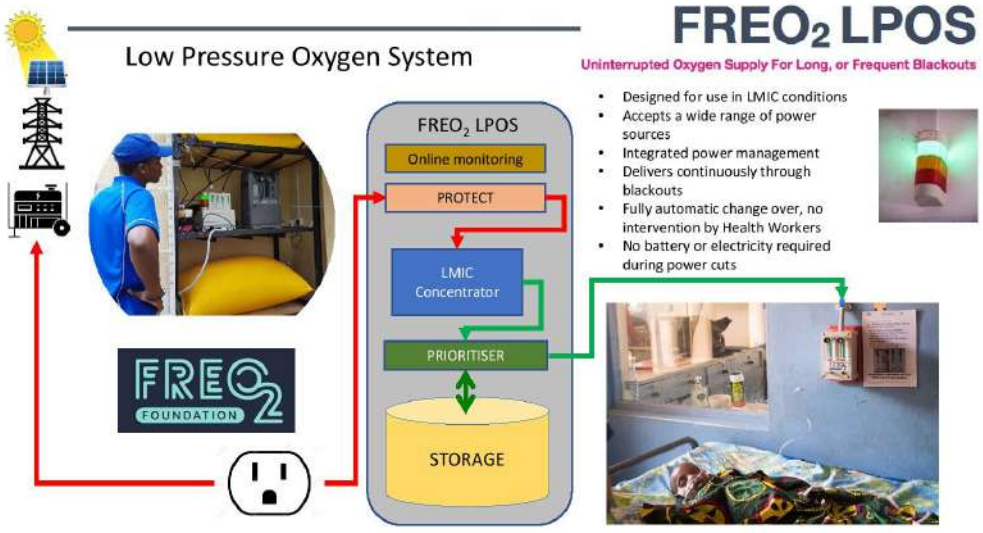
Timely and uninterrupted oxygen therapy is important in reducing childhood mortality, especially from pneumonia which is currently the leading infectious killer of children under five years of age. Reliable supplies of oxygen are scarce in the low-resource settings with the highest mortality rates, and to reduce this mortality burden many more health facilities will need access to oxygen.

Currently, two broad options exist for the delivery of therapeutic oxygen in LMICs: high-pressure compressed-oxygen cylinders and oxygen concentrators. Many health workers rely on their familiarity with cylinders, citing their ease of use, ability to provide continuous oxygen for extended periods and the lack of need for equipment maintenance. However, in remote regions the refilling of oxygen cylinders is problematic and prohibitively expensive.

The FREO2 Low-Pressure Oxygen Storage (LPOS) system directly addresses several of the factors limiting the usefulness of concentrators in regions where the power supply is unreliable and intermittent. The system has been specifically designed for use in harsh conditions often encountered in LMICs. The LPOS system can be run from any power source: grid, solar or generator. It accepts a wide range of input voltages and has inbuilt surge protection. Oxygen produced by LPOS is automatically stored in the low-pressure oxygen storage vessel, which allows for simultaneous delivery while the unit is being filled. An important feature in the design of LPOS is that delivery of previously stored oxygen can be accomplished automatically without electricity. During a power-outage, LPOS maintains oxygen flow to a patient without user intervention.

A recent clinical trial in Uganda has confirmed that over a 3-month period, the FREO2 system provided 100% availability of oxygen to four beds in a pediatric ward. During this trial there were more than 85 significant blackouts and yet the oxygen flow to the patients was never interrupted.

FREO2 has secured manufacturing contracts and will begin mass manufacture of our oxygen system in 2020. An important part of our rollout strategy for LPOS is to empower communities by creating local ownership and employment in the installation, maintenance, and repair of FREO2 oxygen systems.



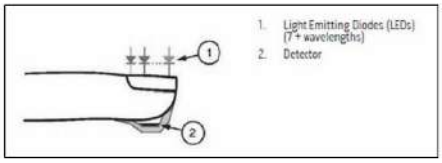
Masimo's noninvasive hemoglobin technology: Total Hemoglobin

Submitted by - Grant Aaron

Total Hemoglobin (SpHb®) is a breakthrough measurement that allows clinicians to noninvasively monitor hemoglobin—facilitating earlier and better clinical decisions, improved patient safety, and reduced cost of care.

SpHb technology uses a multiwavelength sensor with various LEDs that pass light through the measurement site to a diode (detector) as shown in the figure below. Signal data is obtained by passing various visible and infrared lights (LEDs, 500 to 1400nm) through a capillary bed (for example fingertip) and measuring changes in absorption during the blood pulsatile cycle. The detector receives the light and converts it to an electrical signal which is, in turn, used to predict SpHb.

Fig 1. SpHb technology overview



Masimo's Rad-67 provides the ability for portable spot-check monitoring measurements of both oxygen saturation and noninvasive hemoglobin making it a single-device solution in multiple clinical and non-clinical settings, such as emergency rooms, pre-/post-surgery settings, and physicians' offices.

When used with the rainbow® DCI-mini sensor, Rad-67 provides spot-check monitoring with Next Generation SpHb. Next Generation SpHb technology significantly advances the forefront of noninvasive portable hemoglobin spot-check monitoring: SpHb field performance is enhanced across all hemoglobin ranges through faster measurement results and improved repeatability.

