NEO FOR NAMIBIA
HELPING BABIES SURVIVE

MISSION REPORT

Mission 2017-1

July 10, 2017 to August 1, 2017

AUTHORS
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1. INTRODUCTION

Following two fact finding missions in October 2015 and October 2016, we have now completed our first mission with the goal to enhance neonatology services at Rundu State Hospital in the Kavango region of Namibia. For obvious reasons, we aim for sustainable improvements; in addition, we realize that success must be measurable.

We were very fortunate and grateful that our mission was officially welcome by the Health Mister, Dr. Bernard Haufiku and the Permanent Secretary (PS), Dr. Andreas Mwoombola. In addition, the administrative support of Mrs. Landine Beukes from the Ministry of Health and Social Services (MHSS) was highly appreciated.

2. MAIN MISSION GOALS

Based on our observations during two previous visits, we decided to focus on neonatal respiratory support during mission 2017-1. Apart from two pulse oximeters and neonatal pulse oximetry sensors for intermittent oxygen saturation (SpO_2) monitoring, we brought three Pumani© bubble CPAP (bCPAP) devices (Hadleigh Health Technologies, San Rafael, California, USA). The latter device can provide non-invasive respiratory support by providing continuous positive airway pressure (CPAP), which keeps the lungs open and improves gas exchange. It was developed by researchers at Rice University in Texas and field tested in a prospective non-randomized convenience sample in Malawi (1). In this study, the use of the low-cost bCPAP system resulted in a 27% absolute improvement in survival (nasal oxygen group (n = 25): 44%, bCPAP group (n = 62): 71%) (Fig. 1). In other words, mortality rates were reduced by almost 50% (from 56% to 29%).

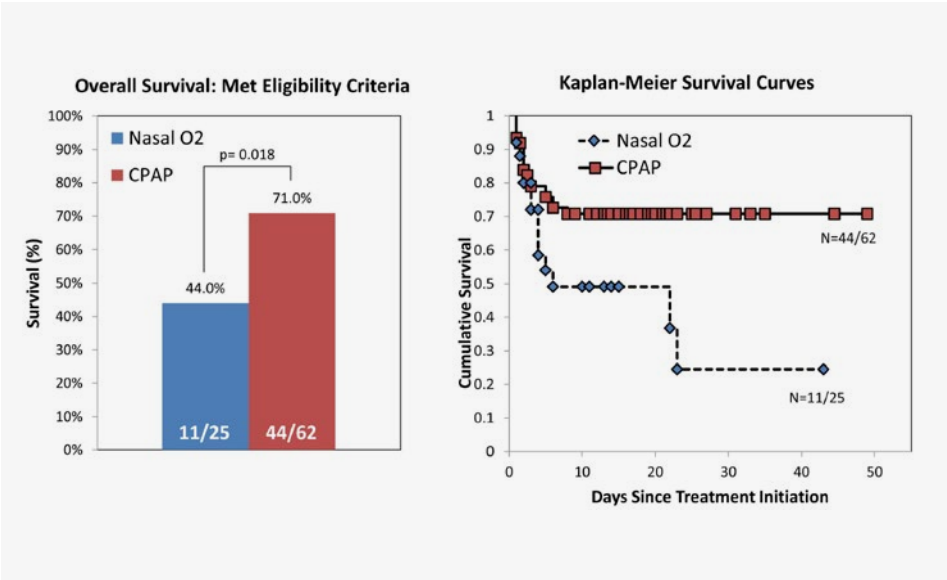


Fig. 1. Pumani© bCPAP study in Malawi: Survival rates of eligible study participants receiving nasal oxygen versus bCPAP (1).

Interestingly, this is very close to the initial observation by George Gregory in San Francisco who was the first to report on the effect of CPAP in infants with respiratory distress more than 50 years ago (2). Recently, Jensen and colleagues have argued that enough evidence has accumulated to consider CPAP a first-line standard of care in devel-

oping countries (3). Quite likely, the successful introduction of this form of non-invasive respiratory support could have a major impact on survival of (preterm) infants with respiratory distress (4 – 6).

Information on the company's website (http://hadleighhealthtechnologies.com) indicates that 639 Pumani© bubble CPAP devices have now been distributed to 127 hospitals in low income countries (accessed August 5, 2017), including the ones we brought to Namibia (Fig. 2).

