NEO FOR NAMIBIA
HELPING BABIES SURVIVE

MISSION REPORT

Mission 2020 – 1

November 5, 2020 to December 5, 2020

AUTHOR
Prof. Thomas M. Berger, MD
Pediatrician and Neonatologist

Lucerne, 28.01.2021

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www.neo-for-namibia.org

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1. INTRODUCTION

The 10th mission of NEO FOR NAMIBIA – Helping Babies Survive lasted from November 5 to December 5, 2020.

Following the cancellation of our planned mission in April 2020 during the first wave of the Corona pandemic, the next opportunity to travel to Namibia came in late fall. At this time, only a negative Covid-19 PCR test was required to enter the country, and there were no additional quarantine requirements.

This time, Prof. Berger had to carry out the mission without the help of his wife Sabine, because a family medical emergency did not allow her to leave Switzerland.

The flights from Zurich via Frankfurt to Windhoek and from Windhoek via Johannesburg back to Zurich were remarkable for its Corona precautions (Fig. 1), but ultimately uneventful.

Fig. 1. Traveling during the Corona pandemic: empty airports, physical distancing and compulsory face masks also during flights.

After passing Covid-19, immigration and customs check points, Prof. Berger was welcomed at the Hosea Kutako International Airport in Windhoek by Brenton Titus. Together, they traveled more than 4'500 km across the country (Fig. 2, 3). They headed north the next day and spent two weeks at Rundu State Hospital before proceeding to Katima Hospital on November 22, 2020 for a one-week-mission. Thereafter, they returned to Windhoek via Rundu and Otjiwarongo. The final days were spent to meet with representatives at Windhoek Central Hospital (Prof. Clarissa Pieper, Beatrice Callard), Katutura Hospital (Dr. Wilson Landuleni Benjamin), as well as the Minister of Health (Dr. Kalumbi Shangula) and the Executive Director of the Ministry of Health and Social Services (MHSS) (Dr. Ben T. Nangombe).

Fig. 2. Traveling a total of 4'500 km from Windhoek to Rundu, Katima and back.

Fig. 3. Scenes from the Kavango River: this river does not have an outlet to the sea; instead, it flows into the Okavango Delta where it seeps away.

Later, on December 3, 2020, they traveled to Gobabis to visit the family of Quintoline de Westa, the little patient who had been born with a rare heteropagus malformation (Fig. 4) and had undergone several surgical procedures (free of charge) at the University Children's Hospital of Zurich, Switzerland (see Mission Report 2019-1). Accompanied by Michaela Tietz, founder of Okanti Foundation, they were pleased to meet a happy little girl who obviously had made a remarkable recovery (Fig. 5, 6).

Fig. 4. Queenie was born with a complex heteropagus malformation (also known as a parasitic twin) (left); in 2019, she underwent successful repair to achieve normal anatomy of her lower body at the University Children's Hospital of Zurich (right).

Fig. 5. Queenie and her family live in a simple house in Gobabis, 220 km east of Windhoek; recently, with the support of the Okanti Foundation, water has become available outside of the house.

Fig. 6. Queenie and her mom Pauline at their home (left); Queenie goes shopping with Prof. Berger (right).

2. MAIN MISSION GOALS

The goals of the 10th mission were:

- To analyze progress, sustainability and quality of care at Rundu State Hospital by updating statistical data from the Prem Unit
- To train Mrs. Eleotelia Hamutenya to prospectively collect data (NMNDS: Namibian Minimal Neonatal Data Set, CPAP registry, Mechanical Ventilation registry)
- To support the team at Rundu State Hospital to plan the final steps to move to the new Prem Unit (set to open by the end of 2020)
- To review progress made at Katima Hospital following our first visit in December 2019
- To meet with officials of the MHSS to discuss future collaborations
- To visit Quintoline de Westa in her hometown of Gobabis

3. EQUIPMENT

Since Sabine and Thomas Berger had not been able to travel to Namibia in April 2020 as planned, they tried to support their local friends and colleagues by supplying urgently needed equipment and consumables. Provision of the latter had become even more unreliable following the lockdown due to the Corona pandemic. In addition, NEO FOR NAMIBIA – Helping Babies Survive had been contacted with a request by the MHSS to provide open warming units and phototherapy units for Windhoek General Hospital after a critical incident involving a newborn infant (thermal injury due to hot water bags) had resulted in the amputation of an extremity (Fig. 7).

Fig. 7a. The Executive Director of the Ministry of Health and Social Services, Dr. Ben Nangombe, has contacted NEO FOR NAMIBIA – Helping Babies Survive to express his gratitude and to acknowledge the impact of the organization's efforts on neonatal mortality.

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: (061) 203 2325
Fax: (061) 229-637
Elizabeth.Amia@mhss.gov.na

OFFICE OF THE EXECUTIVE DIRECTOR

Ref: 4/5/6/2
Enq: NE Amia

Date: 07 August 2020

Prof. Thomas M. Berger
Secretary and Chief Medical Advisor
NEO FOR NAMIBIA - Helping Babies Survive
Brambergstrasse 25
CH-6004 Luzern
Switzerland

Dear Prof. Berger,

Re: Donation from NEO FOR NAMIBIA to Ministry of Health and Social Services - Namibia

This letter serves to acknowledge the receipt of an assortment of medical equipment and consumables that your organization donated to Intermediate Hospital Rundu and Katima Mulilo State Hospital, respectively.

