NEO FOR NAMIBIA
HELPING BABIES SURVIVE

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MISSION REPORT

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NEO FOR NAMIBIA
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EXECUTIVE SUMMARY

In Namibia, the under-5-mortality rate reached 49.8/1000 live births in 2013; however, this figure is likely to be substantially higher for the Kavango region. According to UN/WHO estimates, almost 50 % of this toll are due to deaths in the neonatal period.

At the Rundu State Hospital, 11 % of all neonates admitted to the neonatal unit from January 1, 2016 to September 26, 2016 did not survive (this rate excludes deliver room deaths). The main causes of death were prematurity and low birth weight with hypothermia, infections, respiratory distress and birth asphyxia. A substantial proportion of these deaths are preventable by introducing a bundle of simple interventions that do not require expensive high-tech equipment.

In the short-term, these measures include a) improved staffing and identification and support of local leaders (both among physician and nursing staff), b) basic care of preterm infants (including thermoregulation, adequate nutrition, management of apnoea and bradycardia syndrome, Kangaroo Mother Care), c) improved support for infants with respiratory distress (monitoring of oxygen therapy, non-invasive respiratory support), d) standardised approach to neonates with suspected early-onset sepsis, and e) preventive efforts to avoid birth asphyxia.

The implementation of these interventions is likely to require considerable on-site involvement of qualified educators and supervisors; on-the-job training will lead to more rapid changes and facilitate progress. Success of such a project requires firm commitment of all stakeholders and parties involved.

The new maternity and neonatology ward at Rundu State Hospital has progressed to near completion but now awaits some important final work. The opening of this unit might be a good starting point for our involvement. We foresee an initial project duration of 2 – 3 years (2017 – 2019) with stepwise introduction of the suggested interventions. At the end of each year, progress should be documented in a report.

CONTENT

1. INTRODUCTION

This report is based on our previous analysis entitled «Neonatology in the northern part of Namibia» from 2015 (attached), as well as observations made during a more recent visit to the Rundu State Hospital from September 21–25, 2016.

Some comments relate to discussions with the Health Minister, Dr. Bernard Haufiku, Dr. Shonag Mackenzie (Chief of OB/GYN at Windhoek General Hospital and Katutura Intermediate Hospital), Dr. James Benjamin (Chief of Paediatrics at Windhoek General Hospital), Beatrix Callard (Head of Nursing at Windhoek General Hospital), as well as Mrs. Petronella Masabane (PS in the Ministry of Health ands Social Services). We have also had the opportunity to meet with Prof. Clarissa Pieper (Head of Neonatology) and to visit the level III neonatal intensive care unit (NICU) at Windhoek General Hospital.

We are grateful that we once again had the opportunity to train local health care professionals at Rundu State Hospital (neonatal resuscitation training, case discussions of neonatal emergencies, non-invasive and invasive respiratory support). Many of them also joined us on teaching rounds in the Prem Unit.

Fig. 1. Teaching rounds were well attended by both physician and nursing staff.

2. OVERALL ASSESSMENT

Since our visit in September / October 2015, there has been little change in staffing, infrastructure and level of patient care. The new maternity and neonatology ward has progressed to near completion but now awaits some important final work. By and large, suggestions made in the 2015 report Neonatology in the northern part of Namibia have not yet been addressed. There continues to be an urgent need to improve neonatal care.

3. STAFFING AND DUTY SCHEDULE PHYSICIANS

Currently, there are five medical doctors working in the Department of Paediatrics with two doctors originating from Cuba, one from the Ukraine and two from the Democratic Republic of the Congo (DRC) (Table 1). During our brief visit, it was not possible

to explore their levels of expertise in detail; however, their knowledge of neonatology appears to be limited.

Name	Rank	Duration of appointment	Comment
Chantal Nyembo, MD	SMO	7 years	Originally from the DRC
Katumba Banza, MD	MO	1 year	Originally from the DRC
Odalys Alfonso, MD	MO	3 years	Originally from Cuba
Amarilys Castro, MD	MO	5 months	Originally from Cuba
Vira Kornishov, MD	MO	9 months	Originally from the Ukraine

Table 1. List of physicians working in the Department of Paediatrics at Rundu State Hospital (SMO: senior medical officer, MO: medical officer).