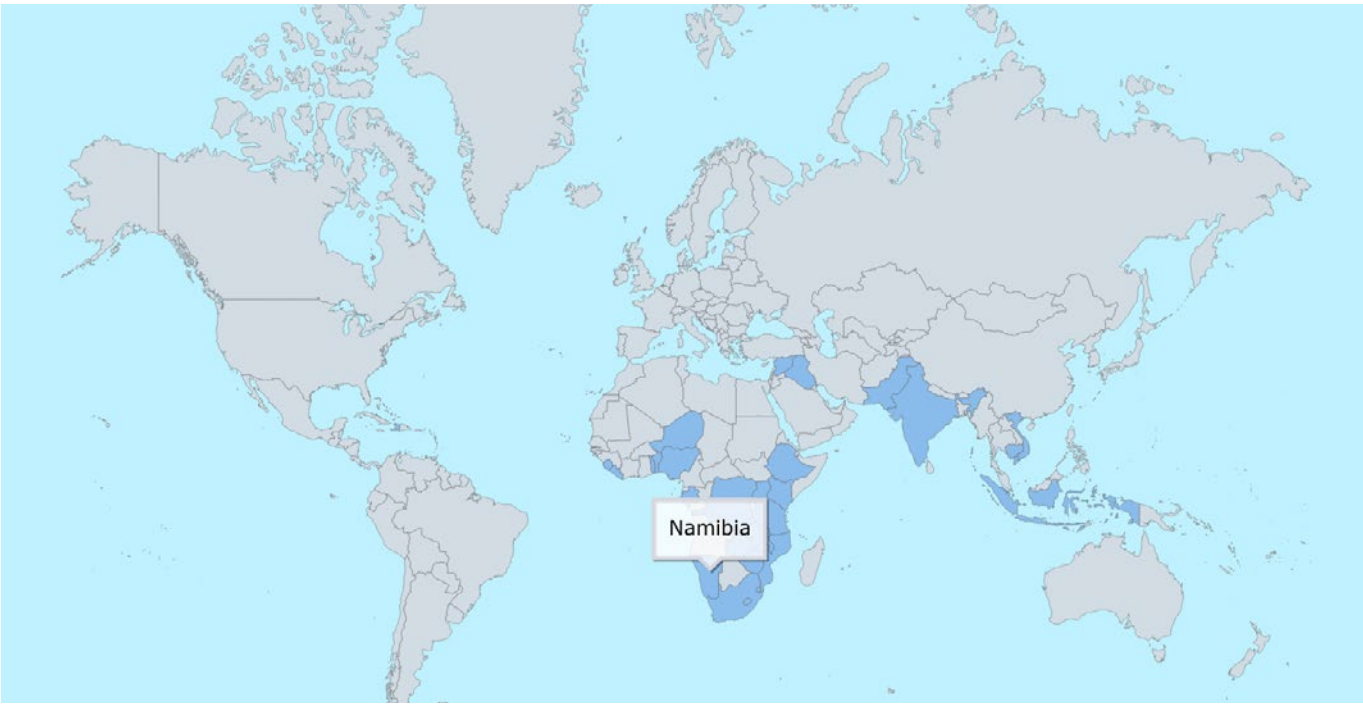


Fig. 2. World map indicating where the Pumani© bCPAP device has been introduced.

We understand that while cheap, robust and reliable equipment is a prerequisite, successful use of such equipment is only possible after careful instruction. We therefore decided to provide intensive training for all health care professionals who would potentially use the device.

3. EDUCATIONAL SESSIONS

3.1 Lectures

Theoretical presentations included lectures on basic respiratory support, neonatal resuscitation, oxygen therapy, apnea of prematurity, fluid and nutrition management of sick neonates (including a standardization of written orders) as well as early-onset sepsis and rational use of antibiotics. These lectures were attended by an average of 20 physicians and nurses from various pediatric wards (i.e., Prem Unit, High Care Unit, IV Unit, Pediatric Ward and Maternity Ward).

In addition, two Grand Rounds lectures were given on Friday mornings on topics of

interest to nurses and physicians in general: first, a presentation on the history of neonatal respiratory support, and, second, a presentation on neonatal asphyxia, therapeutic hypothermia and meconium aspiration syndrome. These lectures were attended by more than 40 people and followed by lively discussions.