On behalf of the Ministry, I wish to express my sincerest appreciation for the generosity shown by way of this donation. I am extremely grateful for your invaluable support to the Ministry in specific and the country at large. Your donation will make a positive impact on healthcare as a whole. You have my assurance that the items will be used for the benefit of our patients as intended.

Your organization's support led to a significant reduction in the number of maternal and child deaths in the country. However, the outbreak of COVID 19 has increased the strain on the Neonatal Intensive Care Unit (NICU) at Windhoek Central Hospital. It is for this reason, the Ministry would like to use the donated infant warmer and phototherapy light that formed part of the current equipment received at Windhoek Central Hospital to contain this pandemic.

Furthermore, the country is experiencing a serious delay in the delivery of certain lifesaving equipment such as infant warmers and phototherapy lights amongst others. It will therefore be beneficial to the Ministry if such donations could be extended to other health facilities across the country, including Windhoek Central Hospital NICU.

It is my sincere hope that this relationship and collaboration between your organization and the Ministry of Health and Social Services will continue to grow from strength to strength for the benefit of the Namibian population.

Thank you once again for your continued support and strengthening of our Neonatal health care system. I look forward to a favorable response from you in this regard.

Yours Sincerely,

EXECUTIVE DIRECTOR
MINISTRY OF HEALTH AND SOCIAL SERVICES

.....
BEN NANGOMBE
EXECUTIVE DIRECTOR

Fig. 7b. In his letter, the ED highlighted the strain that the Corona pandemic had put on the health care system; he also requested that NEO FOR NAMIBIA – Helping Babies Survive should consider to donate much needed equipment to the NICU at Windhoek Central Hospital.

Ultimately, the following pieces of equipment and consumables could be delivered in 2020:

2 **MTTS Dolphin®** CPAP devices

4 **Masimo®** pulse oximeters

11 **Wallaby®** warming tables

6 **Colibri®** LED PTx units

2 **Leyte Medical** video laryngoscopes

Fig. 8. Donations by NEO FOR NAMIBIA – Helping Babies Survive in 2020: medical equipment delivered to Rundu State Hospital, Katima Hospital and Windhoek Central Hospital (consumables not shown).

Rundu State Hospital

- 2 MTTS Dolphin® CPAP devices (delivered in June 2020)
- 2 Masimo® Rad-8 pulse oximeters (incl. 4 patient cables)
- 165 pulse oximetry sensors
- 2 video laryngoscopes (Leyte Medical)
- 120 endotracheal tubes (various sizes)
- 5 stylets for endotracheal tubes
- 2 Eve® neo patient tubing sets (reusable)
- 2 Eve® neo neonatal flow sensors (reusable)
- 6 Eve® neo expiration valves (reusable)
- 105 umbilical venous catheters
- 200 IV tubing connectors
- 100 oxygen cannulas for preterm and term infants
- 3 stethoscopes for neonates

Katima Hospital

- 1 MTTS Wallaby® infant warmer (delivered to Namibia in June 2020, but held at Windhoek Central Hospital; finally delivered to Katima Hospital in December 2020)
- 1 MTTS Colibri® phototherapy unit (delivered to Namibia in June 2020, but held at Windhoek Central Hospital; finally delivered to Katima Hospital in December 2020)
- 2 Masimo® Rad-8 pulse oximeters (incl. 4 patient cables)
- 60 pulse oximetry sensors
- 4 umbilical venous catheter training sets
- 20 umbilical venous catheters
- 2 Ambu® bags
- 10 anatomically shaped cushion rim masks for neonates
- 100 oxygen cannulas for preterm and tern infants
- 3 stethoscopes for neonates

Windhoek Central Hospital

- 10 MTTS Wallaby® infant warmers (delivered to Namibia in June 2020)
- 5 MTTS Colibri® phototherapy units (delivered to Namibia in June 2020)

Our thanks go to all of the sponsors of NEO FOR NAMIBIA – Helping Babies Survive who have made these urgently needed donations possible (Fig. 8) and supported the organization's efforts. Clearly, without their help, NEO FOR NAMIBIA – Helping Babies Survive would not have been able to change the lives of so many babies and their families.

4. HOSPITALS VISITED

4.1 Rundu State Hospital

4.1.1 Overall impression

The Prem Unit at Rundu State Hospital continued to function well. The credit for this goes to Dr. Kamara, Dr. Mapanga and Dr. Ashipala, as well as the core nursing staff under the leadership of Cecilia Ndepavali. They worked tirelessly to provide the best possible care to their patients under enormous pressure. Admissions to the Prem Unit increased dramatically in 2020, and, as a result, the average patient census was around 24–32 patients at any given time (Fig. 9).

Fig. 9. The Prem Unit at Rundu State Hospital: busier than ever, the daily census varies between 24 and 32 patients.

Considerable side effects of steps taken to confront potential outbreaks of Covid-19 were noted (Fig. 10). For example, pediatricians had been ordered to cover the Covid-19 unit at Rundu State Hospital; during those time periods (usually 7 days in a row), they were not allowed to work in any other areas of the hospital. In addition, following these rotations, they had to stay in quarantine for another 10 days. Staff shortage was thus even more pronounced than usual.

