MISSION REPORT

Mission 2023 – 4

November 6, 2023 to December 5, 2023

AUTHORS
Prof. Thomas M. Berger, MD
Kundai Mapanga, MD
Sabine Berger, RN

Lucerne, 10.01.2024

NEO FOR NAMIBIA
HELPING BABIES SURVIVE

www.neo-for-namibia.org

MISSION REPORT

Mission 2023 – 4

November 6, 2023 to December 5, 2023

1. INTRODUCTION

The 20th (!) mission of NEO FOR NAMIBIA – Helping Babies Survive lasted from November 6, 2023, to December 5, 2023.

The anniversary mission team consisted of Prof. Thomas M. Berger and his wife Sabine Berger. For part of the mission, they were accompanied by Dr. Kundai Mapanga (15 days), their assistant Marcel Bösch (20 days), and the driver Isaak Bois (15 days).

Following a brief visit to the world famous Sossusvlei dunes in the south, Prof. Berger and Sabine Berger attended a Pediatric Pathology Conference in Windhoek where they met Dr. Kundai Mapanga. Prof. Berger had been invited by the organizer, Dr. Christy Kaiyamo, to give a talk on Neonatal Mortality and Morbidity.

The three team members then traveled to Swakopmund where they were joined by Isaak Boois and Marcel Bösch. After a National Neonatology Conference organized by NEO FOR NAMIBIA – Helping Babies Survive and the Ministry of Health and Social Services (MHSS) on November 16, 2023, the 5-member-team drove up north to visit the State Hospitals in Oshakati and Rundu. At that point, Dr. Kundai Mapanga and Isaak Boois returned to Windhoek, while Prof. Thomas M. Berger, Sabine Berger, and Marcel Bösch traveled on to Katima to visit the last hospital on this mission.

On December 1, 2023, after handing over the car to their driver at Mpacha Airport in Katima, the three team members flew back to Windhoek to catch their return flights to Switzerland on December 3, 2023 (Marcel Bösch) and 4, 2023 (Prof. Thomas M. Berger and Sabine Berger).

2. MAIN MISSION GOALS

The goals of the 20th mission differed in many aspects from the goals of previous missions. They were:

1. To help organize a National Neonatology Conference in Swakopmund where the work of NEO FOR NAMIBIA – Helping Babies Survive could be presented to explore the possibility to expand the NGO's program

2. To re-assess the status of the neonatology units in Swakopmund and Walvis Bay

3. To evaluate the possibility to support efforts to improve neonatal care at Oshakati Hospital (first visit)

4. To assess the status of neonatal care at Rundu State Hospital (the hospital that had been visited on every mission) and define the future collaboration

5. To assess the status of neonatal care at Katima Hospital and to explore ways to strengthen the hospital's role as a referral center for the Zambezi region

6. To introduce a new low-cost CPAP device (Vayu® bubble CPAP) and an air-oxygen blender (Vayu® blender) in several hospitals

7. To recruit motivated young Namibian physicians to join the board of NEO FOR NAMIBIA – Helping Babies Survive

3. HOSPITALS VISITED

3.1 Swakopmund Hospital and Walvis Bay Hospital

Together with the young Namibian physician Dr. Kundai Mapanga, Prof. Thomas M. Berger and Sabine Berger visited both Swakopmund (Fig. 1) and Walvis Bay Hospitals (Fig.2). They were welcome by Dr. Beatrice Maringo (senior medical officer), Dr. Memory Shimpanda (medical officer) and Sr. Melody (Swakopmund Hospital), as well as Dr. Augustu Gawab (chief medical officer) and Sr. Faustina Dominicus (Walvis Bay).

Fig. 1. Swakopmund: Dr. Kundai Mapanga and Sabine Berger at the hospital's front entrance (left); mother with her baby in the postpartum ward (middle); preterm baby being syringe fed (right).

Fig. 2. Walvis Bay: the hospital's infrastructure is in a poor condition; nevertheless, the staff tries to make the best of it!

3.1.1 Overall impression

The caseload at both hospitals is relatively low with a daily patient census ranging between 2–8 patients per unit. Pumani® bubbleCPAP devices are only used in the neonatal unit at Swakopmund Hospital. The new perinatal unit in Swakopmund is still under construction; reportedly, all work has been stopped and will only resume when a new contractor takes over the project. If the unit will be completed in 2024 remains uncertain. In the meantime, sick neonates will be treated at both hospitals.

After the departure of Dr. Helvi Joel (the physician who had contacted NEO FOR NAMIBIA – Helping Babies Survive in 2022), Dr. Beatrice Maringo, a fully trained pediatrician has been appointed to work at the two state hospitals. Interestingly, during her training in Kenya, Dr. Maringo has been working both the Pumani® and the Vayu® bubbleCPAP devices (see below). Her experience will undoubtedly be of great help when more advanced neonatal care will be introduced in Swakopmund.

3.1.2 Inventories

At Swakopmund Hospital, there are:

- Pumani® bubbleCPAP devices (total: 4, functional: 4)
- MTTS Wallaby® open warmers (total: 2, functional: 2)
- MTTS Colibri® phototherapy units (total: 2, functional: 2)
- Masimo® Rad-G pulse oximeters (total: 2, functional: 2)

All devices were tested and found to be fully functional (Fig. 3). The two phototherapy units were tested with an MTTS light meter and sufficient irradiance was confirmed, i.e., more than 30 $W \cdot cm^{-2} \cdot nm^{-1}$ (unit 1: normal mode: 41 $W \cdot cm^{-2} \cdot nm^{-1}$, boost mode: 57 $W \cdot cm^{-2} \cdot nm^{-1}$; unit 2: normal mode: 42 $W \cdot cm^{-2} \cdot nm^{-1}$, boost mode: 61 $W \cdot cm^{-2} \cdot nm^{-1}$).