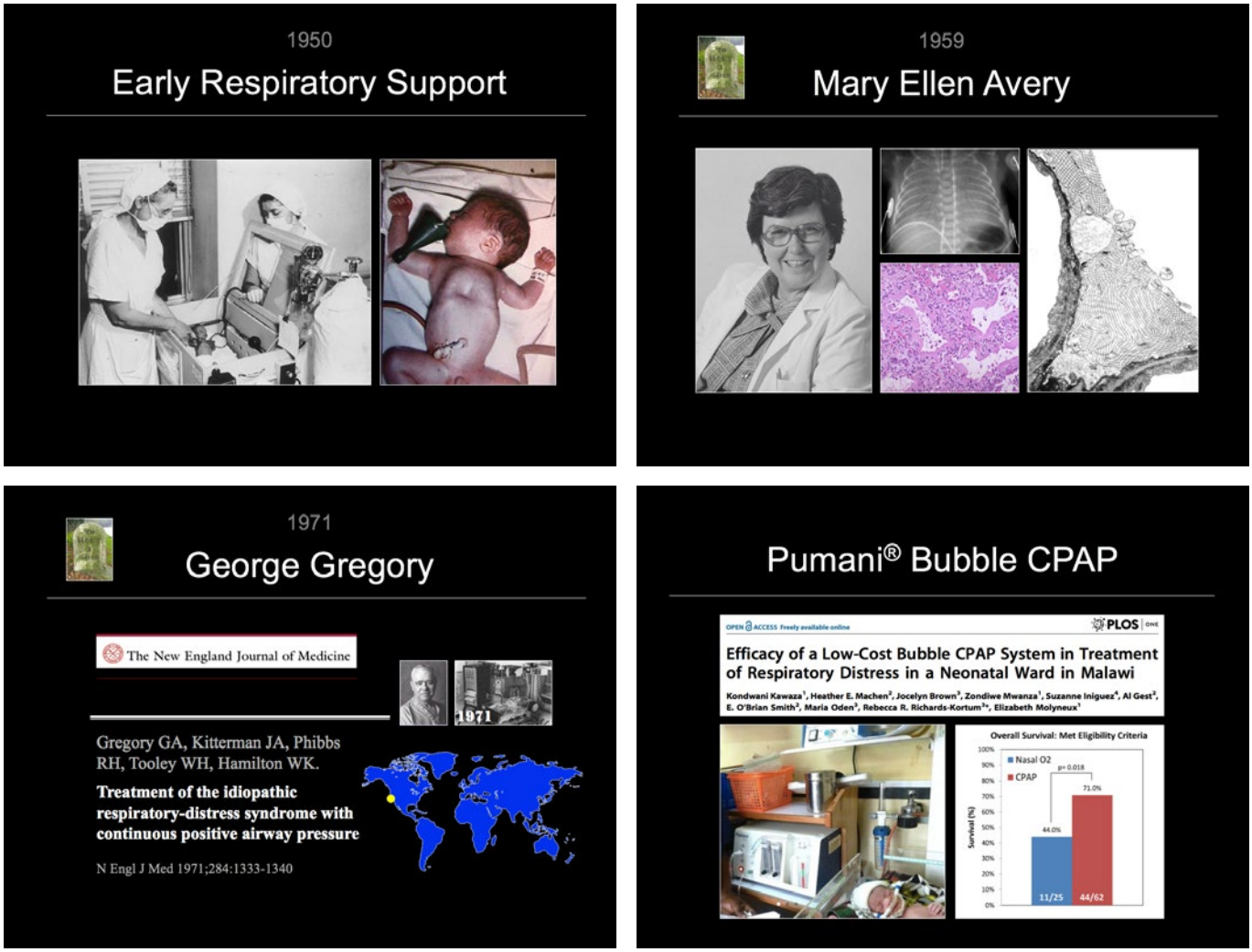
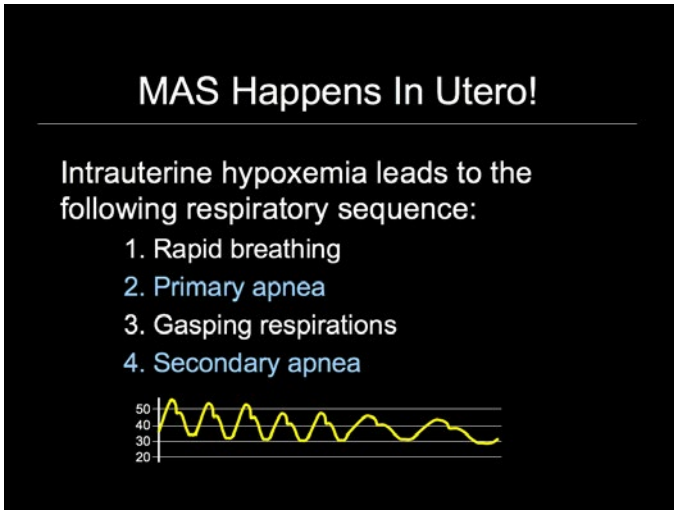
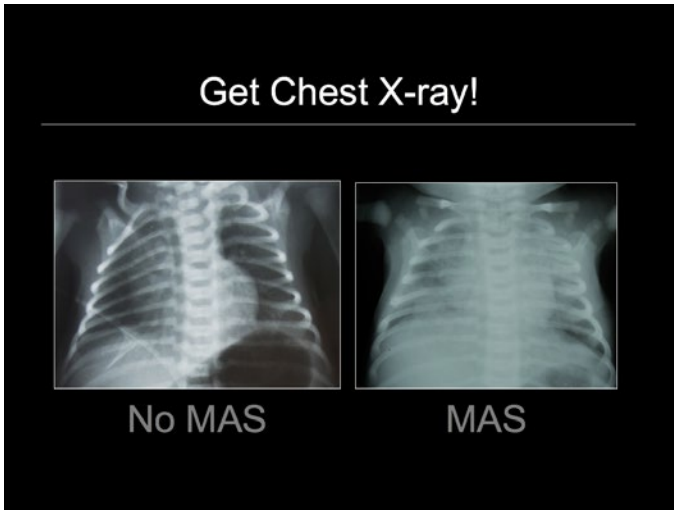
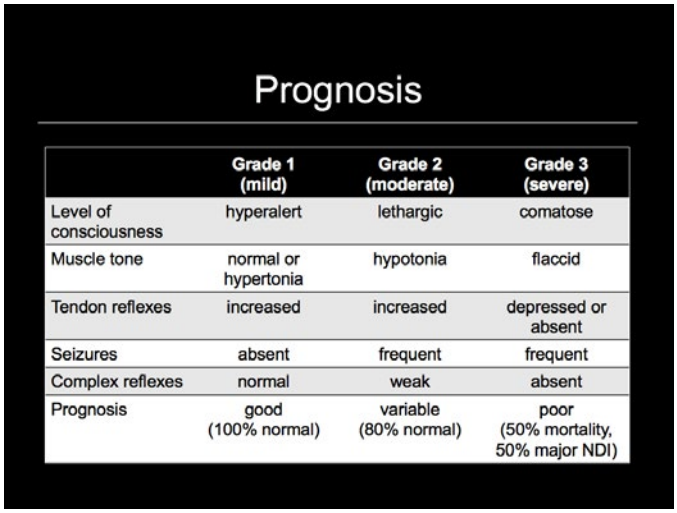