Fig. 10. Corona precautions at Rundu State Hospital: Patients and visitors must wear masks, keep their distance and disinfect their hands at the hospital entry.

Delivery of consumables had become even more unreliable in recent months. Fortunately, NEO FOR NAMIBIA – Helping Babies Survive was able to order various supplies through the public Kavango Pharmacy (at a total cost of CHF 3'500.00 over the past 12 months), thus helping to avoid critical shortages.

4.1.2 Annual statistics

As mentioned above, Rundu State Hospital noted substantial increases in deliveries and Prem Unit admissions in 2020. The reasons for this are unclear, but increased referrals and consequences of the Corona pandemic lockdown might in part explain that phenomenon.

For the first time, delivery room statistics were analyzed by Prof. Berger. Overall, there were 6'980 deliveries in 2020 (up from around 5'000 in previous years), i.e., an increase of almost 40 %. Of these, 6'842 deliveries resulted in live births (some in multiple pregnancies). There were 89 macerated stillbirths, 49 fresh stillbirths and 13 delivery room deaths after live births. To put these figures into perspective: the largest delivery unit in Switzerland at the University Hospital of Geneva had reported 3'955 deliveries in 2016.

In 2020, there were 922 admissions to the Prem Unit (up by 43 % compared to 2019). Inborn admissions increased by 195 (+36 %) and outborn admissions by 82 (+78 %) (Fig. 11). The disproportionately higher increase of admissions of outborn babies suggests that more sick babies are referred to Rundu; in fact, the Prem Unit at Rundu State Hospital has gained a reputation as a high-quality referral center.

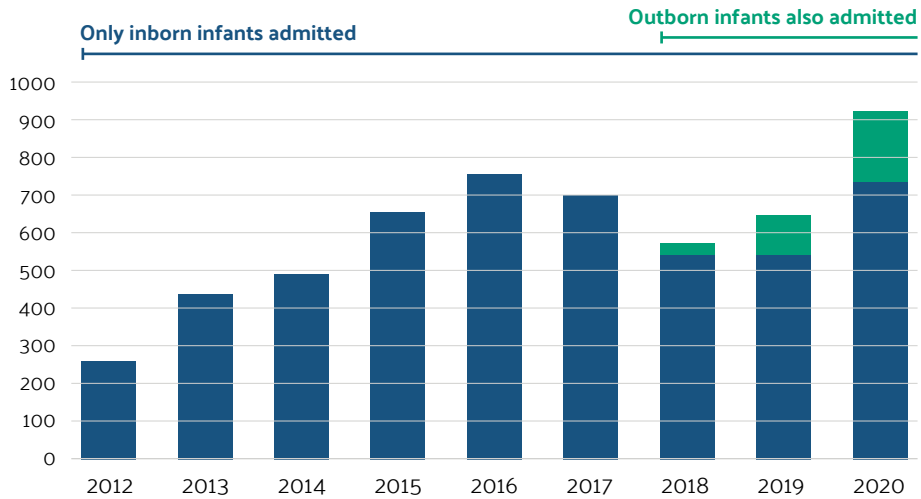

Fig. 11. Annual numbers of admissions to the Prem Unit at Rundu State Hospital (note: since September 2018, outborn infants have also been admitted to the Prem Unit).

These figures are impressive and highlight the importance of providing additional staffing. This is an urgent issue and must be addressed without delay, both with regards to nursing and physician staff.

Despite these enormous challenges, the mortality rate for inborn patients remained stable at 7.8 % (compared to 7.7 % in 2019). Therefore, the reduction of the mortality rate of inborn infants by 50 % following the interventions by NEO FOR NAMIBIA – Helping Babies Survive starting in 2016 has been proven to be sustainable (Fig. 12). In addition, the mortality rate of outborn babies has decreased from 23 % in 2019 to 15 % in 2020. Analysis of birth weight-specific mortality rates (Fig. 13) revealed that among babies with a birth weight of less than 1000 g, only one in three survived. Still, this was a higher survival rate compared to previous years (36 % in 2020 versus 15 % in 2017/18). The same holds true for infants with a birth weight between 1000 – 1500 g: survival rate in 2020 was 90 % compared to 82 % in 2017/18.

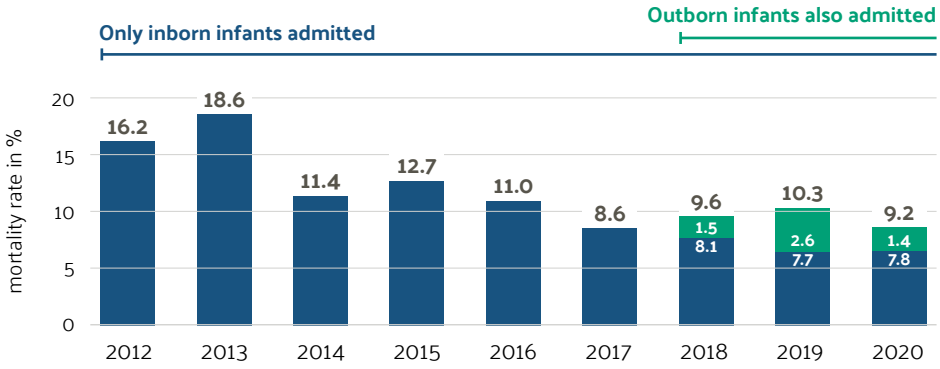

Fig. 12. Mortality rates of Infants admitted to the Prem Unit at Rundu State Hospital from 2012 – 2019 (note: since September 2018, outborn infants have also been admitted to the Prem Unit),