The following table represents the accuracy of SpHb measurements obtained using Rad-67 spotcheck monitoring and total hemoglobin (tHb) measurements using an invasive point-of-care device, each compared to a laboratory reference device.

Device	Subjects	Samples	Limits of Agreement
SpHb vs Laboratory Hematology Analyzer	319	660	-1.82 to 2.07
Invasive Point-of-care Device (Capillary Blood Draw) vs Laboratory Hematology Analyzer	283	283	-2.5 to 1.98

BlueBird - The Path of Least Resistance

Submitted by - Dr Darryl Vine

Neonatal sepsis is a common and deadly disease that remains a leading causes of morbidity and mortality among newborns. While the challenge is significant, technology such as Bluebird can dramatically reduce adverse events, improve clinical outcomes and deliver significant return-on-investment.

Bluebird is a cloud based, tightly integrated infection control and antimicrobial stewardship and clinical decision support (CDS) solution that improves the efficiency of clinicians and the safety of patients allowing more to be accomplished with fewer clinical and IT resources. Bluebird institutionalize best practices and facilitates compliance with regulatory mandates. Bluebird was designed from the ground up to exceed both the American CDC and the Australian Commission on Safety and Quality in Health Care guidelines and currently helps more than 70 large facilities in Southern Africa consistently achieve best practice.

In the context of the NICU, Bluebird helps manage neonatal sepsis by providing real time identification of "At Risk" babies and then ensuring early, effective and audited action to ameliorates that risk.

Bluebird's intelligent algorithms aggregate real time data to identify patients where clinical intervention would do the most good. Actionable intelligence is provided at the bedside in order to facilitate optimal decision making. A systematic, standardized and efficient clinical workflow helps ensures that important risks to patient safety are not overlooked and that the work load is balanced with the clinical resources available in that specific NICU.

Role based, intuitive interfaces are available to unit managers, doctors, infection control nurses and clinical pharmacists. Allocated tasks are tracked to completion. Sophisticated wizards such as one for pedVAE ensure that HAIs are accurately and consistently classified. Tools for supervisory oversight are provided.

Targeted prospective audits of antibiotics with tight feedback to prescribers are included as part of the pharmacist's work list. CDS is provided, for example, if a baby has Vancomycin prescribed, Bluebird will show the recommended dosing specific for that baby.
Bluebird offers a comprehensive library of potential alerts and, importantly, tracks any alert fired to resolution. Cascading alerts ensure that life threatening conditions such as bacteraemia, meningitis, CRE and CRPA are addressed urgently.

Bluebird's Active Outbreak Management is another powerful tool that saves lives in the NICU.

While it is becoming increasingly difficult to manage the complexity inherent in modern medicine, technology such as Bluebird can dramatically reduce adverse events and improve clinical outcomes.

Smart Discharges

Submitted by - Matthew Wiens

In low-income countries, death, disability and recurrent illnesses after routine treatment and discharge from hospital are common. This is particularly true for those with sepsis, one of the most common causes of death in children in these settings. Astonishingly, for children admitted to hospitals for severe infections that cause sepsis, similar rates of death are seen once they leave the hospital as during their stay in the hospital. In Uganda, about 1 in 20 children die during the post-discharge period.

Smart Discharges is our innovative solution to improve the outcomes of children after discharge. Smart Discharges combines data-driven risk prediction with a personalized care program to ensure that the most vulnerable children receive life-saving care after discharge. Facilities who implement this program benefit through the efficient use of limited resources. The caretakers of children benefit through a care plan most suited to the unique risk profile of their child, rather than a one-size fits all approach. Ultimately, Smart Discharges is a holistic system-based approach to reduce post-discharge morbidity and mortality in children through improving the quality of care for children who are recovering from severe infections and sepsis.

Through strong partnerships with a Ugandan NGO, Walimu, and the Uganda Ministry of Health, Smart Discharges is being implemented in four hospitals in southern Uganda, which together serve a catchment area of 31 districts.

A Smart Discharges package for facilities includes:

- A facility survey for baseline assessment, as well as ongoing monitoring & evaluation of discharge resources, practices and patient/health worker feedback
- A comprehensive training program for health workers and facility administrators to guide implementation of Smart Discharges at the facility
- Access to the novel Smart Discharges prediction algorithms, which can be integrated into EHR's, tablets/phones, or paper-based models, according to facility resources, to conduct post-discharge risk assessments on admitted children
- Patient and health worker counselling and educational materials for use in discharge planning and counselling

Preliminary results have demonstrated:

- A 3-fold increase in appropriate post-discharge follow-up
- A 2-fold increase in re-admission, demonstrating early identification and treatment of critically ill children
- A potential 30% reduction in mortality

The NeoTree

Submitted by - Dr Michelle Heys & Dr Simbarashe Chimhuya

Each year, around 2.5 million children die in their first month of life. The NeoTree, seeks to overturn this statistic by empowering healthcare workers and strengthening healthcare systems in their care for sick and vulnerable newborns.