According to information provided by Dr. Alfonso, these physicians cover the following areas in the hospital, where paediatric patients are cared for:

- General paediatric ward
- High care unit (HCU) - paediatric patients only
- Intravenous unit (IVU)
- Maternity ward – well babies only
- Outpatient department (OPD) – paediatric patients only
- Emergency department – paediatric patients only

Their work starts with a common morning report from 8.00 am to 8.30 am; this is followed by rounds of all paediatricians in the HCU lasting between 30–60 minutes. They then do rounds individually in their assigned wards. At 10.30 am, one of them is on duty for the emergency department and continues to cover the inpatient wards; three of them continue their work in the OPD and the post-call physician can go home. There is a lunch break from 1 to 2 pm. Work then continues until 5 pm; thereafter, the night shift doctor takes over all responsibilities until the next morning.

Even though we were not able to assess the hospital's total paediatric case load (inpatients and outpatients), it is highly likely that both the quantity and quality of physician staffing at Rundu State Hospital is critically low. Leadership appears to be missing and responsibilities are not clearly defined.

4. STAFFING AND DUTY SCHEDULE NURSES

We were not able to assess staffing and work schedules for nurses in the Prem Unit in detail (let alone for the other areas of paediatric care); however, during rounds no more than three nurses were available to care for between 15 and 20 patients. It is likely that staffing is even more restricted during night shifts and possibly on week-ends.

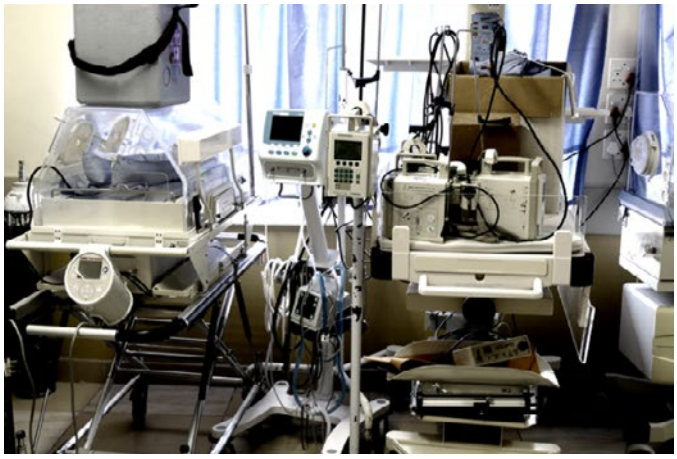
Once again, we were impressed to see that mothers are involved in the basic care of their infants: they change diapers and cup or syringe feed their babies. Since nurse

staffing is limited, help of the mothers is obviously more than welcome; on the other hand, their level of education is quite variable and, consequently, there is a clear need for supervision of their activities.

Given the limited availability of physician staff – particularly during night time and on week-ends – nurses are frequently forced to deal with critical situations on their own. One patient we saw serves as an example to illustrate this situation: a preterm infant (gestational age of about 30 weeks) had severe apnoea and bradycardia spells requiring stimulation and intermittent bag mask ventilation. The doctor in charge was informed about the critical situation; apparently, she was unable to come and see the patient and simply ordered to give oxygen via face mask (obviously of no use in an apnoeic patient). No attempts were made to explore the potential causes of the apnoea spells (in fact, we found the patient to be hypothermic with a temperature of 35.3 °C; a blood glucose was normal). The baby died several hours later with his mother sitting at the bedside.

5. INFRASTRUCTURE AND EQUIPMENT

Inadequate storage and maintenance of technical equipment and interruption of supply chains are a major issues and must be addressed urgently.



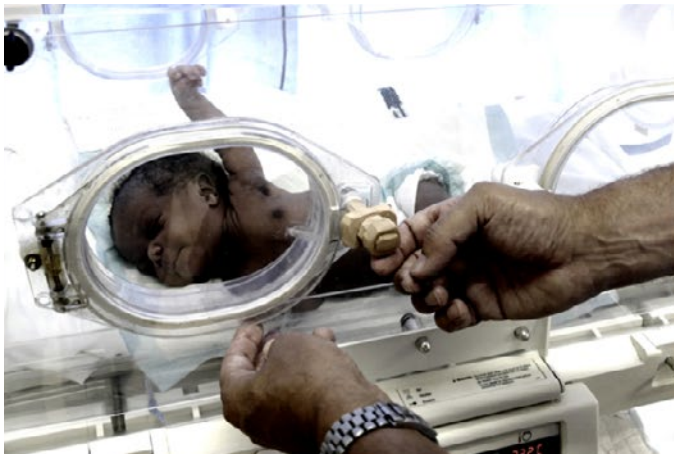


Fig. 2. Storage and maintenance of technical equipment is inadequate; similarly, timely supply of consumables is not guaranteed.