Birth weight category	Number of admissions	Number of deaths	Mortality rate
< 1000 g	33	21	63.6 %
1000 g – 1500 g	136	14	10.3 %
1501 g – 2500 g	322	17	5.3 %
> 2500 g	431	34	7.9 %
All birthweights	**922**	**86**	**9.3 %**

Fig. 13. Birth weight-specific number of admissions, deaths and mortality rates of inborn and outborn infants admitted to the Prem Unit at Rundu State Hospital (January to December 2020).

Infections have probably become the leading cause of death in very low birth weight infants. In contrast, perinatal asphyxia was responsible for most deaths in near term and term infants. Causes and circumstances of deaths will have to be analyzed in more detail to better understand how some deaths can be prevented in the future.

CPAP was used routinely in 2020. Every month, close to 30 patients were treated with this form of respiratory support (i.e., approximately 40 % of all patients admitted to the Prem Unit). Survival rate of these patients increased to more than 85 %. Undoubtedly, this is an ongoing success story!

As of November 2020, Eleotelia Hamutenya, the mother of Nicoteh (a former very low birth weight infant cared for at Rundu State Hospital), will collect more detailed data on

all patients admitted to the Prem Unit, as well as all patient supported either with CPAP or invasive mechanical ventilation (Fig. 14, 15). Prof. Berger took the opportunity to train Mrs. Hamutenya during his stay at Rundu State Hospital. Eleotelia, welcome to the team!

Fig. 14. Eleotella Hamutenya (center), her sister Otilia (left) and Nicoteh (right): Mrs. Hamutenya will work for NEO FOR NAMIBIA – Helping Babies Survive, allowing her to support her family.

Fig. 15. Eleotelia Hamutenya collecting data at the Prem Unit at Rundu State Hospital.

4.1.3 Teaching

Due to time constraints, there were no formal teaching sessions this time. However, during rounds and whenever there was a small time slot, Prof. Berger tried to discuss various topics with doctors and nurses in small groups (Fig. 16).

Fig. 16. Prof. Berger discussing principles of invasive mechanical ventilation with Dr. Ashipala: using various scenarios, she was asked to adapt ventilator settings.

4.1.4 Equipment maintenance

Given the recent growth of the Prem Unit at Rundu State Hospital, future equipment needs were carefully assessed. Currently, the following pieces of equipment are available:

- 7 MTTS Wallaby® infant warmers
- 12 MTTS infant cot beds
- 5 MTTS Colibri® phototherapy units
- 6 Pumani® CPAP devices
- 3 MTTS Dolphin® CPAP devices
- 5 Masimo® Rad-5 Pulse oximeters
- 11 Masimo® Rad-8 Pulse oximeters
- 2 video laryngoscopes (Leyte Medical)
- 1 EVE® neo ventilator

Overall, this equipment has performed extremely well. During his visit, Prof. Berger wrote an inventory list, indicating year of acquisition, ID numbers, location and comments regarding condition and need for servicing or repair. Most pieces of equipment are fully functional. Together with the local medical technician, Prof. Berger changed all air filters of the Pumani CPAP devices and secured the internal tubing with cable binders (Fig. 17).

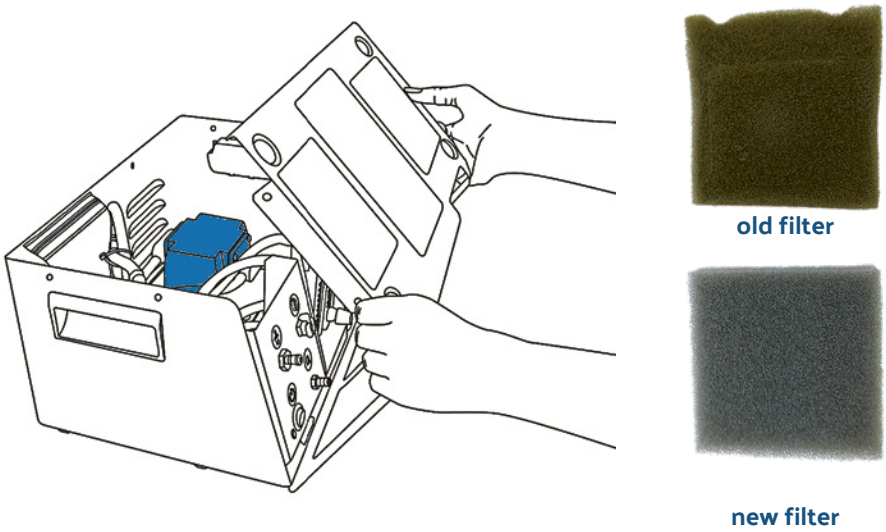

Fig. 17. The Pumani® bubbleCPAP device (left) has an integrated pump (blue) to generate air flow; air enters the device on the bottom, and dust is eliminated by simple filters (right) before it is directed into the machine's internal tubing system.