The NeoTree is a mobile health application for newborn health care workers to use on a low-cost tablet device at the bedside to admit and discharge sick and vulnerable newborns. While capturing vital clinical information at admission and discharge it provides an interactive platform for clinical decision support and quality improvement according to national guidelines and best available evidence. Key features include immediate data collection, newborn emergency triage warnings, integrated newborn education and feedback of data collected by healthcare workers to a user friendly data dashboard in the local neonatal department displaying summary statistics for key newborn outcomes.

The Neotree app was co-created with healthcare workers in Bangladesh, Malawi and Zimbabwe. The ideas behind the NeoTree were first tested with newborn care nurses in Bangladesh. We then co-developed and tested an early version of the NeoTree in Malawi where it was shown to be acceptable and feasible to healthcare workers and to fit within their usual clinical work. This agile, feasible and accessible tool is currently being further developed and tested in Malawi and Zimbabwe with a view to larger scale roll out and testing in these countries. In the future we look to extend it to other African and South Asian countries and to including a version of the app that improves the care for mother and baby during delivery.

The NeoTree is not for profit. All of our software code is open source. Co-production is a strong theme – not only with healthcare workers but also with the Ministries of health in both Malawi and Zimbabwe in order to optimise applicability, relevance and sustainability. We have an inclusive ethos and collaborate with a number of clinical and academic teams to allow the data collection function of the NeoTree to aid evaluation of other interventions in newborn care.

Pocket Doc – A Digital Triage Platform

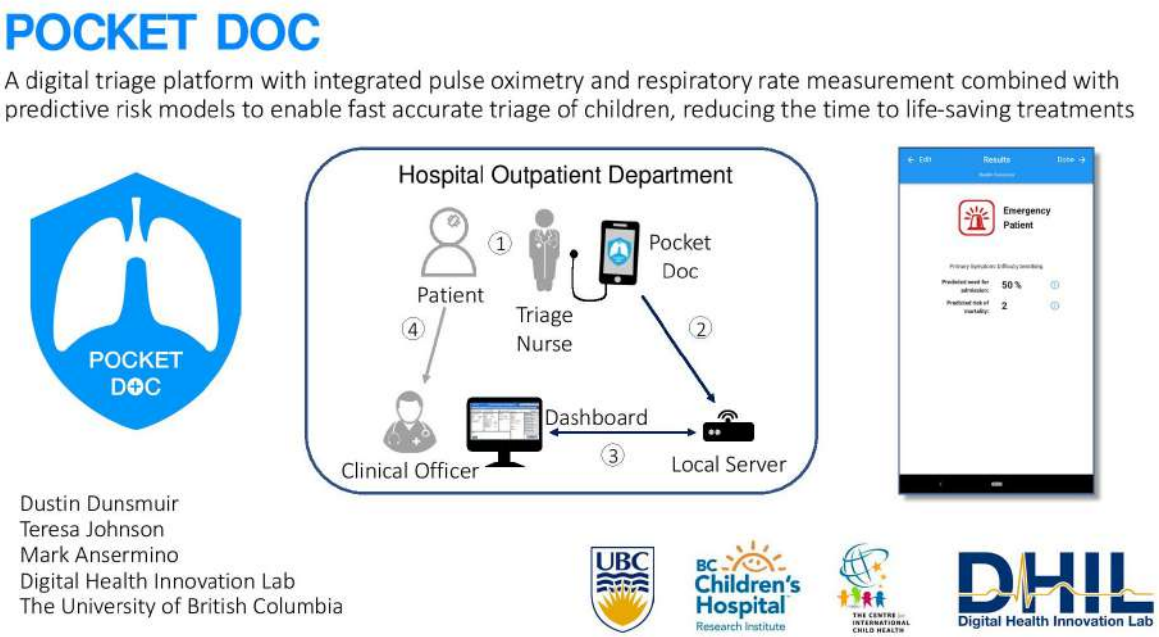
Submitted by - Dustin Dunsmuir

The Pocket Doc is a simple, low-cost, mobile health technology that uses a light-weight sensor and a data-driven app to assess a child's vital signs and overall condition. The Pocket Doc can help streamline the triage process in an outpatient department (OPD) by identifying within just a few minutes whether a patient is at a high risk of adverse health outcomes and may require immediate medical attention.

The Pocket Doc collects routine patient demographics, signs and symptoms, as well as pulse oximetry and respiratory rate information through validated apps using mobile phone compatible sensors, all in under 5 minutes. For each child, the system calculates a predictive risk score and assigns a triage category (non-urgent, priority, or emergency) that is sent to a clinician dashboard where skilled healthcare workers can immediately see level of risk, how long they've been waiting, and track the child's location in the hospital. Using the dashboard, a healthcare worker can rapidly prioritize and administer lifesaving treatments to the children who need it most.

The Pocket Doc platform was developed using a human-centered design approach that included focus groups and ongoing feedback from healthcare workers in the Mbarara region of Uganda. The system has been operating at Holy Innocents Children's Hospital (HICH) as a quality improvement initiative since October 2018. Data collected from the dashboard on the movement of patients throughout the OPD, including the timing of triage and treatment, have allowed us to monitor improvements in efficiency through weekly summary reports developed for HICH. Compared to baseline, the Pocket Doc was able to help hospital administration and staff reduce the percentage of children waiting an hour or longer for intravenous antibiotics (IVA) from 44.3% to 34.8%.