Fig. 3. Grand Rounds presentation I: History of neonatal respiratory support.







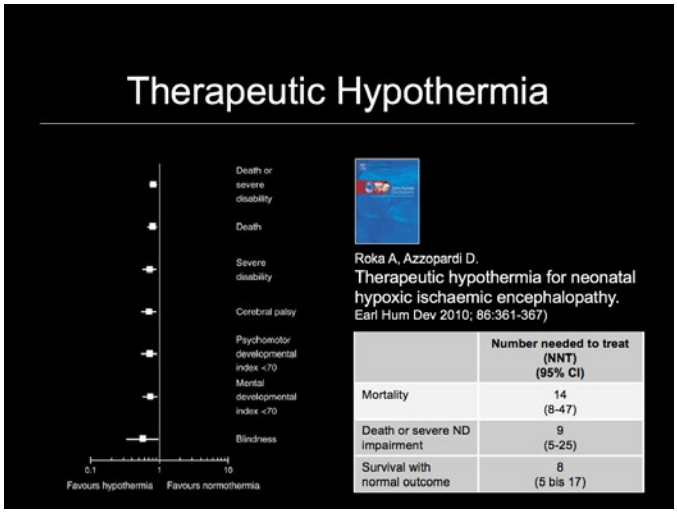


Fig. 4. Grand Rounds presentation II: Neonatal asphyxia and meconium aspiration syndrome.

3.2 Practical sessions

A total of three Pumani© bubble CPAP device were purchased and shipped from the United States to Windhoek, Namibia. From there, we brought them to Rundu State Hospital (more than 700 km north of Windhoek) by car. We were very satisfied to see that the equipment was complete and in working order (Fig. 5).

The goal of the practical sessions was to familiarize all health care professionals with the features of the Pumani© bubble CPAP device. The practical sessions were conducted in small groups and repeated until a total of 39 physicians and nurses could attend at least one session (many attended several times) (Fig. 6). On two separate days, health care professionals were given the opportunity to demonstrate their knowledge and skills. Those who were successful received a CPAP button indicating their successful training (Fig. 7).

We were thrilled to hear that a certified pediatrician, Dr. Isha Kamara, who was trained in Nairobi, Kenya, had prior experience in the use of the Pumani© bubble CPAP device. She joined the physician staff at Rundu State Hospital in December 2016. We found her to be extremely well trained and highly motivated; we are convinced that she has the potential to play a key role in the successful implementation of bCPAP in this hospital.

Fig. 5. Arrival of the equipment at Rundu State Hospital: complete and in working order!