Obviously, servicing more complex machines with electronic parts is more challenging. For example, the oxygen sensor of one of the MTTS Dolphin® CPAP devices needed to be replaced. This type of work requires more advanced skills and, at least at this time, cannot be performed by local technicians.

Fortunately, the Prem Unit's head nurse, Cecilia Ndepavali, was able to refer Prof. Berger to Dr. John Namwira, a clinical technician from a private company called "newmed – health comes first". They met several times (twice in Rundu and once in Windhoek) and

agreed to draft a contract describing details of future collaboration. Mr. Namwira, originally from Rundu, would be interested to oversee equipment maintenance at both Rundu State Hospital and Katima Hospital at regular intervals, and to train local medical technicians.

4.1.5 Future equipment needs

Given the dramatic increases in deliveries and numbers of patients admitted to the Prem Unit, additional equipment will be required in the near future. Once the Prem Unit is moved to the new building, new opportunities will arise. There will be wall outlets with vacuum and compressed air: therefore, new suction devices, air/oxygen blenders and possibly devices to deliver heated humidified high flow (HHHF) therapy could be used.

Urgent needs are:

- A 2nd EVE® neo ventilator: to be used concurrently with the first machine and also as a back-up in case of equipment malfunction
- A 2nd Pfaff Medical Bilimeter because babies will be cared for in two locations in the near future: (1) one unit for sick babies in their acute phase (ICU: intensive care unit/ and IMC: intermediate care unit); (2) one unit for recovering babies (CC: continuous care unit)
- Additional pulse oximeters
- Additional MTTS Wallaby® infant warmers
- Additional infant cot beds: MTTS is manufacturing a new version called Koala® at an affordable cost of 392.00 USD (Fig. 18)

Fig. 18. The new MTTS Koala® infant cot bed, mostly used for less ill or recovering babies.

4.1.6 Special patients

4.1.6.1 Osteogenesis imperfecta

This infant was born at term and noted to have shortened and bent extremities. Various X-rays showed multiple fractures of long bones and ribs, as well as reduced height of some vertebral bodies (Fig. 19). On further clinical examination, bluish to grayish sclerae were noted (Fig. 20). These findings were felt to be consistent with a diagnosis of osteogenesis imperfecta type II or III. Unfortunately, there is no cure for this condition, and, given the limited availability of drugs for pain control in Namibia, the provision of palliative care is difficult.

Fig. 19. Term infant with shortened and bent extremities (left); X-ray examinations show multiple fractures (right), suggesting a diagnosis of osteogenesis imperfecta.

Fig. 20. The Infant was noted to have bluish to greyish sclerae, characteristic of certain types of osteogenesis imperfecta.

4.1.6.2 Resilience

Shortly before leaving Rundu to head south towards Windhoek, Prof. Berger and Brenton Titus once more stopped by at the Prem Unit. Dr. Banza, the pediatrician on call, pointed out a very low birth weight infant who had been extubated the previous night because of suspected obstruction of the endotracheal tube. The 1450 g baby had not been saturating above 70–80 % on an FiO_2 of 100 % on the MTTS Dolphin® bubbleCPAP machine. Despite the apparently hopeless situation, a decision was made to reintubate the baby and administer a second dose of surfactant. Remarkably, the baby was extubated 3 days later and, at the age of 10 days was doing well without any respiratory support on room air (Fig. 21). Another example of the amazing resilience of these babies!

Fig. 21. This very low birth weight infant was intubated on day of life 3 when no longer achieving oxygen saturatlons above 80 % on CPAP (left) and miraculously recovered to become a stable feeder and grower one week later (right).

4.2 Katima Hospital

4.2.1 Overall impression

The Covid-19 pandemic has also reached this corner of the world. While the number of actual cases had remained low, and no deaths had been recorded, several precautionary measures have been put in place. Masks must be worn at all times, and hand sanitizing stations had been set up at the hospital entrance (Fig. 22). In addition, medical students and young doctors had been dispatched from Windhoek to assist with the hospital's efforts to fight the Covid-19 pandemic.

Fig. 22. Improvised hand sanitizing station near the main entry at Katima Hospital.

Mrs. Agnes Mwilima, Regional Director of the Zambezi Health District, and Dr. Noel Siame, Chief Medical Officer, welcomed Prof. Berger and expressed their profound gratitude towards NEO FOR NAMIBIA – Helping Babies Survive. They also made clear that they would welcome intensified collaboration.

Almost one year after the first visit by NEO FOR NAMIBIA – Helping Babies Survive, the neonatal unit at this hospital at the eastern tip of the Caprivi strip has made recognizable progress. The unit is kept clean, and many suggestions made in December 2019 have been taken up (Fig. 23).

Fig. 23. Medical records are organized according to recommendations made a year ago (left); consumables are cleaned and dried in an incubator (right).

However, the challenges remain enormous. Dr. Xiamara, a Cuban doctor, is the only pediatrician at the hospital. While nursing leadership and dedicated nursing staff for the neonatal unit have been selected, and some nurses had been sent to Windhoek Central Hospital for additional training, knowledge and skills remain suboptimal and training must be intensified.