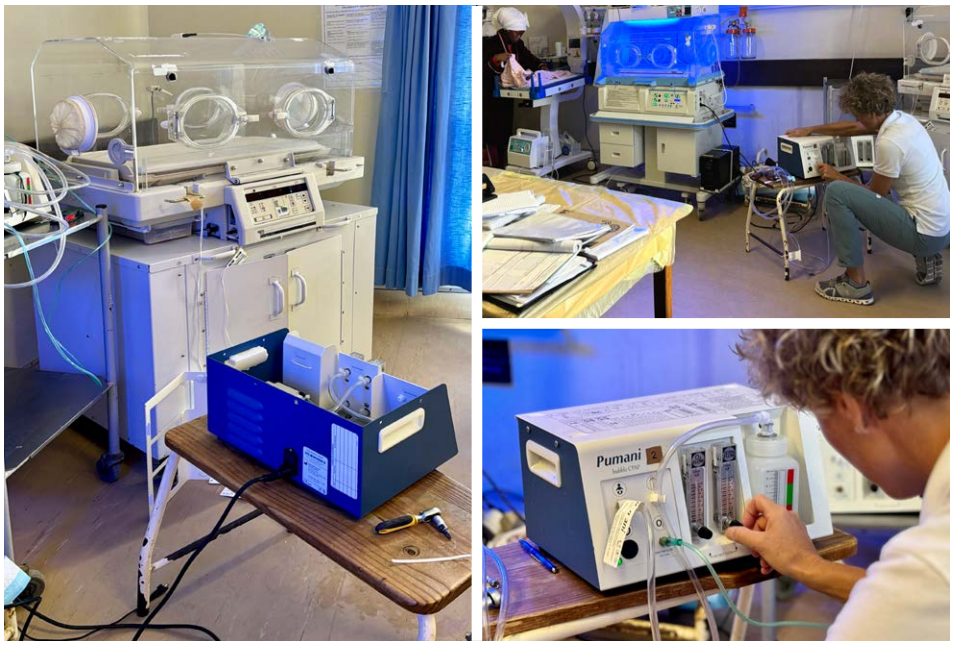

Fig. 3. Sabine Berger servicing the Pumani® bubbleCPAP devices at Swakopmund Hospital.

3.1.3 Statistics

At this time, no reliable statistical data regarding delivery room (DR) activity, admissions to the neonatal ward and birthweight-specific mortality rates could be obtained from the maternity and neonatal units at Swakopmund Hospital or Walvis Bay Hospital (Fig. 4).

Fig. 4. Prof. Thomas M. Berger and Dr. Kundai Mapanga attempting to obtain statistical data from various sources.

However, Prof. Thomas M. Berger was able to analyze data from the CPAP registry (Swakopmund Hospital): over a 10-month-period, 31 babies had been treated with CPAP. Among these patients, 20 survived and 8 died (3 on transfer to Windhoek); for 3 additional babies (all transferred to Windhoek), no outcome data was available. Therefore, the survival rate for infants treated with CPAP may be as high as 74.2 % and as low as 64.5 %. Details of the known deaths are shown in Table 1.

Table 1. Details of neonatal deaths following bubbleCPAP treatment at Swakopmund Hospital (BW: birthweight; HMD: hyaline membrane disease; GI: gastrointestinal; WDH: Windhoek).

Nr.	BW (g)	Surfactant	Diagnoses	Age at death (DOL)	Comment
1	1295	yes	HMD, pulmonary hemorrhage	3	
2	1800	yes	HMD, pulmonary hemorrhage	6	Transferred to WDH: died in transit
3	955	yes (x2)	HMD, pulmonary hemorrhage	15	
4	2015	yes	Hydrops	3	
5	1315	yes	HMD, pulmonary hemorrhage	22	Transferred to WDH: died in transit
6	2180	yes	HMD, upper GI bleeding	8	
7	1195	yes	Pneumonia, bacterial meningitis	18	
8	3110	no	Aspiration pneumonia	unknown	Transferred to WDH: died in transit

Very sick babies and babies with surgical conditions must be transferred to Windhoek. Often, these ambulance transports occur under quite dramatic conditions: neither CPAP nor ventilators are available in the ambulances, and monitoring is limited to pulse oximetry with adult sensors. Babies who are intubated prior to transfer must be hand-bagged for up to five hours (Swakopmund – Windhoek: 361 km). Unfortunately, deaths on transfer or shortly after arrival in Windhoek are not uncommon.

3.1.4 Future directions

Doctors and nurses at both hospitals are interested to collaborate with NEO FOR NAMIBIA – Helping Babies Survive. Local leaders have been identified. Both Swakopmund Hospital and Walvis Bay Hospital will participate in the Vayu® bubbleCPAP trial (see below).

Walvis Bay will receive 2 MTTS Wallaby® open warmers and 1 MTTS Colibri® phototherapy unit. This equipment had been ordered prior to the current mission and was cleared through customs; it will be delivered by the Ministry of Health and Social Services (MHSS), hopefully within the next few weeks.

Provided that sufficient funding can be obtained, both neonatal wards should be equipped with neonatal pulse oximeters (including appropriately sized sensors). In addition, point of care testing (POCT) for bilirubin (and possibly C-reactive protein) measurements should be made available.

Finally, if the multicenter Vayu® bubbleCPAP trial proves to be successful, additional devices should be procured available. We envision the following indications:

1. Use for stabilization in the delivery rooms
2. Use on transports (both for referrals within the Erongo region and to Windhoek)
3. Use for longer-term support in the neonatal units of Swakopmund and Walvis Bay

We also encouraged the leaders at both hospitals to regularly update their statistical data. This data will likely confirm that only one referral center should be developed; based on decisions already made, this unit will be in Swakopmund. Other hospitals in the Erongo region (including Walvis Bay Hospital) should then transfer women with high-risk pregnancies and sick babies to this level II–III perinatal unit. This will require adequately equipped ambulances; in this regard, the Vayu® bubbleCPAP device may be playing an important role soon.

3.2 Oshakati Hospital

Earlier this year, Prof. Thomas M. Berger had been contacted by Dr. Liljia Ashipala, a senior medical officer in the Department of Pediatrics at Oshakati Hospital. She had previously worked as a medical officer at Rundu State Hospital and seen the work done by NEO FOR NAMIBIA – Helping Babies Survive. Dr. Liljia Ashipala had inquired whether we would be willing to assess the level of neonatal care in Oshakati, and to determine if NEO FOR NAMIBIA – Helping Babies Survive would be able to provide some support.