The following is a list of currently available and regularly used equipment:

5.1 Thermoregulation

- Incubators: different brands; used in a non-servo mode, unclear if humidification works; on the other hand, cheaper warming beds are not available
- Open cot beds (fewer than incubators)
- Warming table: Resuscitaire® is only in use for procedures (e.g., insertion/removal of umbilical venous catheters); lack of compressed air severely limits its use

5.2 Respiratory support

The only form of respiratory support is free-flow oxygen administered via face masks, which are frequently too large for the patients and easily get displaced; nasal cannulas for oxygen therapy are not available

- There are no air-oxygen blenders and dosing of oxygen is largely uncontrolled (see monitoring)
- Suction device: available, however, vacuum cannot be adjusted and suction catheters used are too small
- There are two CPAP devices (Fabian Accutronic®, CareFusion Viasys Infant Flow®), however, they cannot be used because of lack of compressed air (a stand-alone air compressor is not in use) and lack of training
- There is no caffeine available to treat apnoea of prematurity

Fig. 3. Oxygen therapy by face mask (left); oxygen therapy by improvised nasal cannula (right).

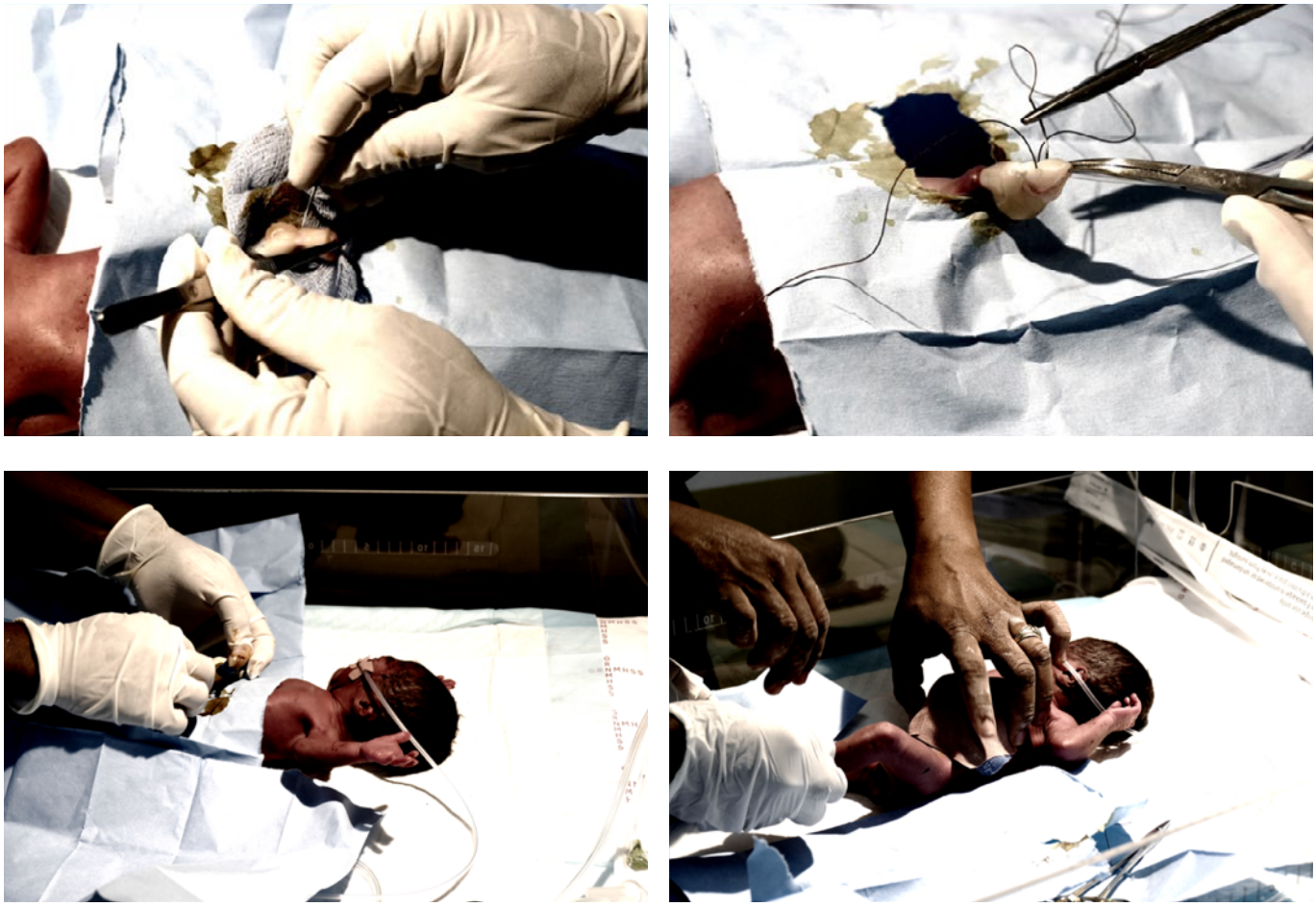
5.3 Monitoring

- Oxygen saturation (SpO2) monitors: only two in functioning condition, inadequate sensors for smaller neonates
- There is no continuous SpO2 or ECG monitoring (e.g., for patients on supplemental oxygen therapy or preterm infants with apnoea of prematurity)
- SpO2 monitors are not used in the delivery room

5.4 Fluid and nutrition

- Peripheral IV catheters are frequently (and skilfully) used
- Umbilical venous access is used (NG tubes are used instead of umbilical venous catheters): correct position cannot be verified (no mobile X-ray unit), fixation (suturing) and dressing needs to be improved, in addition, they should be removed as soon as feasible (high risk of infection)
- Only 10% dextrose and Neolyte® solutions are available (i.e., no parenteral nutrition)
- Infusion pumps (CareFusion Alaris® GPplus) are available and in regular use (significant improvement compared to fluid administration one year ago)

Fig. 4. Umbilical venous catheters are frequently used; insertion technique (particularly sterile precautions), dressing and handling should be improved to prevent complications.



- The importance of breast milk is recognized and mothers are encouraged to express breast milk if their babies are too sick or too immature to breast feed: NG tube feeding, cup feeding and feeding by syringe are used
- Human milk fortifiers (e.g., Nestlé BEBA® FM 85) to improve caloric intake in small preterm and/or growth restricted infants with a birth weight < 1500 g are not available