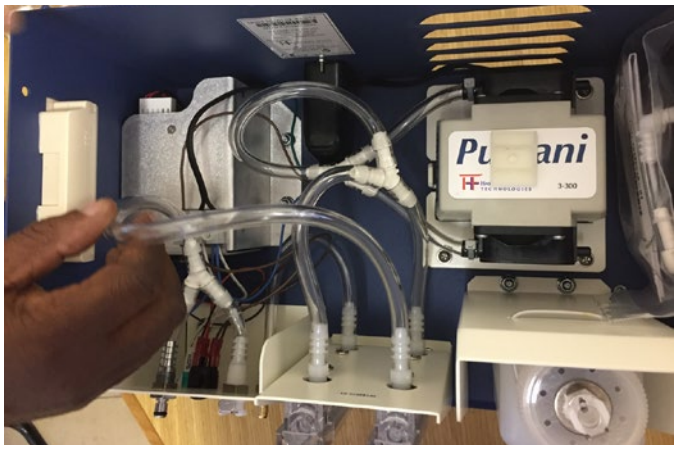


Fig. 6. Practical training sessions on the proper assembly and patient application of the Pumani© bubble CPAP device.

Fig. 7. Following training and examination, participants received a CPAP button to acknowledge their success.

Finally, the Pumani© bubble CPAP devices were installed in the Prem Unit (2 devices) and the High Care Unit (1 device) (Fig. 8). To adequately store consumables, a metal locker and plastic boxes were bought and appropriately labelled. To keep track of the equipment, an inventory list was assembled and handed over to Dr. Isha Kamara.

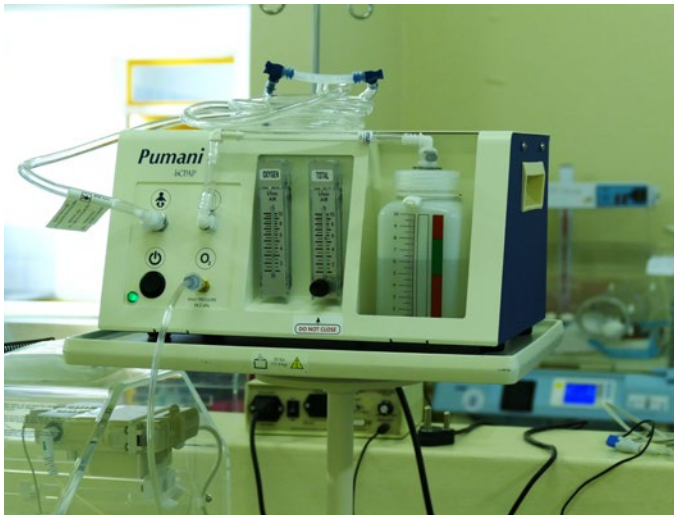


Fig. 8. Finally: the potentially life-saving equipment is installed in the Prem Unit and the High Care Unit.

Together with Dr. Kamara, we developed three different algorithms for the use of the bCPAP devices to guide health care professionals (Fig. 9). We also encouraged the use of flow charts to document the support patients on bCPAP were receiving (Fig. 10, left).

Finally, we asked Dr. Kamara to ensure that for all patients who will be put on bCPAP a short registry form will be filled out and sent to us by e-mail at the end of each month (Fig. 10, right). This will allow us to assess the use of the new equipment and provide support if needed.