Oshakati is a town in northern Namibia. It is the regional capital of the Oshana Region and one of Namibia's largest cities both by population and as an economic center. Oshakati is situated in the Cuvelai-Etosha Basin and cut by the Okatana River.

3.2.1 Overall impression

Oshakati hospital was constructed in 1966 by the apartheid regime of South Africa, which at the time was occupying the territory. Not surprisingly, the building structures are run down and would require renovation. The maternity ward is too small, and – following delivery – many mothers must lie on mattresses placed on the floor (Fig. 5). Sick babies are cared for in a 35-bed-unit; frequently, the available space is insufficient, and incubators are occupied by two babies at a time (Fig. 6). In fact, patient census could be as high as 45. Overall, the size and activity of the neonatology unit at Oshakati State Hospital seems to be comparable to the one at Rundu State Hospital.

Fig. 5. Due to lack of space, mothers and their newborn babies must reside on the floor in the postpartum ward at Oshakati Hospital.

Fig. 6. At Oshakati Hospital, sick babies frequently must share one incubator; for several reasons (infection control, different temperature requirements), this is highly problematic.

3.2.2 Inventory

While the unit appears to be well equipped at first sight, its infrastructure and many of the devices are in poor condition or even completely broken and non-functional (Fig. 7). For certain types of equipment (e.g., incubators, infusion pumps, CPAP devices), several different brands are in use: this automatically makes skillful use, maintenance, and repair more difficult. In addition, a large variety of consumables must be on stock to allow for uninterrupted use when needed.

Fig. 7. Oshakati Hospital: while the unit appears to be well equipped at first sight, its furniture and many devices are in poor condition or even completely broken.

For example, there are several different types of CPAP devices. For one of the brands, the Vyaire Medical Infant Flow® SiPAP, no patient tubing can be purchased from the MHSS's central medical store. Currently, the hospital receives or buys recycled single use sets from the private hospital in town.

A prime example of how equipment should NOT be purchased and introduced in a neonatal unit is the story of the ResVent® iHope ventilators. We came across 8 (eight!) machines in the neonatal ward at Oshakati Hospital (Fig. 8). The graphical user interface (GUI) seems very intuitive and easy to use.

Reportedly, they had been bought by the government during the Covid pandemic. Currently, the machines are all stored in a small room. We were told that they are not used because no or insufficient training had been provided by the Namibian distributor (novo-medical – improving health). Consequently, nobody would feel comfortable to operate the device.

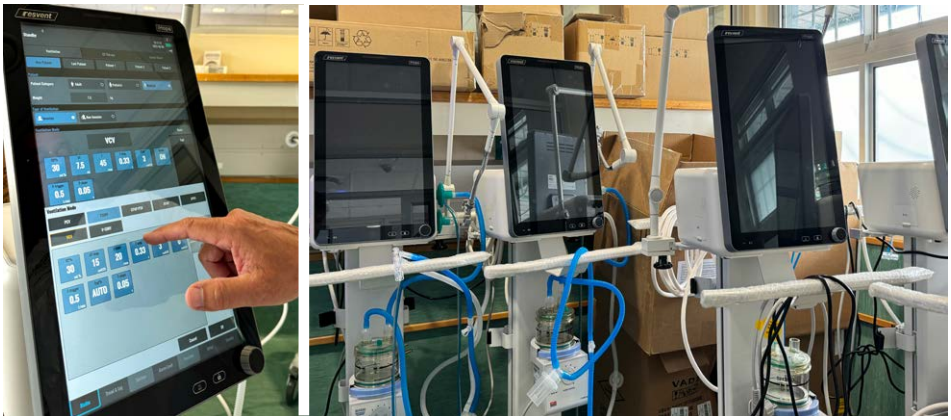

Fig. 8. Oshakati Hospital: a total of 8 ResVent® iHope ventilators are kept in a storeroom: because staff has not been instructed and the oxygen sensors have expired, they are not used.

3.2.3 Teaching

Accompanied by the head of the Department of Pediatrics, Dr. Rahja Kauluma, and the medical superintendent of the hospital, Dr. Asumani Kibandwa, Prof. Thomas M. Berger and his team joined the local doctors and nurses on work rounds. There were structured presentations by the interns with supplemental information given by the medical officers (Fig. 9).

Fig. 9. Work rounds at Oshakati Hospital: following structured presentations by interns and medical officers, Prof. Thomas M. Berger took the opportunity to make some teaching points.

While the overall quality of the presentations was good, many details in patient care could be improved. This will require more training and bedside teaching. The local health care professionals seem to have a genuine interest to pursue this suggestion further. It was agreed that patient record forms developed by NEO FOR NAMIBIA – Helping Babies Survive (i.e., Front Page Doctors' Notes, Progress Notes, Charting sheets for CPAP patients, Charting sheets for MV patients) would be made available for use in the unit.

Prof. Thomas M. Berger was also asked to give lectures on fluid and nutrition management and various forms of respiratory support (including invasive mechanical ventilation). These lectures were attended by nurses, interns, medical officers, and the medical superintendent..

3.2.4 Statistics

The hospital had sent us statistical data prior to our 20th mission. The submitted data covered the time from February 2022 to March 2023. During our stay in Oshakati, we were not able to double check data quality.

Over the 14-month-period, there had been 1452 admissions to the neonatal unit. The overall mortality rate for the same time was 12.1 % (i.e., at total of 176 deaths were recorded). Calculations of birthweight-specific (BW-specific) mortality rates revealed the following results: BW < 1000 g: 56 admissions, 33 deaths (mortality rate 58.9 %); BW 1000 – 1500 g: admissions 206, deaths 46 (mortality rate 22.3 %); BW 1501 – 2500 g: admissions 478, deaths 57 (mortality rate 11.9 %); BW > 2500 g: admissions 752, deaths 45 (mortality rate 6.0 %).