Pocket Doc has been adapted to fit within the workflow of the HICH OPD. Redundant data entry has been reduced through automated information exchange between the electronic hospital information system and the Pocket Doc app. The Pocket Doc system, including the dashboard, runs completely independent of an Internet connection to avoid interruptions of service due to outages. We are currently analyzing the HICH data for the performance of Pocket Doc's triage categorization using IVA and admission as outcomes to determine how we can improve and tailor triage classifications for the local context.



ResAppDx: A cough analysis smartphone application for diagnosis of acute respiratory illnesses in children

Submitted by - Dr. Peter Moschovis

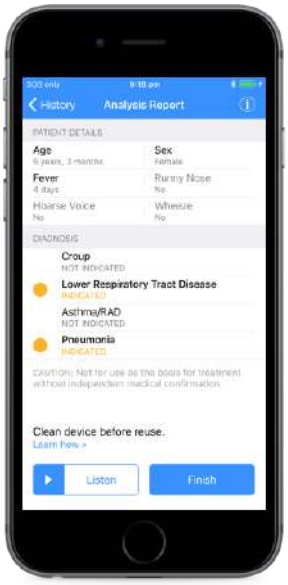
Background: Acute respiratory illnesses, including upper respiratory tract infections, asthma, croup, bronchiolitis, and pneumonia, are the most common reason for emergency department (ED) visits among children in the United States and the leading cause of under 5 mortality worldwide. A point of care test for distinguishing between the major causes of acute respiratory illness could reduce time to appropriate treatment, reduce ED visits, and improve outcomes.

Methods: We performed a prospective study of ResAppDx, a cough analysis algorithm that automatically detects coughs and uses mathematical features of the cough and parent-reported symptoms (fever, wheeze, rhinorrhea, duration of symptoms, and age) to predict the presence of various common childhood respiratory illnesses. We enrolled children age 1 month to 12 years presenting with a respiratory complaint to primary care clinics, urgent care, emergency department, or inpatient wards (within 24 hours of admission) at Massachusetts General Hospital, Cleveland Clinic, and Texas Children's Hospital. A minimum of 5 spontaneous or voluntary coughs were recorded using an iPhone 6S. All cases were reviewed by an adjudication committee blinded to the ResAppDx diagnosis. The sensitivity and specificity of the ResAppDx diagnosis was calculated using clinical and radiologic adjudication as reference standards.

Results: We enrolled 1468 children, of which 1251 children had analyzable coughs. The average age of enrolled children was 5.8 (+/- 3.2) years, and 55% of children were male. Children were enrolled in outpatient clinics, (30%), urgent care (19%), ED (45%), and inpatient (6%) settings. The ResAppDx algorithm predicted presence of isolated upper respiratory tract disease with 76.5% sensitivity and 70.9% specificity, lower respiratory tract disease with 73% sensitivity and 77% sensitivity, asthma/reactive airways disease with 71% sensitivity and 86% specificity, bronchiolitis with 76% sensitivity and 60% specificity, and pneumonia with 63% sensitivity and 62% specificity (see Table).

Discussion: A smartphone-based algorithm using cough analysis and parent-reported symptoms provides moderate sensitivity and specificity for common childhood respiratory illnesses, within the reported range of chest radiography and rapid viral respiratory tests. This diagnostic tool has potential applications in the care of children with acute respiratory illness in both high and low-resource healthcare settings.

Disease	Sensitivity (%) [95% CI]	Specificity (%) [95% CI]	Positive likelihood ratio (LR+) [95% CI]	Negative likelihood ratio (LR-) [95% CI]
Upper respiratory tract disease (isolated)	76.5 [73.2, 79.5]	70.9 [66.4, 75.0]	2.62 [2.26, 3.05]	0.33 [0.29, 0.38]
Lower respiratory tract disease	72.8 [68.2, 77.1]	77.2 [74.0, 80.1]	3.19 [2.77, 3.68]	0.35 [0.30, 0.42]
Asthma	71.0 [63.7, 77.6]	85.9 [83.4, 88.1]	5.03 [4.17, 6.07]	0.34 [0.27, 0.43]
Bronchiolitis	76.2 [60.5, 87.9]	59.6 [48.6, 69.8]	1.88 [1.39, 2.55]	0.40 [0.23, 0.71]
Pneumonia	63.0 [52.8, 72.4]	61.9 [59.0, 64.7]	1.65 [1.40, 1.96]	0.60 [0.46, 0.78]