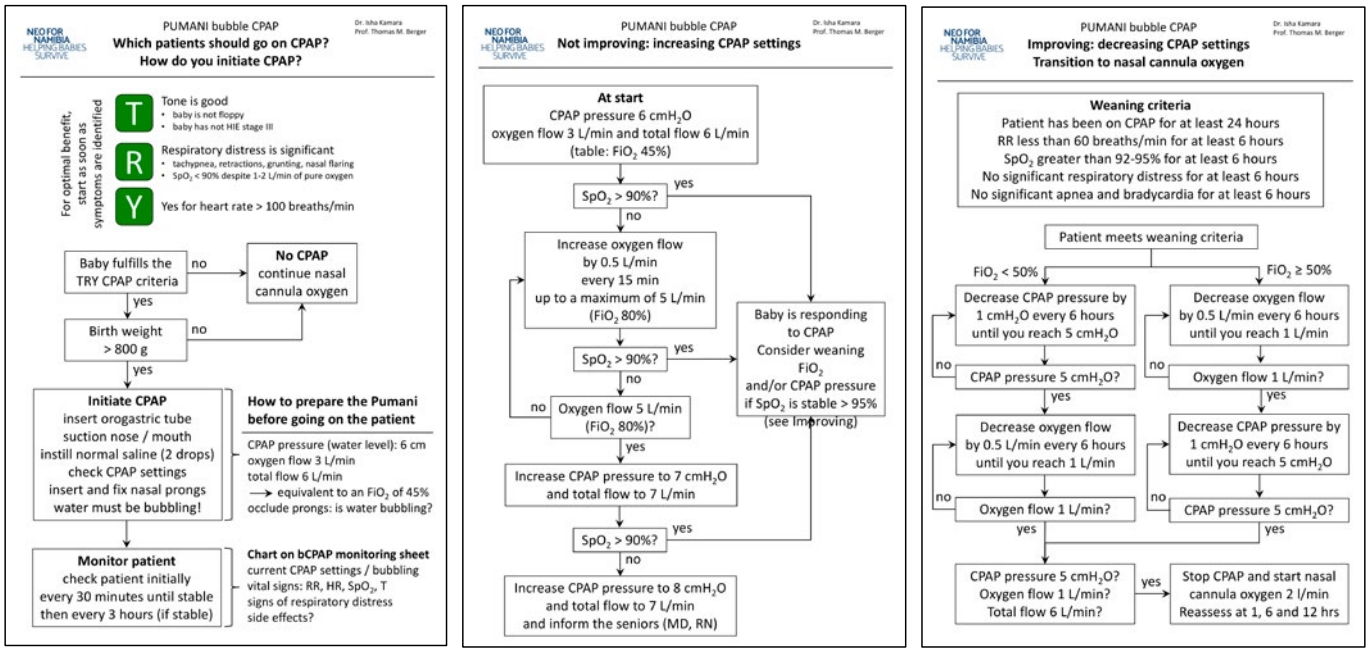
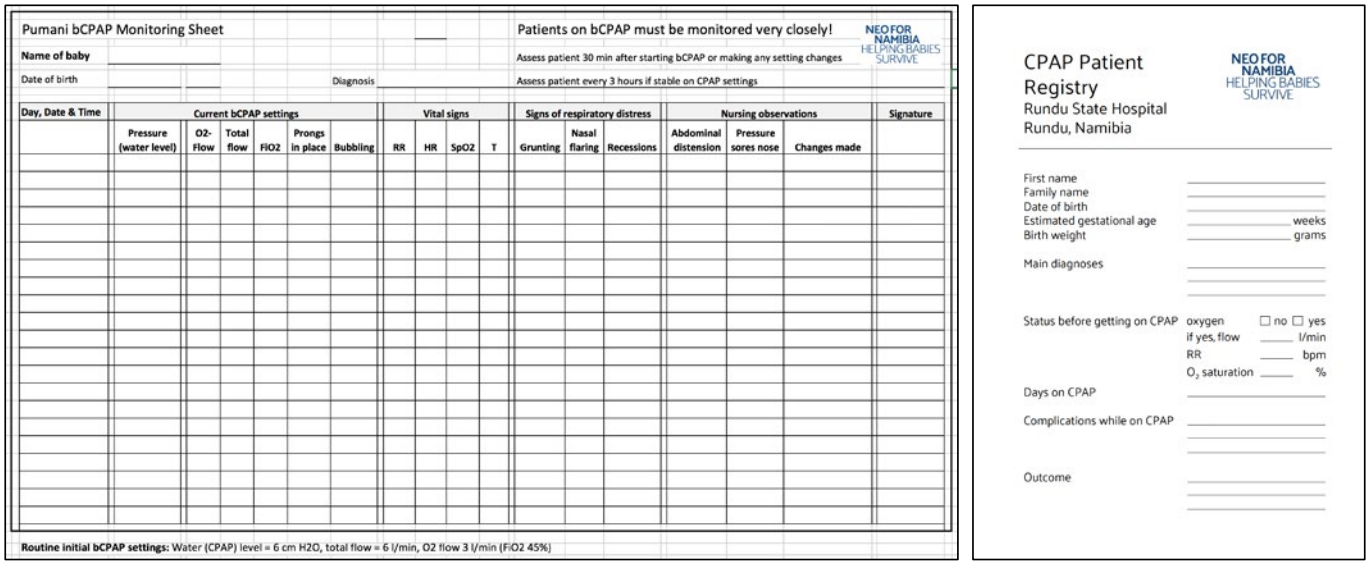


Fig. 9. Pumani© bCPAP algorithms developed in collaboration with Dr. Kamara (left: initiation of bCPAP; middle: increasing bCPAP settings; right: weaning bCPAP).



Pumani bCPAP Monitoring Sheet

Name of baby _____

Date of birth _____ Diagnosis _____

Patients on bCPAP must be monitored very closely!

Assess patient 30 min after starting bCPAP or making any setting changes

Assess patient every 3 hours if stable on CPAP settings

Day, Date & Time	Current bCPAP settings						Vital signs				Signs of respiratory distress			Nursing observations			Signature
	Pressure (water level)	O2-Flow	Total flow	FiO2	Prongs in place	Bubbling	RR	HR	SpO2	T	Grunting	Nasal flaring	Recessions	Abdominal distension	Pressure sores nose	Changes made	

Routine initial bCPAP settings: Water (CPAP) level = 6 cm H2O, total flow = 6 l/min, O2 flow 3 l/min (FiO2 45%)

CPAP Patient Registry
Rundu State Hospital
Rundu, Namibia

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First name _____
Family name _____
Date of birth _____
Estimated gestational age _____ weeks
Birth weight _____ grams

Main diagnoses _____

Status before getting on CPAP oxygen ☐ no ☐ yes
if yes, flow _____ l/min
RR _____ bpm
O_2 saturation _____ %

Days on CPAP _____

Complications while on CPAP _____

Outcome _____

Fig. 10. Pumani© bCPAP: form for nursing documentation (left), form for bCPAP registry (right).