It is interesting to compare the mortality rates at Oshakati Hospital in 2022 with data from the same period at Rundu State Hospital, where the introduction of more advanced equipment had always followed some basic rules:

- Stepwise approach: new equipment would only be introduced when simpler interventions and devices were mastered: 1) adequate oxygen therapy with SpO_2 monitoring, 2) successful use of a simple CPAP device, 3) successful use of a more advanced CPAP device, 4) introduction of invasive mechanical ventilation

- Thorough training consisting of lectures on the theoretical background and practical one-on-one teaching at the bedside
- Assessment of impact to identify both successes and/or failures

With a higher number of admissions (1584 versus 1228), the overall mortality rate in 2022 was almost 40 % higher at Oshakati State Hospital than at Rundu State Hospital (12.1 % versus 8.7 %). This can likely not be explained by a different case mix since mortality rates were higher in all birthweight strata (Table 2).

	Rundu State Hospital (2022)	Oshakati State Hospital (2022)
Total admissions	1228	1584
Total deaths	107	192
Overall MR	8.7 % (107/1228)	12.1 % (192/1584)
MR < 1000 g	56.8 % (21/37)	58.9 % (36/61)
MR 1000 – 1500 g	18.5 % (24/130)	22.3 % (50/225)
MR 1501 – 2500 g	7.3 % (25/341)	11.9 % (57/478)
MR > 2500 g	5.1 % (37/720)	6.0 % (49/820)

Table 2. Comparison of number of admissions, overall and birthweight-specific mortality rates (MR) at Rundu State Hospital and Oshakati State Hospital (data from Oshakati extrapolated from data from 02-12 2022).

The differences can also not be explained by a lack of equipment; rather, poor planning and inadequate training (the most recent example being the delivery of the ResVent® iHope mechanical ventilators mentioned above) are likely reasons for the lower survival rates at Oshakati State Hospital. This lends strong support to the approach taken by NEO FOR NAMIBIA – Helping Babies Survive!

3.2.5 Future directions

Our organization promised to support Oshakati State Hospital by supplying patient charting forms (see above), analyses of statistical data and additional training during upcoming visits. As far as equipment is concerned, a bilifuge and bilimeter (Pfaff Medical, Germany) will be purchased and donated for point of care testing (POCT) of total bilirubin concentrations. This intervention has greatly facilitated management of neonatal jaundice at Rundu State Hospital, Katima State Hospital, as well as Katutura State Hospital.

In addition, hospital staff would likely benefit from additional training, both in the form of lectures and bedside teaching of interns and medical officers.

3.3 Rundu State Hospital

This was the 20th visit of Rundu State Hospital (now upgraded to Rundu Intermediate Hospital). Within nine years, neonatal care has changed dramatically. Improved staffing, better equipment and successful knowledge transfer have all contributed to higher survival rates. Importantly, progress made has been sustainable (Fig. 10, 11).

Fig. 10. Improved staffing, better equipment, and knowledge transfer have led to greatly improved neonatal care at Rundu State Hospital over the past eight years.

Fig. 11. Rundu State Hospital: very low birth weight infants (birth weight 1000–1500 g) now have much better chances for survival than five years ago (mortality rate 2017/8: 35.7 %, mortality rate 2023: 10.4 %).

3.3.1 Overall impression

The Prem Unit at Rundu State Hospital was moderately busy during our 5-day-stay with an average census of 35 patients. The senior pediatrician, Dr. Isha Kamara, was on maternity leave after having given birth to twins. Dr. Geraldine Beukes, the senior house officer, whom we had met at the National Neonatology Conference in Swakopmund 10 days earlier, was on leave. Therefore, our main contact was with nursing (primarily Emilie Nangura, RN, and Martha Martin, EN). Our work focused on assessing the condition of the equipment donated by NEO FOR NAMIBIA – Helping Babies Survive and analyzing the unit's statistics for the current year.

3.3.2 Inventory

Overall, the unit is well equipped, and most consumables are in stock. Sabine Berger tested the functionality of all equipment and updated the stock list of consumables to account for the goods the team had brought from Switzerland (Fig. 12).

Fig. 12. Sabine Berger taking stock of essential consumables at Rundu State Hospital.

3.3.2.1 Equipment Overview

Over the past 8 years, our NGO has been able to support the Prem Unit's development with the following pieces of equipment (most of which have stood the test of time and proven to be reliable and robust):

- MTTS infant cot beds (total: 12, functional: 12)
- MTTS Koala® bassinets (total: 6, functional: 6)
- MTTS Wallaby® warming tables (total: 9, functional: 8)
- MTTS Colibri® phototherapy units (total: 6, functional: 5, low irradiance (see below): 1)
- Masimo® Rad-8 pulse oximeters (total: 11, functional: 10, lost: 1)
- Masimo® Rad-G pulse oximeters (total: 7, functional: 5, lost: 2)
- Masimo® Rad-97 pulse oximeters (total: 4, functional: 4)
- MTTS Dolphin® bubbleCPAP devices (total: 7, functional: 6, oxygen sensor broken: 1)
- Pumani® bCPAP devices (total 3, functional: 3)
- Pumani® bubbleCPAP devices (total: 1, functional: 1)
- EVE® TR neo ventilators (total: 2, functional: 2)
- MTTS Impala® ventilator (total: 1, functional: 1)
- Airborne T1 ventilator (total: 1, functional: 1)
- Bilifuge® and Bilimeter® Pfaff Medical (total: 2, functional: 2)
- Aidian QuikRead® go CRP (total: 1, functional: 1)

Apart from regular equipment maintenance (an ongoing challenge), the uninterrupted supply of consumables (e.g., pulse oximetry sensors, CPAP and ventilator patient tubing, CRP test kits) is of utmost importance; it currently can only be guaranteed by NEO FOR NAMIBIA – Helping Babies Survive.

3.3.2.2 Mechanical ventilators

The Prem Unit at Rundu Intermediate Hospital has a total of 8 ventilators (4 different brands, 2 serve as back-up ventilators only). Currently, only 4 (maybe 5) are functional (Table 3).