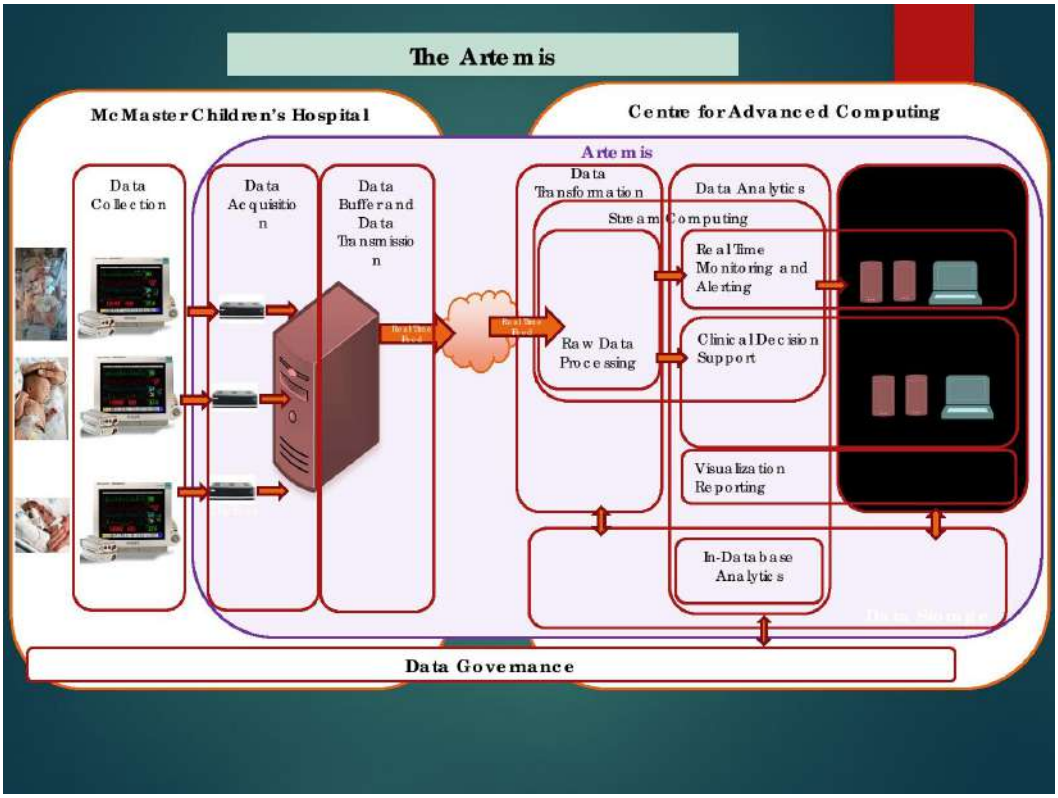
Artermis: Opportunities and challenges using cloud-based big data online health analytics for rural NICUs and PICUs in KwaZulu-Natal, South Africa

Submitted by - Xolisiwa Majola

Early neonatal and perinatal deaths have been affecting most government hospitals in South Africa. There is a challenge of discovering new patterns in high frequency physiological data streams which is not supported by information technology used in Pediatric Intensive Care Units (PICUs) and Neonatal Intensive Care Units (NICUs). The high frequency of physiological data in hospitals provides great potential for new insights in many conditions that patients can develop in critical care units. A Big Data Analytics based Clinical Decision Support Systems, such as Artemis can assist in this regard.

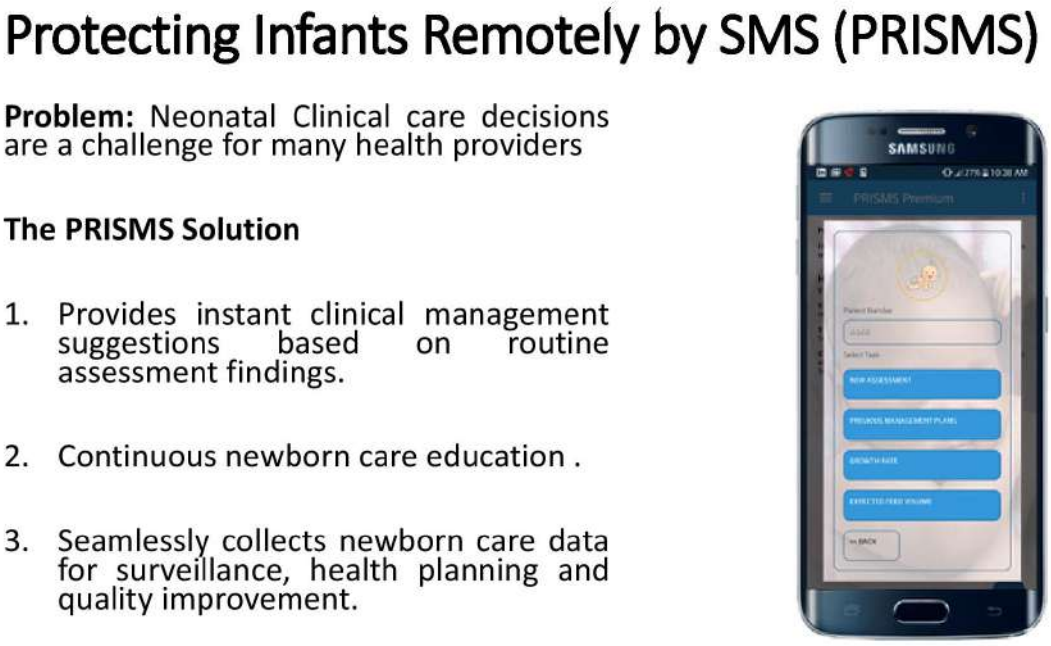
Artemis was first deployed as a pilot in the NICU at The Hospital for Sick Children in Toronto in August 2009. It is now deployed in the NICUs at McMaster Children's Hospital and Southlake Regional Health Centre in Ontario, Canada. It employs all the potentials of big data. Both original data together with newly generated analytics is stored in the data persistence component of Artemis.