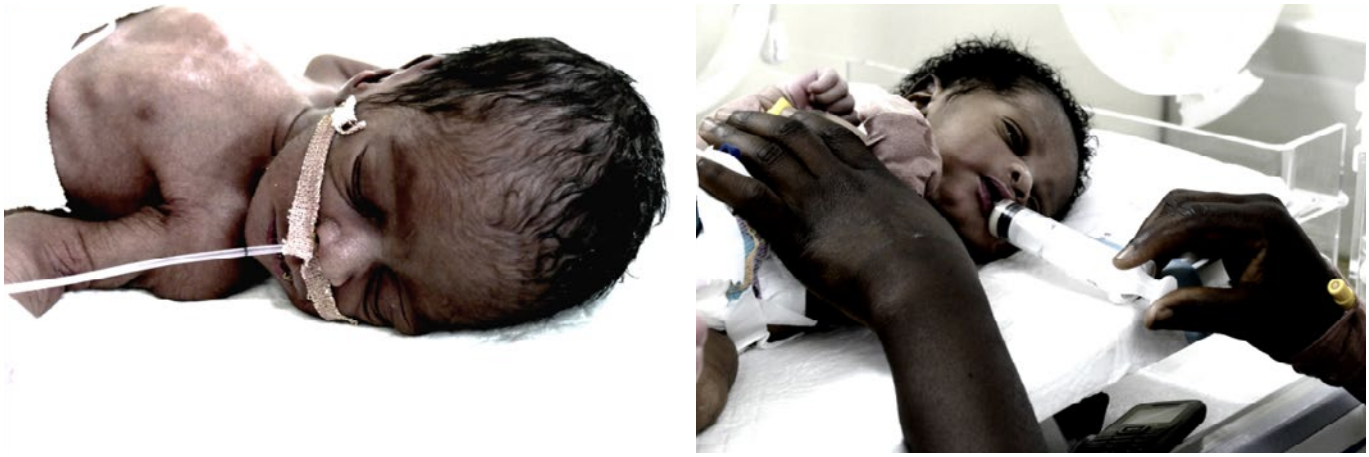


Fig. 5. Feeding of expressed breast milk by NG tube (left) and by syringe (right) is often done by the mothers.

5.5 Antibiotics

- Several antibiotics, including Aminopenicillin, aminoglycosides and cephalosporins (the latter for late-onset sepsis) are available (they are generally given for 7 days)
- Laboratory parameters (e.g., C-reactive protein, CBC) are not used to guide antibiotic therapy

5.6 Anticonvulsants

- Both phenobarbital and diazepam are used (mostly in asphyxiated neonates)
- Phenobarbital levels cannot be monitored

5.7 Laboratory tests

- Severely limited possibilities: glucose measurement is the only point-of-care testing (POCT) parameter available, all other tests need to be sent to the central laboratory (e.g., CBC, blood cultures, bilirubin); unfortunately, results of these tests are rarely available
- Electrolytes and blood gases are never measured
- Capillary blood sampling is rarely used and appropriate skin prick devices are not available

6. WARD STATISTICS PREM UNIT

Based on the Prem Unit's admission book, there have been 549 admissions and 63 deaths between January 1, 2016 and September 23, 2016.

Leading admission diagnosis associated with death are: 1. prematurity (accounting for 68% of all deaths), 2. Congenital malformations (accounting for 13% of all deaths, and 3. asphyxia (accounting for 10% of all deaths). The leading admission diagnoses and associated mortality rates are listed in Table 3.

Month	Admissions	Discharges	Deaths
January	50	45	5
February	60	45	5
March	81	57	13
April	61	44	9
May	51	44	6
June	44	22	8
July	67	52	8
August	73	72	5
September	62	not available	4
Total Jan 1, 2016 to Sep 26, 2016	**549**	**not available**	**63**
Extrapolated Jan 1 to Dec 31, 2016	**745**	**not available**	**85**

Table 2. Prem Unit statistics 2016: number of admissions, number of discharges and number of deaths (note: delivery room deaths not included).

While the prematurity-associated mortality rate is high (29%), mortality rates for meconium aspiration syndrome (MAS) and respiratory distress syndrome (RDS) are extraordinarily low (1.1% and 4.5%, respectively). The latter observation is likely due to the fact that these diagnoses are primarily assumptions based on medical history, as well as clinical signs and symptoms but never verified by chest X-rays; it is quite likely that they are frequently incorrect.

Admission diagnosis	Number of cases	Number of deaths	Diagnosis-specific mortality rate
Prematurity	146	43	29%
Meconium aspiration syndrome	95	1	1.1%
Respiratory distress syndrome	89	4	4.5%
Asphyxia	83	6	7.2%
Neonatal sepsis	44	1	2.3%
Safe keeping	34	0	0.0%
Congenital malformation	11	8	73%
Neonatal jaundice	9	0	0.0%

Table 3. Prem Unit statistics 2016 (note: delivery room deaths not included): main diagnoses and diagnosis-specific mortality rates.

7. MEDICAL INTERVENTIONS WITH POTENTIALLY HIGH IMPACT

Potential interventions to improve neonatal care at Rundu State Hospital are listed in Tables 4 – 8. They are grouped into:

1. Baseline evaluation of infrastructure, staffing and unit statistics (Table 4)
2. General neonatal care (Table 5)
3. Interventions for preterm infants (Table 6)
4. Approach to early- and late-onset neonatal sepsis (Table 7)
5. Interventions to decrease the incidence of perinatal asphyxia (Table 8)

It is suggested that several standard operating procedures (SOPs) are developed:

1. Monitoring with pulse oximetry
2. Thermoregulation
3. Fluids and nutrition
4. Apnoea of prematurity
5. Early-onset sepsis
6. Late-onset sepsis

In addition, these interventions are prioritised according to the time frame for their implementation (phase 1 – 3), possibly spanning a 2-year-period.