Fluid and nutrition orders are mostly appropriate; however, it was noted that the infusion pumps cannot be used because pump infusion sets had not been available since February 2020! Therefore, infusion rates had to be adjusted manually, and, occasionally, IV fluids were not administered at all because the nurses feared to fluid overload their little patients. With the help of Dr. Siame, Prof. Berger was able to order 200 IV pump infusion sets at a cost of CHF 1'150.00 (i.e., CHF 5.75 per piece) from a private Namibian supplier (Omiti Orthopaedic Supplies, Windhoek).

4.2.2 Teaching sessions

During his stay in Katima, Prof. Berger gave lectures on physiology and pathophysiology of neonatal adaptation, fluid and nutrition management, early-onset sepsis and hyperbilirubinemia. Practical and interactive sessions covered neonatal resuscitation and calculation/writing of fluid and nutrition orders.

During teaching rounds, a number of issues were addressed and later discussed with Mrs. Mwilima. The poor performance of the National Institute of Pathology (NIP) renders daily work very difficult: results of blood tests (e.g., C-reactive protein, bilirubin) are reported with enormous delays (rendering them useless) or are not available at all because the laboratory's machines are broken. It was made clear that this leads to avoidable deaths!

While the Pumani® bubbleCPAP machine was used regularly in 2020, teaching must be intensified and strategies must be adapted (initiation: early CPAP, duration of CPAP support: do not discontinue too early). Survival rates of babies supported with CPAP remained below those that could be expected (see below).

4.2.3 Annual statistics

Dr. Xiamara presented the neonatal statistics for the time period from January to October 2020; data from November and December 2020 were later sent to Prof. Berger. A total of 3'667 live births were recorded that year. Overall, 446 neonates were admitted in 2020: 377 to the neonatal unit (inborn infants only, admission rate of 10 %) and 69 to the Pediatric ward (mostly outborn infants). Compared with 2019, admissions to the neonatal unit have increased by 72 % from 219 to 377.

The mortality rate of infants admitted to the two wards remained high at 20.4 % (91 deaths among 446 admissions) (Fig. 24). However, this figure is one third lower than the mortality rate of 33.3 % observed in 2019 during the first visit of Prof. Berger and his wife.

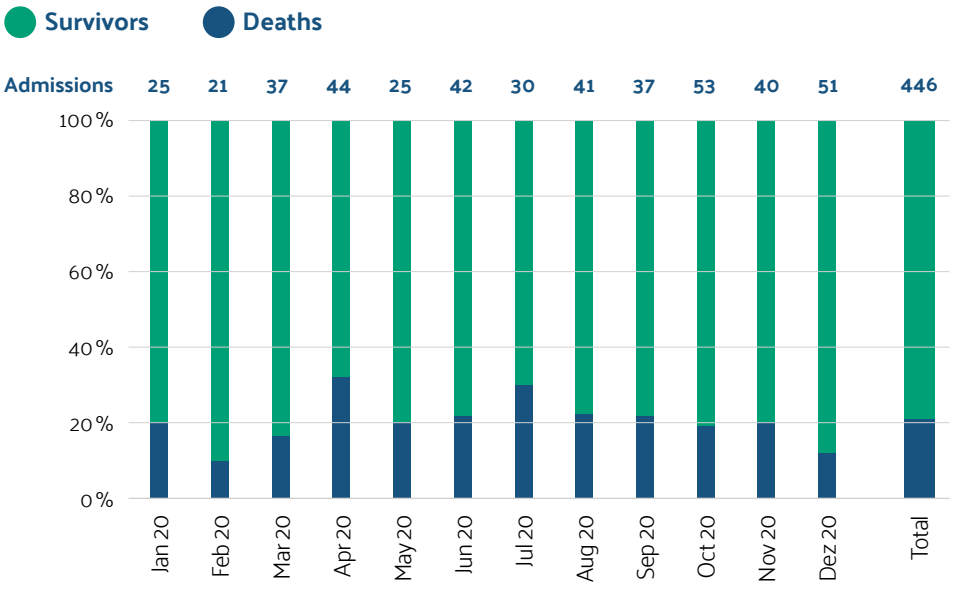

Fig. 24. Monthly numbers of admissions, mortality and survival rates at Katima Hospital in 2020.

Analysis of birth weight-specific mortality rates was restricted to inborn infants admitted between January and October 2020 (Fig. 25). This data shows that extremely low birth weight infants (i.e., birth weight < 1000 g) currently have no chance of survival, and with the current equipment, knowledge and skills, there is little hope for improvement in the near future. On the other hand, comparison with mortality rates at Rundu State Hospital from the same time period shows that infants with birth weights > 1000 g do have a chance of significantly higher survival rates in this setting (Fig. 25, 26).

Fig. 25. Birth weight-specific numbers of admissions, deaths and mortality rates of infants admitted to the neonatal unit (inborn infants only) at Katima Hospital (January to October 2020); comparison with data from Rundu reveals the potential for improvements.

Birth weight category	Number of admissions	Number of deaths	Mortality rate	For comparsion: Rundu State Hospital Mortality rate
< 1000 g	11	11	100.0 %	63.6 %
1000 g – 1500 g	50	27	54.0 %	10.3 %
1501 g – 2500 g	110	14	12.7 %	5.3 %
> 2500 g	163	27	16.6 %	7.9 %
All birthweights	**334**	**79**	**23.7 %**	**9.3 %**

Fig. 26. At Katima Hospital, infants with a birth weight < 1000 g currently have no chance of survival (left: ELBW infant with a birth weight of 660 g died on day of life 3); however, survival rate of infants with birth weights > 1000 g have improved significantly (right: VLBW infant with a birth weight of 1500 g on CPAP).