Real-time analytics is performed in the Online Analytics component. The knowledge extraction component of the system takes care of data mining which is enabled to support clinical research for various conditions. Artemis to date has been utilized in three different implementations. However the use of Artemis still holds many challenges for lower resource settings like South Africa. This research demonstrates the challenges and opportunities to use Artemis cloud as a cloud computing based Health Analytics-as-a-Service approach for the provision of remote real-time patient monitoring for low resource settings. A case study research will demonstrate the implications, opportunities and challenges of utilizing Artemis in KwaZulu-Natal for small and remote pediatric critical care units viz NICU/PICU in government hospitals. Utilising big data within pediatric intensive care units has great potential to improve healthcare in these low resource settings.



Augmented Infant Resuscitator (AIR)

Submitted by - Data Santorino



Augmented Infant Resuscitator (AIR)

Submitted by - Data Santorino

Background: Effective bag-mask ventilation is critical for reduction of birth asphyxia related stillbirths and neonatal deaths, however providers often fail to achieve and maintain effective ventilation. We evaluated the effect of real-time-feedback from the Augmented Infant Resuscitator (AIR) device on ventilation quality in Uganda and USA.

Methods: Participants ventilated manikins with real time feedback or no feedback on ventilation quality using the AIR device. Participants were further randomized to ventilate three blinded ventilation scenarios on identical appearing mannequins whose airways were either normal, partially leaking air, or partially obstructed. We measured time to and duration in effective ventilation in 120 second ventilation sessions.

Results: Providers with AIR device feedback achieved effective ventilation 50% faster, 13.8s [95% CI 10.6, 17.1], compared to control, 27.9s [95% CI 21.6, 34.3], $p < 0.0001$. Duration of effective ventilation was longer in the AIR device arm [72.1s [95% CI 66.7, 77.5] compared to control, 47.9 [95% CI 41.6, 54.2], $p < 0.001$.

Conclusion: Real-time feedback on ventilation causes faster effective ventilation attainment and longer ventilation duration.

D-Rev CPAP

Submitted by - Daniel Wald

Respiratory Distress Syndrome (RDS) is the leading cause of premature infant mortality globally. This breathing disorder occurs in infants born under 37 weeks when the air sacs (alveoli) in the baby's lungs do not remain open. 1.2 million premature babies develop RDS each year. Effective respiratory support can improve a neonate's survival rate by 70%. In well-resourced hospitals, infants receive adequate respiratory support. The market offers a range of respiratory assist devices, yet no product effectively and broadly meets the needs of hospitals in low-income settings. As a result, babies needlessly die or suffer from brain damage and blindness.

Hospitals in low-income settings report that quality technology is expensive (often upwards of $5,000), demands too much of a nurse's time detracting precious attention away from newborn patients, and is difficult to setup and clean. More affordable – and even improvised devices – are often used in outlier facilities, but lack key life-saving features, including: the ability to (1) adjust pressure and flow rates, (2) blend oxygen, humidify, and compress room air, and (3) treat patients without high-risk intubation. Consequently, these devices pose a risk to patients and often result in neonates not receiving adequate respiratory therapy.

Our proposed solution is a novel, comprehensive infant respiratory support system that targets health facilities serving low-income patients. The product features address the challenges of delivering care in complex environments, including facilities with insufficient nursing staff and insufficient access to needed inputs such as sterile water, compressed air or oxygen, and reliable electricity. The device includes built-in heated humidification, air compression, and oxygen blending to mitigate lack of existing hospital resources and improve health outcomes. The all-inclusive device eliminates the need for a separate blender, compressor, and humidifier, reducing the complexity of setup and maintenance. Interactive onboard instructions combined with smart audio and visual therapy alarms help even undertrained and overburdened nurses deliver effective CPAP therapy.

Core Innovations of the D-Rev CPAP

An novel, fully integrated CPAP designed to assist overburdened neonatal nurses in low-resource hospitals deliver world class respiratory therapy and heated humidification to newborns suffering from RDS

Easy to Monitor

- Sensors identify unwanted changes, such as a drop in pressure if the patient interface becomes loose, and alerts clinicians via audio & visual alarms.

Easy to Set Up and Use

- Heated humidification and electronic air/O_2 blending (21%-100%) are directly integrated into device, reducing the need to buy & assemble external components
- Pressure is set directly and electronically: no need to adjust a straw in a bubbler.