Type of ventilator	Comments
EVE TR® neo (1)	Fully functional (serviced in Switzerland in 2021)
EVE TR® neo (2)	Fully functional (serviced in Switzerland in 2022)
MTTS Impala®	Fully functional (used as back-up)
Airborne® transport ventilator	Fully functional (used as back-up)
ResVent® iHope (1)	Probably functional; O2 sensor passed calibration (expired 2021-02-01)
ResVent® iHope (2)	Non-functional; O2 sensor failed calibration (expired 2020-10-01)
ResVent® iHope (3)	Non-functional; O2 sensor failed calibration (expired 2021-02-01)
ResVent® iHope (4)	Non-functional; O2 sensor passed calibration but deviates in operation by more than +/- 8% (expired 2021-02-01)

Table 3. Mechanical ventilators at Rundu Intermediate Hospital: the equipment introduced by NEO FOR NAMIBIA – Helping Babies Survive is fully functional, whereas the newly introduced ResVent® iHope have never been used.

The 4 ResVent® iHope, supplied by the government in large quantities to several hospitals (see Oshakati above), have not yet been used successfully. Lack of training and constant alarms were given as reasons by the staff. Prof. Thomas M. Berger tested all of devices (Fig. 13). The machines can be used in neonates and have a pressure-controlled synchronized intermittent mandatory ventilation with pressure support ventilation mode (PC-SIMV with PSV), the mode that has been used in Rundu with the EVE neo® ventilators since 2019.

Fig. 13. ResVent® iHope at Rundu State Hospital: only 1 out of 4 machines passed both flow and oxygen calibration tests.

Unfortunately, the internal oxygen sensors have all exceeded their expiration date (2020-01: 1 sensor, 2021-02-01: 3 sensors). We were told that even older sensors had been replaced by the current ones three months ago. Indeed, a sticker on the machines indicates that novomedical (the Namibian distributor) had serviced the machines in July 2023. Prof. Thomas M. Berger contacted the managing director of novomedical, Gideon Tweeni Petrus. Mr. Petrus explained that the government had not placed an order for oxygen sensors, therefore, they had not been replaced. Prof. Thomas M. Berger then asked for a quotation for OOM202 medical oxygen sensors: the cost for 1 sensor is NAD 4'550.00 + VAT 15 %, i.e., a total of NAD 5'232.50 (CHF 242.55). Apparently, novomedical is the only Namibian supplier for these sensors.

3.3.3 Statistics

3.3.3.1 Admissions and deaths

Data from January 1, 2023, to October 31, 2023, was analyzed. Among 914 infants admitted, 840 (91.9 %) and 74 (8.1 %) were outborn. The mortality rates were 7.0 % (59/840) and 25.7 % (19/74) for inborn and outborn infants, respectively. Compared with data from 2022, the number of admissions of outborn infants has decreased (from 19.0 % to 8.1 %), and overall and birthweight-specific mortality rates have either remained stable or continued to improve (Table 4). These observations are very reassuring: progress made with the help of NEO FOR NAMIBIA – Helping Babies Survive has been sustainable, and the hospital has evolved into a true referral center with increasing numbers of antenatal (in utero) transfers.

	Rundu State Hospital (2022)	Rundu State Hospital (2023)
Total admissions	1228	1097
Total deaths	107	94
Overall MR	8.7 % (107/1228)	8.6 % (94/1097)
MR < 1000 g	56.8 % (21/37)	58.8 % (24/41)
MR 1000 – 1500 g	18.5 % (24/130)	10.4 % (14/138)
MR 1501 – 2500 g	7.3 % (25/341)	9.3 % (29/308)
MR > 2500 g	5.1 % (37/720)	4.3 % (26/610)

Table 4. Comparison of number of admissions, overall and birthweight-specific mortality rates (MR) at Rundu State Hospital between 2022 and 2023 (data for 2023 extrapolated from data from 01-10 2023).

3.3.3.2 CRP registry

Point of care testing (POCT) of C-reactive protein concentrations had been introduced at Rundu State Hospital in May 2021. The main purposes of this intervention were: 1) to expedite decision making (results are available within 5 minutes, i.e., during work rounds), 2) to avoid unnecessary and prolonged exposure to antibiotics, 3) to avoid side effects in individual babies (e.g., negative impact on their intestinal microbiome), and, 4) to decrease selection pressure and therefore the occurrence of multi drug resistant bacteria in the unit.

Analyses of data from the CRP registry (09.06.2023 to 14.11.2023) revealed the following main findings:

- a total of 124 tests were recorded over the 5-month-period
- most tests (91/124, 73 %) were used to measure a second CRP level to rule out neonatal sepsis (r/o EOS or LOS) in infants who had been started on antibiotics; in 75 of them (82 %) antibiotics could be stopped early because two consecutive CRP concentrations were negative (i.e., less than 10 mg/l); antibiotic were continued in 12 (13 %) and changed in 4 (4 %)
- in 15 cases (12 % of all tests performed), the POCT measurement was used to measure a first CRP level in infants with signs and symptoms of possible neonatal sepsis: in 11 (73 %) of them, antibiotics could be withheld
- finally, in 18 cases (15 %), the POCT measurement was used for other reasons

It can therefore be concluded that the introduction of a device that allows POCT of CRP concentrations has been highly successful. There is, nevertheless, some room for improvement: the interval between first and second measurements of CRP concentrations should be no more than 48 hours (in 28/75 (37 %) of such cases, this interval was exceeded). This issue was emphasized in discussions with the local medical staff. Data capture in the registry will now be paused for a period of 6 months; thereafter, appropriate use will again be supervised with this tool.

3.3.4 Future Directions

Neonatal care in the Prem Unit at Rundu Intermediate Hospital has reached an unprecedented high level. NEO FOR NAMIBIA – Helping Babies Survive will focus on supporting equipment maintenance, provision of necessary consumables and ongoing training of health care professionals. In January 2024, the hospital should receive 1 additional MTTS Dolphin® bubbleCPAP device and 1 additional MTTS Colibri® phototherapy unit.