3.3 Feedback

When health care professionals were asked to provide feedback on the lectures and training sessions, the responses were overwhelmingly positive (Fig. 11). Obviously, this is highly motivating and encourages us to continue with our work!

> **«I think the lectures were very helpful for our staff (…). I thank you very much for your support.»**
> Odalys Alfonso, MD

> **«What I did like: the demonstration of CPAP was excellent, information on oxygen therapy and different forms of apnea of prematurity; in general, all the lessons were excellent. What I would like to hear in the future: please, repeat the calculations of fluid requirements.»**
> Paulina Naingwendje, RN

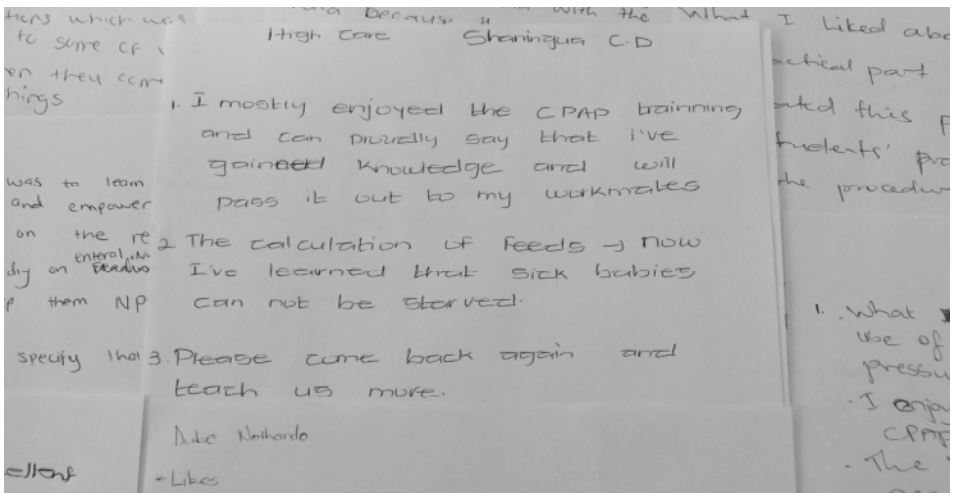


Fig. 11. Participants were asked to provide feedback: what did you like, what did you not like, what would you like to year next time?

«I mostly enjoyed the CPAP training and can proudly say that I've gained knowledge and will pass it out to my workmates. The calculation of feeds: now I know that sick babies should not be starved. Please, come back again and teach us more.»
Conzetha Shaningua, RN

«Perfect presentations, happy to have the CPAP machine and to start using it in patients who need it, understood the whole presentations, saw CPAP machine for the first time. Please, train more nurses on the use of the CPAP machine.»
Hansberth Sifire, EN

«Learning how to use the new equipment was enjoyable and I am willing to accomplish what we were taught in order to save the young ones. I enjoyed the Pumani.»
N. Jossie Muisepi, EN

«The information was easy to understand. There were practicals done, everyone got a chance to set up the CPAP practically. Different modes of information sharing were used, i.e., power point and videos. The facilitators were interactive, initiated discussions and all of us (the participants) were involved. Thank you for taking the time to educate us.»
Nathando Dube, RN

3.4 Work in the ward (Prem Unit)

In addition to our educational efforts, we regularly visited the Prem Unit and observed the daily routines. Whenever possible and appropriate, we got involved in the care of the patients and made suggestions for alternative approaches to various problems (Fig. 12). We emphasised the importance of oxygen saturation monitoring, proper charting of oxygen therapy («L/min» instead of «+»), positioning of babies (encouraging the use of prone positioning), the use of orogastric instead of nasogastric feeding tubes in babies with respiratory distress and weight-based prescriptions of drugs and fluids.

Fig. 12. Bedside instructions of doctors, nurses and mothers.