Appropriate for Low-Resource Hospitals

- Uses a turbine to enable delivery of pressure (21% O_2) without compressed air (can also be used to deliver 21% FiO2 without separate oxygen input)
- Has battery backup for handling power interruptions and short transport
- Can be easily hand-carried around the hospital when CPAPs are in shortage

D-Rev

Stickerchart to improve treatment adherence in children

Submitted by - Dr. A. Marceline Tutu van Furth

A team of Dutch and South African scientists had developed a treatment adherence chart for children with HIV and with tuberculous meningitis in the Western Cape, South-Africa. The tools provided both education and reinforcement to the patient and to the caregiver. At the clinic the nursing staff educated caregivers on how and when to administer the medication. Caregivers are also told what to do if the child refused the medicine or had an adverse reaction. The child was given a low budget medical device (stickerchart) that motivated him to take his medication (Figure 1). Each time the child took his medicine he was rewarded with a sticker. The sticker was affixed to a special chart. At the end of each month of therapy the completed chart revealed a picture (Figure 2). Each month the child received a new chart.This low-cost, culturally friendly treatment-support intervention had beneficial effects on healthrelated quality of life, family impact, caregiver disclosure of HIV status to the child, increased caregiver reporting of medication non-adherence and caregiver reporting of difficulties administering medication.

Picture of the adherence tool

The set of different drawings for the adherence tool

The picture which appears after a month of therapy

Integrations of mother-infant dyad biometrics (finger prints), geolocation (mapping) and clinical data

Submitted by - Bridget Freyne

Clinical care in Sub-Saharan Africa is challenging, the patients are very ill and decisions are made with inadequate clinical, laboratory and radiological information. Provision of care is usually episodic, with little integration of information across different episodes. Integration of information from different health facilities, across research and routine clinical care, and between relevant family members (including mothers and their babies) is almost non-existent. Much of this lack of integration is due to the difficulties of accurately and consistently identifying the same individual. We propose integrating biometric, geolocation and clinical data of mothers and newborns as a foundation for much-needed longitudinal information. We also hypothesise that linking data across the maternal-newborn dyad has huge potential for optimising perinatal health of mothers and their babies from successive pregnancies.

The development of affordable, robust and well-validated biometric tools has been described as a global health priority. Biometric identification of very young children presents challenges due to differences in infant physiology and behavior. We will evaluate biometric tools which can uniquely identify and link clinical records from mother and newborn infant. This linkage will facilitate the transfer of clinical information from ante-natal care through the perinatal period and into infancy, highlighting vulnerabilities amenable to intervention at all stages. In addition, this innovation will allow efficient flow of data between primary, district and tertiary level centres enabling audit and feedback of clinical care outcomes..

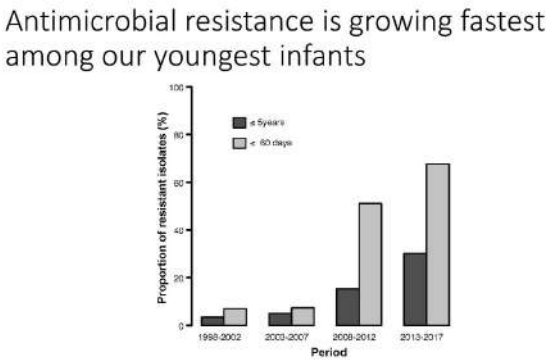
The ePAL system (electronic Participant Locator), allows patients and health workers to geolocate their household directly during a health centre visit. Field workers orientate patients on digital maps using local landmarks and then select co-ordinates for their residence. This facilitates communication with patients and integrates environmental information to improve direct clinical care and research. The use of geospatial information systems has a range of public health applications in maternal and child health including determination of service delivery and utilization, mapping of socio-cultural and environmental determinants of adverse pregnancy outcomes and subnational identification of heterogenetity of risk factors and vulnerable populations. WHO recommends expansion of geospatial mapping capabilities in the development of effective and equitable maternal and child health services.

In summary, we propose to integrate mother-infant dyad biometrics (finger prints), geolocation (mapping) and routine clinical data collection for large-scale longitudinal maternal & child health information which will be reusable across research & care

PRiSM Network: Paediatric Research in Antimicrobial Stewardship and Management

Submitted by - Pui Ying Iroh Tam

Paediatric antimicrobial stewardship in low resource settings faces immense challenges. However, growing concerns with AMR and limited antimicrobials in the development pipeline make this an imperative issue. Studies from AFRINEST group illustrate the ability for low resource settings to tackle antimicrobial stewardship issues in children that may not be open to more developed settings, and illustrate a leadership opening for SSA countries. The Paediatric Research in Antimicrobial Stewardship and Management (PRiSM) was formed to take advantage of this opportunity. The roundtable discussion will focus on specific issues, challenges and considerations for paediatric antimicrobial stewardship research in sub-Saharan Africa.



- Do all the patients who get antimicrobials need them?
- Do our antimicrobial regimens work?
- What evidence base do we have for alternative regimens?
- Do we stop antimicrobials when we should?
- Do all the patients admitted to the neonatal unit require admission?
- Can we identify patients who can be safely managed outside of the unit?
- Can we reduce the emergence of AMR and associated impact on mortality among our youngest infants with judicious and evidence-based stewardship and management practices?