The Pumani® bubbleCPAP device had been introduced at Katima Hospital in December 2019. On-site training had been brief and was supplemented by additional training during a visit of a team of doctors and nurses in Rundu. Despite these challenges, 120 babies were treated with this modality in 2020 (i.e., 27 % of all babies admitted to the neonatal unit). The survival rate of these babies was 52 %, higher than what has been observed with nasal cannula oxygen therapy alone (approximately 44 %, according to a published study from Malawi), but significantly lower than what would be expected (71 %) (Fig. 27). Of note, apart from respiratory failure due to lung immaturity, the leading cause of death among CPAP patients was hypoxic ischemic encephalopathy, a condition not treatable with CPAP. These observations suggest that there is significant potential for improvement. This will require more training and one-on-one teaching during future missions.

Fig. 27. CPAP registry data from Katima Hospital (January to December 2020): the main causes of death were hyaline membrane disease (n = 20) and hypoxic ischemic encephalopathy (n = 20).

Pumani® bubble CPAP experience at Katima Hospital	
Total number of admissions	446
Total number of patients treated with CPAP	120
Percentage of admitted babies treated with CPAP	27 %
Total number of deaths	91
Total number of deaths of babies treated with CPAP	58
Survival rate of babies put on CPAP	52 %

4.2.4 New neonatal unit

At Katima Hospital, an older ward is currently being renovated to accommodate a new neonatology unit. During discussions, it became obvious that a number of details had not been considered. Prof. Berger pointed out the following issues that would need to be addressed:

- Designation of specific patient care areas (admission area, intermediate care (IMC) beds, continuous care (CC) beds)
- Designation of storage rooms
- Number of power sockets per patient bed space (currently only 0 – 2)
- Wall outlets for compressed air, oxygen, vacuum (if feasible)
- Need for a mobile X-ray device

4.2.5 Equipment maintenance

The following pieces of equipment donated by NEO FOR NAMIBIA – Helping Babies Survive were available and found to be in functioning order:

- 2 MTTS Wallaby® infant warmers (1 unit delivered in December 2020 from Windhoek Central Hospital)
- 4 MTTS infant cot beds
- 2 MTTS Colibri® phototherapy units (1 unit delivered in December 2020 from Windhoek Central Hospital)
- 2 Pumani® CPAP devices
- 4 Masimo® Rad-8 pulse oximeters

It became obvious that there was no routine maintenance of medical equipment. Once broken, most pieces of equipment cannot be repaired. The fact that the functioning CareFusion Alaris® infusion pumps in Katima had not been used for months because infusion pump sets could not be obtained through the regular government channels is deplorable and characteristic for unreliable supply chains.

4.2.6 Future equipment needs

Given the dramatic increase in deliveries and numbers of patients admitted to the neonatology wards, additional equipment will be required in the near future. These needs will have to assessed during the 11th mission of NEO FOR NAMIBIA – Helping Babies Survive scheduled for April/May 2021.

4.3 Windhoek Central Hospital

During a brief visit at Windhoek Central Hospital, Prof. Berger had a chance to meet Prof. Clarissa Pieper, Head of Neonatology, and Beatrix Callard, Neonatal Nurse Practitioner. They expressed their gratitude for the donations made by NEO FOR NAMIBIA – Helping Babies Survive (Fig. 28).

They agreed to strengthen future collaborations. Such efforts might include:

- Accommodating visiting fellows from Switzerland
- Welcoming visiting professors (e.g., Prof. Rita Gobet, a pediatric surgeon)
- Training of neonatology nurses
- Prof. Berger giving lectures at University of Namibia covering neonatal topics

Fig. 28. Equipment donated by NEO FOR NAMIBIA – Helping Babies Survive (Wallaby® warming tables and Colibri® phototherapy units) is put to good use at Windhoek Central Hospital.

4.4 Katutura Hospital

On December 1, 2020, Dr. Benjamin welcomed Prof. Berger at Katutura Hospital to present the current status of the neonatal unit. This unit lacks essential equipment, such as open warming tables, phototherapy units, pulse oximeters and CPAP devices. Most ill patients must be transferred to Windhoek Central Hospital; however, this level III neonatology unit frequently has no space.

NEO FOR NAMIBIA – Helping Babies Survive will continue to focus on supporting hospitals in the north but may have resources to provide some equipment for Katutura Hospital. Prof. Berger and Dr. Benjamin agreed to discuss potential options in the near future.

4.5 Virtual Meeting with Hospital representatives of the Erongo region

On December 2, 2020, the MHSS organized a Zoom meeting with Anna Jonas, Erongo Regional Director, and representatives from different hospitals. The region's capital is Swakopmund. Erongo contains the municipalities of Walvis Bay, Swakopmund, Henties Bay and Omaruru, as well as the towns Arandis, Karibib and Usakos (Fig. 29).