It is hoped that Rundu Intermediate Hospital will rapidly gain experience with the Vayu® bubbleCPAP device (Fig. 14); if considered useful, additional units will have to be provided to referring hospitals and transport teams (Fig. 15) (see below).

Fig. 14. Vayu® bubbleCPAP training at Rundu State Hospital: this device may prove to be very useful for stabilization in the delivery room and interhospital transports.

Fig. 15. Ambulance transfer of a baby with a cardiac condition to Windhoek: the vehicles are only equipped with power and oxygen cylinders.

On the next mission, Prof. Thomas M. Berger will provide ventilator training with a focus on the ResVent® iHope devices, provided that the machines function reliably after replacement of the oxygen sensors. Zoom meetings will be held regularly to improve communication and allow for timely planning of upcoming missions.

3.4 Katima Hospital

3.4.1 Overall impression

On our 12th visit to Katima State Hospital, we were once again pleased to see improved staffing, unwavering enthusiasm and, consequently, continuing progress (Fig. 16 – 18). We met with colleagues both from the Department of Obstetrics and Gynecology (Dr. Manolo Berbe) and the Department of Pediatrics (Dr. Cristy Victor, Dr. Sharon Mungofa). In addition, we had the pleasure to meet Dr. Yurisleydi Valdes for the first time; she is a neonatologist from Cuba and the wife of Dr. Manolo Berbe.

Fig. 16. Nurses at Katima Hospital have become very skilled: babies with respiratory distress supported with CPAP (left top and bottom), nurses inserting an intravenous cannula in a very low birth weight baby (right).

Fig. 17. Surviving babies at Katima Hospital: preterm baby with is kept warm (left), ready for discharge (right).

Fig. 18. KMC (Kangaroo Mother Care) is increasingly practiced in the Neonatal Ward at Katima Hospital..

At a little ceremony after an official meeting with hospital leadership, Prof. Thomas M. Berger and his wife, Sabine Berger, received a framed certificate (Fig. 19) with the following text:

"Certificate (of) Appreciation is awarded to NEO FOR NAMIBIA in recognition for the unwavering support and dedication to saving babies & reducing the mortality rate of neonates born at Katima Mulilo Hospital since December 2019 under the leadership of Prof. Thomas M. Berger, MD & Sabine Berger".

Fig. 19. NEO FOR NAMIBIA – Helping Babies Survive receiving a "Certificate of Appreciation": Sabine Berger (left), Dr. Christy Victor (center), Prof. Thomas M. Berger (right).

3.4.2 Inventory

Over the past 4 years, our NGO has been able to support the development of Neonatology Unit at Katima hospital with the following pieces of equipment:

- MTTS Wallaby® warming tables (total: 6, functional: 6)
- MTTS Koala® bassinets (total: 5, functional: 5)
- MTTS Colibri® phototherapy units (total: 3, functional: 2, low irradiance (see below): 1)
- Masimo® Rad-5 pulse oximeters (total: 3, functional: 0, lost: 1, no batteries: 2)
- Masimo® Rad-8 pulse oximeters (total: 8, functional: 6, lost: 2)
- Masimo® Rad-G pulse oximeters (total: 2, functional: 2)
- MTTS Dolphin® bubbleCPAP devices (total: 2, functional: 2)
- Pumani® bCPAP devices (total 3, functional: 1, broken flowmeter: 2)
- Pumani® bubbleCPAP devices (total: 4, functional: 4)
- Bilifuge® and Bilimeter® Pfaff Medical (total: 1, functional: 1)
- Aidian QuikRead® go CRP (total: 1, functional: 1)

In January 2024, the hospital should receive 1 additional MTTS Dolphin® bubbleCPAP device, 4 additional MTTS Wallaby® warming tables, and 2 additional MTTS Colibri® phototherapy units. There are plans to build a local network for neonatal care, and some of the equipment will likely be used at referring hospitals or clinics. As in Rundu, if considered useful, Vayu® bubbleCPAP devices will have to be provided to those hospitals and transport teams.

Regular equipment maintenance (an ongoing challenge) and the uninterrupted supply of consumables (e.g., pulse oximetry sensors, CPAP patient tubing, CRP test kits) will be of utmost importance; this can currently only be guaranteed by NEO FOR NAMIBIA – Helping Babies Survive. Again, it is planned to organize regular Zoom meetings to improve communication and allow for timely planning of upcoming missions.

3.4.3 Statistics

Data from January 1, 2023, to October 31, 2023, was analyzed. A total of 431 infants were admitted during that period (unfortunately, available data does not allow to distinguish between inborn and outborn infants). The overall mortality rate was 8.6 % (37/431). This represents a record low for Katima Hospital, however, at least in part, this can be explained by a very low rate of admissions of extremely low birthweight (ELBW) infants. Apparently, live born infants with a birthweight of less than 1000 g are considered "abortions" and only rarely admitted to the neonatology unit; it remains unclear how these decisions are made.

It is therefore important to analyze birthweight-specific mortality rates (Table 5). Compared with data from Rundu Intermediate Hospital, mortality rates of infants in the lower

birthweight strata were significantly higher (< 1000 g: 85.7 % and 58.8 %, 1000 – 1500 g: 24.4 % and 10.4 % in Katima and Rundu, respectively), whereas the mortality rates of babies with higher birthweights were comparable (1501 – 2500 g: 6.6 % and 9.3 %, > 2500 g: 4.7 % and 4.3 % in Katima and Rundu, respectively). Of note, invasive mechanical ventilation is not available in the neonatology unit at Katima Hospital; given the overall progress made and the fact that a neonatologist (Dr. Yurisleydi Valdes) has been recruited, the introduction of this mode of respiratory support should perhaps be considered in the foreseeable future.