Whatsapp for Bubble CPAP Support

Submitted by - Alinane Linda Nyondo-Mipando

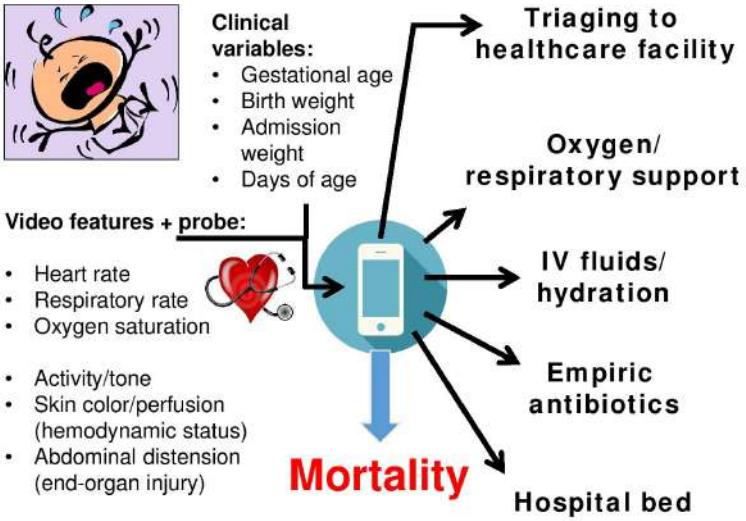
Term and preterm neonates with respiratory distress can often be effectively managed with Continuous Positive Airway Pressure (CPAP) and Bubble CPAP is a safe and cost-effective method for delivering CPAP in low-income settings. Training is key to safe, timely, efficient and effective implementation of Bubble CPAP. Training is compromised because of lack of adequate human resource especially when training demands health care workers to leave their duty station to attend it. Furthermore, in instances where a health worker has been trained, their use of the skills and knowledge are further compromised when staff are rotated from one section to the other. Rotation of staff results in creating a skill and knowledge gap since those that were trained in a technology are not exempted from it which further demands training. As such, training on Bubble CPAP remains a continuous activity within the Malawi Health care system.

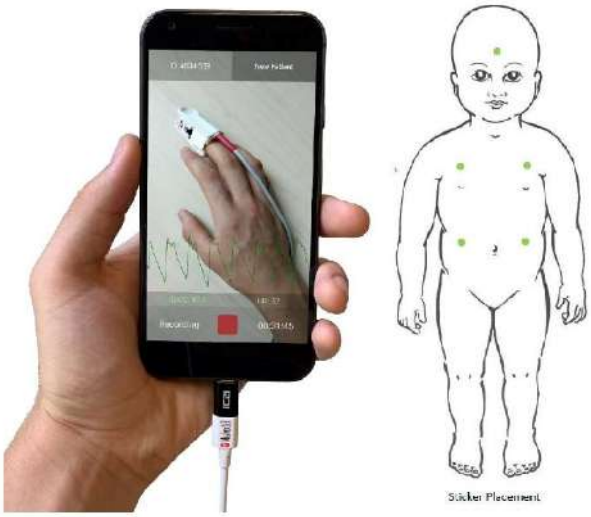
Digital platforms are key in improving delivery of health services. Whatsapp platform is a social media appliance that is widely used for communication in Malawi. Majority of health care workers have a whatsapp profile and use it. This platform has received less inclusion in the health system as a mechanism for supporting health service delivery. This concept proposes development of an app for Bubble CPAP training that can be embedded within a whatsapp platform and forum with an aim of ensuring that health care workers have a training resource within their reach. This platform will include on the eligibility, initiation, monitoring and weaning off process that a health care worker would follow through flow diagrams or decision making points. Having this platform in place has potential of lessening disagreements over implementation of Bubble CPAP secondary to inadequate and incomplete training because health workers will have a resource to consult. We also propose to have a consultant who is skilled in Bubble CPAP to review and respond to the questions raised over the platform with an aim of a creating a frequently asked question list for bubble CPAP.

Video OX: Video for sepsis identification

Submitted by - Pascal Lavoie

Babies can become sick very fast, and they may be unable to tell us when something is wrong medically with them. For parents of a sick baby, it can also be hard to decide if it's time to go to hospital. Even for health worker it can be difficult to identify a sick baby that needs urgent critical care unless this health worker has a high level of clinical experience assessing danger signs in this age group. In countries where healthcare resources are extremely limited, this can pose real additional challenges because healthcare facilities may not be readily available. This situation affects over 4 million infants who die of a major illness before their 28th day each year in the world. To address the major health resource challenge, we are working to develop a smartphone app that can integrate complex video images of a potentially sick baby, together with vital sign measures from a simple, plug-in sensor. Our goal is to integrate this data to provide users with information about how ill a baby is. So far we gathered video image data from hundreds of babies in a health facility in Malawi, Africa and at BC Women's hospital's NICU in Vancouver, Canada. We are currently working on optimizing image processing algorithms that can measure key vital signs including respiratory rate and heart rate from these babies' videos. We are also working on integrating machine learning to similarly detect abnormal clinical signs such as abnormal tone/activity, decreased perfusion (hemodynamic status) and abdominal distension (as a measure of end-organ failure in a critically ill baby) from babies' videos to help triage, refer and orient medical decisions such as the need for O2, respiratory support or IV fluid therapies in those babies.





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