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Pilot Project 2017/18
Baseline evaluation of infrastructure, staffing and unit statistics

Date (when)	Main Topic (what)	Intervention (how)	Responsibility (who)	Assessment
Phase 1	Staffing and duty roster	Assessment of: • staff list (nurses, physicians) • duty roster (nurses, physicians) • identify potential leaders	Swiss Team Chief of Paediatrics Head nurse	• Complete lists of staff, duty rosters and physician rotations available • Potential leaders identified (must have long-term assignment to unit)
Phase 1	Infrastructure - equipment	Assessment of: • available infrastructure • vital additions to infrastructure • maintenance practices Designate responsible staff member	Swiss Team Neonatologist Head nurse Medical engineering	• Inventory completed • List of essential material compiled • Needs of biomedical engineering recorded
Phase 1	Infrastructure – consumables and stock management	Inventory of • medications and IV solution • nasal cannulas, feeding tubes, etc. • dressing supplies Clarification of supply chain Designate responsible staff member	Swiss Team Head nurse	• Inventory completed • List of essential missing items • Supply chain clarified
Phase 1	Unit statistics	Introduce Minimal Neonatal Data Set (MNDS) • number of deliveries • number of NICU admissions • main diagnoses • number of deaths (both DR and NICU) • causes of death Designate responsible staff member	Swiss Team Chief of Paediatrics Chief of OB/GYN Local unit clerk	• MNDS established: paper records of MNDS readily available and used; data transfer into computerised statistics program (unit clerk) • Baseline assessment started

Table 4. Baseline evaluation.

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Pilot Project 2017/18
General care

Date (when)	Main Topic (what)	Intervention (how)	Responsibility (who)	Assessment
Phase 1	Patient documentation Charting by nurses/parents	Assess current documentation and charting Introduce simple nursing charts	Swiss Team Neonatologist Head nurse	• Doctors' notes and orders evaluated • Simple nursing charts introduced for all patients
Phase 1	Hygiene	Review hygiene guidelines: • emphasize hand hygiene • disinfection of equipment • discontinue changing of shoes Provide functioning sanitation systems	Swiss Team Neonatologist Head nurse	• Disinfectant available at every bed • Stethoscopes cleaned before every use • Functioning sinks, toilets, showers
Phase 1	Ward rounds	Introduce structured ward rounds Prioritise patient care	Swiss Team Neonatologist Head nurse	• Roles of team members during ward rounds clarified • Ward rounds proceed in a well-structured and efficient way
Phase 1	Monitoring	SOP 1 – Monitoring with pulse oximetry • supply of at least 5 monitors • supply of neonatal sensors • use of monitors (sensor positions, alarm limits, response to alarms, etc.)	Swiss Team Neonatologist Nursing team member Biomedical engineering	• Monitors are used either intermittently or continuously • Alarm limits are set appropriately • Nurses respond to alarms
Phase 1	Consumables	Introduce material appropriate for neonates: • IV cannulas, connectors, IV tubing • feeding tubes • nasal cannulas for oxygen therapy • skin friendly tape Designate responsible staff member	Swiss Team Nursing team member	• Neonatal size material introduced • Supply chain clarified
Phase 2	Analgesia	Introduction of pain concept: • non-pharmacological pain control • use of glucose 30% solution for the management of procedural pain • introduction of a step-up analgesic drug concept (paracetamol, morphine)	Swiss Team Neonatologist Head nurse	• Use of non-nutritive sucking, facilitated tucking, breastfeeding for management of procedural regularly used • Glucose 30% introduced and used for procedural pain • Paracetamol, morphine available
Phase 3	Palliative care	Discuss the concept of palliation: • determine cultural aspects and evaluate feasibility • primary palliative care • redirection of care • resource allocation	Swiss Team Neonatologist Head nurse	• Assess feasibility to determine if topic can be pursued further

Table 5. General neonatal care.