	Rundu State Hospital (2022)	Rundu State Hospital (2023)
Total admissions	914	431
Total deaths	78	37
Overall MR	8.5 % (78/914)	8.6 % (37/431)
MR < 1000 g	58.8 % (20/34)	85.7 % (6/7)
MR 1000 – 1500 g	10.4 % (12/115)	24.4 % (10/41)
MR 1501 – 2500 g	9.3 % (24/257)	6.6 % (10/151)
MR > 2500 g	4.3 % (22/508)	4.7 % (11/232)

Table 5. Comparison of number of admissions, overall and birthweight-specific mortality rates (MR) at Rundu State Hospital and Katima State Hospital (January 1 to October 31, 2023).

3.4.4 Future directions

Given the encouraging results, NEO FOR NAMIBIA – Helping Babies Survive will continue to support the neonatology unit at Katima Hospital. The idea of creating a neonatal network that spans the four neighboring countries in the mighty Zambezi region (Namibia, Botswana, Zambia, Zimbabwe) deserves to be pursued and supported. Some basic equipment (e.g., MTTS Wallaby® warming tables, POCT of bilirubin concentrations, MTTS Colibri® phototherapy units, Vayu® bubbleCPAP, pulse oximeters) would potentially make a big difference.

As mentioned above, the possibility of introducing invasive mechanical ventilation should be explored. If the ResVent® iHope ventilators purchased by the MHSS prove to be reliable (operation, maintenance, supplies), the time might have come to offer this treatment modality to sick neonates in the Zambezi region. However, additional staffing and thorough training of doctors and nurses would be absolute prerequisites.

4. CONFERENCES

4.1 Pediatric Pathology Conference

After returning from the Sossusvlei Dunes, Prof. Thomas M. Berger and Sabine Berger met Dr. Kundai Mapanga at a Pediatric Pathology Conference at Windhoek Central Hospital on November 11, 2023. Dr. Kundai Mapanga had worked as a medical officer (MO) at Rundu State Hospital from 2018 – 19. Currently, she is undergoing further pediatric training

in Dublin, Ireland. A few months ago, she had contacted NEO FOR NAMIBIA – Helping Babies Survive and expressed an interest to accompany the team on the next mission.

Dr. Christy Kaiyamo, a fellow in pediatric pathology in Bristol, UK, led through the program. The hybrid conference was attended by approximately 50 health care professionals, with the majority joining online.

In his talk, Prof. Thomas M. Berger pointed out milestones and pitfalls in neonatal history with a particular focus on bronchopulmonary dysplasia (BPD) and retinopathy of prematurity (ROP). Particularly the latter, a disease that can lead to blindness, is of relevance in low- and middle-income countries (LMICs) where uncontrolled use of oxygen is still highly prevalent and screening examinations are not available in many places. Prof. Thomas M. Berger also discussed other complications that mainly affect premature babies and can have severe long-term consequences: periventricular and intraventricular hemorrhages (PIVH) and periventricular leukomalacia, often associated with neurodevelopmental impairment, and necrotizing enterocolitis (NEC), a potentially rapidly fatal inflammation of the gut. Finally, using two exemplary case reports from the case collection of the Swiss Society of Neonatology, he highlighted the important role that pediatric pathology plays in neonatology.

4.2 National Neonatology Conference

Organized by the Ministry of Health and Social Services (MHSS) and NEO FOR NAMIBIA – Helping Babies Survive, the First National Neonatology Conference was held at the Seaside Hotel in Swakopmund (Fig. 20). The main purpose of this conference was to present the work of our NGO to a larger audience. The MHSS had invited representatives from various hospitals in the country who might have an interest to collaborate with NEO FOR NAMIBIA – Helping Babies Survive to improve their ability to care for sick term and preterm infants.

MHSS
Ministry of Health and Social Services
REPUBLIC OF NAMIBIA

NEO FOR NAMIBIA
HELPING BABIES SURVIVE

National Conference on Basic and Advanced Neonatral Care

Date Thursday, November 16, 2023
Time 08:00 - 17:30
Venue Seaside Hotel, Swakopmund

Director of Ceremony: Taimi Amaambo, Deputy Executive Director, MoHSS

Time	Activity	Facilitator
08:00 - 08:30	Registration & domestic logistics	Toini Shimooshili, MoHSS
08:30 - 09:00	Introductions	Taimi Amaambo, Deputy Executive Director, MoHSS
09:00 - 09:15	Welcome remarks I	Ms. Anna Jonas, Erongo Regional Director
09:15 - 09:30	Welcome remarks II	Prof. Thomas M. Berger, NEO FOR NAMIBIA - Helping Babies Survive
09:30 - 09:45	Official Opening	Hon. Dr. Kalumbi Shangula, Minister of Health and Social Services
09:45 - 10:30	**Tea Break**	
10:30 - 12:45	**Presentations & Discussions (Part I)**	
10:30 - 11:15	The history of neonatology	Prof. Thomas M. Berger, NEO FOR NAMIBIA - Helping Babies Survive
11:15 - 12:00	Neonatal respiratory support - What lessons can be learned from history?	Prof. Thomas M. Berger, NEO FOR NAMIBIA - Helping Babies Survive
12:00 - 12:45	NEO FOR NAMIBIA - Helping Babies Survive: How do we work and what has been achieved?	Prof. Thomas M. Berger, NEO FOR NAMIBIA - Helping Babies Survive
12:45 - 14:00	**Lunch Break**	
14:00 - 16:00	**Presentations & Discussions (Part II)**	
14:00 - 14:30	Early-onset neonatal sepsis: antibiotic stewardship and point of care testing	Dr. Kundai Mapanga
14:30 - 15:00	NEO FOR NAMIBIA - Helping Babies Survive: The Rundu Experience	Team from Rundu
15:00 - 15:30	NEO FOR NAMIBIA - Helping Babies Survive: The Katima Experience	Team from Katima
15:30 - 16:00	NEO FOR NAMIBIA - Helping Babies Survive: Round table discussion	Team NEO FOR NAMIBIA - Helping Babies Survive (moderating), Teams from Rundu and Katima
16:00 - 16:30	**Tea Break**	
16:30 - 17:45	**Presentations & Discussions (Part III)**	
16:30 - 17:15	Discussion on the way forward	Dr. Theo-Ben Kandetu, Acting Deputy Executive Director, Office of ED
17:15 - 17:30	Vote of thanks and closure	Taimi Amaambo, Deputy Executive Director, MoHSS

Fig. 20. The First National Neonatology Conference (left) was officially opened by the Honorable Minister of Health, Dr. Kalumbi Shangula (right with Prof. Thomas M. Berger); the conference was held in Swakopmund and attended by 65 health care professionals.