The discussions revealed that only basic neonatal care was available at the three hospitals:

Walvis Bay (Dr. Mutinga):

- 140 beds at the hospital
- Maternity ward: 36 beds
- 2'500–3'000 deliveries per year
- Neonatal room: 3 incubators (2 in working condition)
- 7–17 preterm babies per month
- No trained staff
- No infusion pump sets

Osakos (Mrs. Beauty Kavana):

- No trained nurses
- Critical lack of equipment: no nasal cannulas, no pulse oximeters
- No operating room (no Cesarean sections?)

Omaruru (Dr. Katoma):

- Very restricted space
- 1 incubator
- 4–5 preterm infants per month
- Transport challenges (lack of capacity in Windhoek)

Reportedly, the MHSS plans to open a higher-level neonatal unit in Swakopmund in 2022. It might be reasonable for NEO FOR NAMIBIA – Helping Babies Survive to get involved in the planning stage of this unit. A next step might be to visit the hospitals in the Erongo region during one of the upcoming missions in 2021.

In January 2021, Yvonne Stephanus, the Regional Director of Health in the Hardap Region, also expressed an interest in collaborating with NEO FOR NAMIBIA – Helping Babies Survive (Fig. 29).

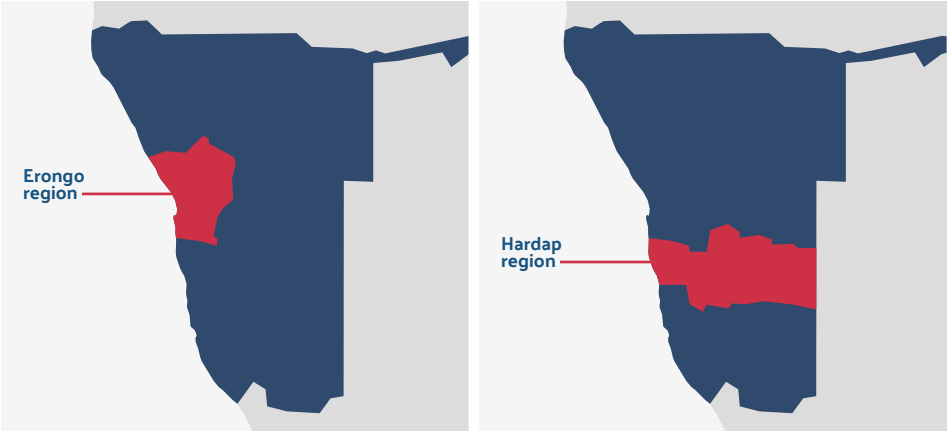

Fig. 29. Regions that have expressed an interest in the NEO FOR NAMIBIA – Helping Babies Survive program are the Erongo and Hardap Regions.

5. MEETING WITH THE MINISTER OF HEALTH

Following the virtual meeting described above, Prof. Berger was welcomed by the Minister of Health, Dr. Kalumbi Shangula, the Executive Director (ED), Dr. Ben Nangombe, the pediatrician, Dr. Wilson Landuleni Benjamin, as well as several additional officials.

The Minister and the ED emphasized that the efforts of NEO FOR NAMIBIA – Helping Babies Survive were highly appreciated. They agreed that the MHSS will provide unbureaucratic administrative support regarding work permits for mission team members and VAT exemption documents for donated equipment. They also promised to evaluate the possibility to provide additional staffing for Rundu State Hospital (nurses, residents). To send residents to Rundu State Hospital would be a win-win situation: working in the Prem Unit is a great learning experience, and, at the same time, the workload of senior pediatric staff could be reduced; the latter would help to prevent physician burn-out.

It was suggested that Dr. Benjamin will be the primary contact at the MHSS for any requests for support by NEO FOR NAMIBIA – Helping Babies Survive. As in the past, Mrs. Lydia Haufiku (VISA and work permits) and Mrs. Natasja Cupido (VAT exemption for donations and transport of donated goods) will remain additional contacts.

6. FUTURE DIRECTIONS

6.1 Mission 2021-1

It is planned that we will visit Rundu and Katima in April/May 2021 during the 11th mission of NEO FOR NAMIBIA – Helping Babies Survive. The focus on this mission will be on the following topics:

- Assessment of the new Prem Unit at Rundu State Hospital
- Ventilator refresher training at Rundu State Hospital
- Supporting Mrs. Hamutenya to further increase data quality
- Provision of manpower for daily work routines
- On-site training at Katima Hospital
- Introduction of Namibian MNDS and CPAP registries at Katima Hospital

Additional missions are planned for July/August 2021 and October/November 2021. Sarah Knoll, MD, and Salome Waldvogel, MD, neonatology fellows at the University Children's Hospital in Basel plan to join Prof. Berger and his wife on upcoming missions in 2021. They both consider a longer-term commitment to the project and would be a welcome addition to our team.

6.2 Fundraising efforts

The neonatology program of NEO FOR NAMIBIA – Helping Babies Survive can only be expanded to cover other areas in Namibia if additional mission team members can be recruited and additional pieces of equipment can be bought. Therefore, fund raising efforts must be intensified. It is our sincere hope that the documented success of the organization's efforts will be recognized and motivate donors to support NEO FOR NAMIBIA – Helping Babies Survive.

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

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Luzerner Kantonalbank
Postfach, 6002 Luzern, Switzerland
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