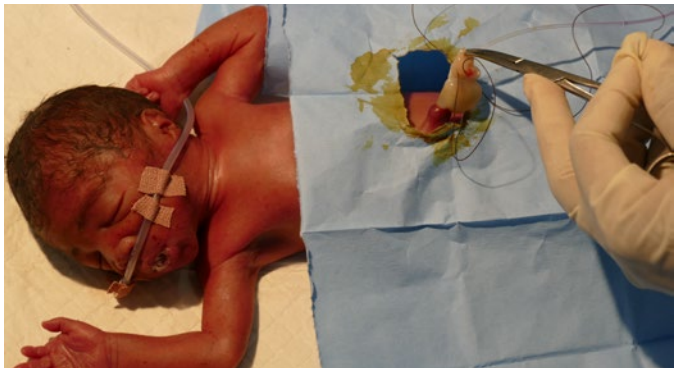
The importance of obtaining daily weights in sick neonates had already been stressed on previous visits and, among many other improvements, Dr. Isha Kamara has successfully introduced this routine (Fig. 12, 13).

Sabine suggested that pulse oximetry sensors were attached to sick patients and left in place for undisturbed intermittent SpO_2 measurements. Careful manipulation of these expensive sensors (approximately 20 US$/piece or 300 NAD) will be important to allow their reuse (Fig. 12). Prone positioning was encouraged when we observed babies with respiratory distress were usually cared for in unsupported supine positioning (Fig. 14).

Fig. 13. Joining ward rounds with Dr. Isha Kamara and Dr. Katamba Banza: we always felt welcome and appreciated that our suggestions were well accepted by doctors and nurses.

Fig. 14. Prone positioning was encouraged based on the observation that many babies with respiratory distress are more stable when put on their bellies.

We also encouraged physicians to use the available diagnostic options, such as CRP measurements to reevaluate suspected early-onset sepsis (two negative values might allow early discontinuation of antibiotic therapy) or bedside X-rays. Many patients with a diagnosis of meconium aspiration syndrome (often made simply based on a history of having been born through meconium-stained amniotic fluid) will be reclassified as having a more benign condition when chest X-rays are normal. When umbilical venous catheters are placed (nasogastric tubes without depth marks are used for this purpose), position should be verified with a babygram (Fig. 15).



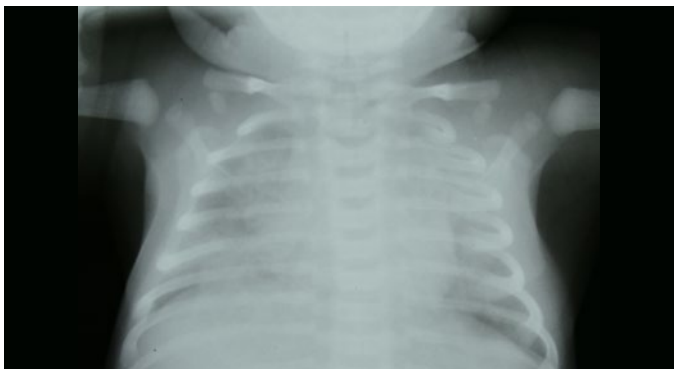


Fig. 15. Bedside X-ray has become available but is only used in some patients: malpositioning of umbilical venous catheters (left) or confirmation of meconium aspiration can only be recognized by X-ray.

When we arrived, Kangaroo Care was practiced, but with difficulties. We were informed that no appropriate chairs were available. We therefore decided to search for light-weight folding chairs in various Rundu stores. Fortunately, our search in town was successful and we could buy five comfortable chairs at an Indian store (Fig. 16, 17).

Fig. 16. Kangaroo Care: it is good for moms and their babies!

Fig. 17. Evidence from the literature is clear: Kangaroo care has many benefits and saves lives!

4. NEXT STEPS

Our work has just begun. We sincerely hope that we will have the opportunity to continue to support developments that will result in improved neonatal care and, consequently, reduce mortality and morbidity of newborn infants in the Kavango region of Namibia.

The project at Rundu State Hospital is a pilot project with a clear focus on certain aspects of neonatal care. It will be important to set up a data base to document the impact of various interventions (forms for a CPAP registry have been developed). If we are successful, our interventions could also be extended to other regions of the country. This approach has officially been approved by the Ministry of Health and Social Services and the Health Minister, Dr. Bernard Haufiku.

We are interested in supporting the final stages of the creation of a new maternity and neonatology ward (Fig. 18); this will also be a major step forward for the care of both mothers and their babies.

Fig. 18. Maternity ward: due to lack of space, mothers must lay on mattresses put on the floor in the corridors of the maternity ward; a new maternity and neonatology ward awaits completion.

We will create a foundation (NEO FOR NAMIBIA – Helping Babies Survive) and present our work on a website. We will develop a business plan, intensify our fund-raising efforts and recruit collaborators (nurses, doctors) who are interested in supporting the program on-site, as well as people who support our foundation with expertise in financing and legal aspects. In the coming years, we plan to spend several months per year in Namibia.

Prof. Thomas M. Berger, MD
NEO FOR NAMIBIA
Helping Babies Survive

Sabine Berger, RN
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