After introductory comments by the host, represented by Mrs. Anna Jonas, Regional Director of the Erongo region, and the Deputy Executive Director (DED) of the MHSS, Mrs. Taimi Amaambo, the conference was officially opened by the Minister of Health, the Honorable Dr. Kalumbi Shangula.

The following talks followed during the morning session:

- History of neonatology (Prof. Thomas M. Berger)
- Neonatal respiratory support – What lessons can be learned from history? (Prof. Thomas M. Berger)
- Neonatal sepsis and the role of biomarkers (Dr. Kundai Mapanga)

After a brief lunch break, the following topics were covered during the afternoon session:

- NEO FOR NAMIBIA – Helping Babies Survive: How do we work and what has been achieved? (Prof. Thomas M. Berger)
- NEO FOR NAMIBIA – Helping Babies Survive: The Rundu Experience (Mrs. Emilie Nangura, RN)
- NEO FOR NAMIBIA – Helping Babies Survive: The Katima Experience (Dr. Christy Victor)

During breaks an at the end of the conference, interested parties were given a chance to look at the Vayu® bubbleCPAP device, the low-cost and light-weight CPAP device that might be of particular interest for stabilization in the delivery room and for transports.

The conference was closed after a round table discussion (with participation of doctors and nurses from Rundu and Katima) and the presentation ideas for the way forward. A total of 68 health care professionals had participated, and immediate feedback was very positive. In the following days, print media and the Namibia Broadcasting Corporation (NBC) reported on the event (Fig. 21).

145 mothers die while giving birth

...1 066 stillbirths recorded from 2018 to 2021

• ADAM HARTMAN

Jonas highlighted the complexities involved, particularly if healthcare workers lack the necessary knowledge, skills and equipment to adequately care for these vulnerable infants.

"The blend of equipment in the survival of neonatal babies is indispensable," Jonas said, stressing the necessity of both skills and resources to ensure newborn survival.

Thomas Berger of Neo for Namibia emphasised the need for specific plans to continue making strides in neonatal care.

"We actually know how to proceed and how to make a difference within a very short period of time," he said, referencing successful experiences in other regions.

Fig. 21. The media reported about the First National Neonatology Conference the following day.

5. VAYU® bubbleCPAP TRIAL

Vayu® bubbleCPAP device was developed by a research team headed by Prof. Thomas Burke at the Massachusetts General Hospital (MGH), a Harvard affiliated teaching hospital in Boston. The device is characterized by low cost, low weight, and its ingenious simplicity. It does not require electricity, and only requires an oxygen source. A blender that is based in the Venturi principle mixes ambient air with the oxygen to provide the desired FiO_2.

The NEO FOR NAMIBIA – Helping Babies Survive team presented the device on several occasions during their 20th mission (Fig. 14, 22, 23). All the hospitals we visited agreed to participate in a Vayu® bubbleCPAP test trial. Thus, we hope to rapidly gain experience with the device. This would allow us to determine whether the machine would be suitable for wide-spread use in Namibia.

Fig. 22. Demonstration of the Vayu® bubbleCPAP device at the First National Neonatology Conference in Swakopmund (left: complete setup; right: Sabine Berger explaining the blender).

Fig. 23. Demonstration of the Vayu® bubbleCPAP device to ambulance crews in Katima (left: proud ambulance crews after completing the training, right: simple fixation of the patient tubing).

6. NAMIBIAN IMPRESSIONS FROM THE 20TH MISSION

Once again, we would like to conclude our mission report with photographs of people we encountered and landscapes we admired (Fig. 24 – 31).

Fig. 24. The world famous Deadvlei is surrounded by the largest sand dunes in the world, the highest reaching 300–400 meters (350 m on average), named "Big Daddy"; the trees have died; however, the wood has not decomposed because the area is so dry.

Fig. 25. View from "Big Daddy" into the surrounding Namib Desert.

Fig. 26. Because of the heat, climbing "Big Daddy" took about 45 minutes; descending into the Deadvlei is much easier and faster (about 5 minutes)!

Fig. 27. During our missions, we usually travel several thousand kilometers across Namibia by car (left); to save time, we often choose to fly from Katima to Windhoek (right).

Fig. 28. Scene from the open market in Rundu.

Fig. 29. While in Windhoek, we encountered the the family of Martin; he is unemployed and lives as a homeless person in the streets of the capital; together with Marcel Bösch, we supported them with some clothes and food.

Fig. 30. Meeting the Hamutenya sisters and their kids in village outside of Rundu: Grace (left) is the second child of Eleotelya; in contrast to her older sister Nicoteh (born prematurely with a birth weight of 1150 g), she was born at term.

Fig. 31. Always a pleasure to meet our good old friend Johannes: he works as a guard at the Kaisosi River Lodge (he is still happy with his bicycle!).

A big thank you to our donors

flexmedics menschlich engagiert

HIRSLANDEN ANDREASKLINIK

Fondation JThuma

Kiwanis LUZERN-SEETAL

Kriens hilft Menschen in Not 50 JAHRE

FAMILY LARSSON ROSENQUIST FOUNDATION dedicated to human milk

Partners Group REALIZING POTENTIAL IN PRIVATE MARKETS

rent anesth wir beschützen die schlafenden

Rotary Luzern Wasserturm

SCHMERZ ZENTRUM ZOFINGEN

STARR INTERNATIONAL FOUNDATION

ZUGER Kantonsspital

Donate and help babies survive

neo-for-namibia.org/donate

Luzerner Kantonalbank
Postfach, 6002 Luzern, Switzerland
BIC/SWIFT LUKBCH2260A
IBAN CH75 0077 8206 2817 2200 1