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Pilot Project 2017/18
Preterm infants

Date (when)	Main Topic (what)	Intervention (how)	Responsibility (who)	Assessment
Phase 1	Thermoregulation	SOP 2 – Thermoregulation Teaching: • use of open radiant warmers • use of incubators • Kangaroo Care Charting: • admission temperature recorded • temperature checked at regular intervals	Swiss Team Local medical officer	• Charting of admission T • Charting of NICU T
Phase 1	Fluids and nutrition	SOP 3 – Fluids and nutrition Teaching: • fluid requirements • nutrition requirements • Introduction milk fortifier (e.g., FM 85) • charting (weight, intake)	Swiss Team Local medical officer	• Charting established • Daily weights measured • FM 85 available: reliable supply established • Infants with BW < 1500 g receive fortified BM once on full feeds
Phase 1	Apnoea and bradycardia	SOP 4 – Apnoea of prematurity • define patients at risk • charting & intervention • introduction caffeine therapy	Swiss Team Local medical officer	• Caffeine used in all preterm infants with an estimated gestational age less than 34 weeks • Reliable supply established

Table 6. Interventions for preterm infants.

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Pilot Project 2017/18
Neonatal sepsis

Date (when)	Main Topic (what)	Intervention (how)	Responsibility (who)	Assessment
Phase 1	Neonatal early-onset sepsis	SOP 5 – Early-onset sepsis • identification of patients at risk • initiation of therapy without delay • choice of antibiotics • use of C-reactive protein to guide duration of therapy (in addition to clinical evolution)	Swiss Team Neonatologist Head nurse	• C-reactive protein measurements readily available to guide treatment duration (may have to be deferred to phase 2) • Unit statistics: number of patients treated with antibiotics; determination of duration of therapy • Mortality related to early-onset sepsis prospectively analysed
Phase 2	Late referrals of infants at risk for early-onset sepsis	Contact with referral health care facilities • Teaching sessions Evaluation ambulance services	Swiss Team	• Analysis of referral patterns • Age at time of referral
Phase 3	Neonatal late-onset sepsis	SOP 6 – Late-onset sepsis • risk factors • clinical signs and symptoms • choice of antibiotics	Swiss Team Neonatologist Head nurse	• C-reactive protein measurements readily available to guide treatment duration • Unit statistics: number of patients treated with antibiotics; determination of duration of therapy • Mortality related to late-onset sepsis prospectively analysed

Table 7. Approach to (suspected) early- and late-onset neonatal sepsis.

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Pilot Project 2017/18
Birth asphyxia

Date (when)	Main Topic (what)	Intervention (how)	Responsibility (who)	Assessment
Phase 2	Birth asphyxia	Contact with obstetrics at Rundu State Hospital Contact with referring health care facilities Evaluation ambulance services	Swiss Team	• Analysis of referral patterns • Age at time of referral
Phase 2	Neonatal resuscitation training	Resuscitation training • train-the-trainer course • courses at referring health care facilities	Swiss Team	• Instructors identified and trained • Course evaluation at referring centres • Number of participants recorded

Table 8. Interventions to decrease the incidence of perinatal asphyxia.

8. CONCLUSIONS

There is an urgent need to improve neonatal care at the Rundu State Hospital. We are convinced that the implementation of a limited set of key interventions that do not require expensive high-tech equipment could have a major impact on mortality and morbidity rates of neonates in the Kavango region. If the proposed pilot project is successful, other regions in Namibia could potential benefit form the experience.

We would be interested to support such a project and serve as voluntary advisors. We envision that we would be able to possibly spend up to three months per year in Rundu to accompany the improvement process. The opening of the new maternity and neonatology unit (hopefully early in 2017) would be a good starting point for our involvement.

Fig. 6. Currently, because of lack of space, mothers are placed on mattresses in the corridor of the maternity ward; more space is desperately need to improve obstetric care.

Identification local champions (i.e., leaders), both among physician and nursing staff, will be critical. Once identified, they need to take over leadership responsibilities and, if successful, should be rewarded accordingly to guarantee continuity and avoid "brain drain".

The project must be approved by the Ministry of Health and Social Welfare and, while we do not expect to receive any salaries, we do expect to receive administrative support of our efforts. The opening of the new maternity and neonatology unit at Rundu State Hospital might be a good starting point for our involvement. We foresee an initial project duration of 2–3 years (2017–2019) with stepwise introduction of the suggested interventions.

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