

Business Case - Project NICU 2020- 2025

STICHTING
VRIENDEN
SENGEREMA
HOSPITAL

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Abbreviations:

SVSH - Friends of Sengerema Hospital Foundation

NICU - Neonatal Intensive Care Unit

Chapter 1: dedicated NICU team

In this chapter the participants of Project NICU will be introduced by name and function within Project NICU.

Main contacts and contact information

Name	Role	E-mail address	Phone number
Milou van Ingen	Project leader SVSH	Milou.vaningen@radboudumc.nl	+31615961550
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Niek Versteegde	Project manager SVSH	niek@versteegde.com	+31616915011
Marije Hogeveen	Consultant Neonatologist	Marije.hogeveen@radboudumc.nl	+31630099291
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1.2 Goals and objectives

To lead by example for patients, providers and other stakeholders in providing good quality and sustainable care for neonates at low costs in Sengerema Designated District Hospital

- To ensure sufficient bed capacity for providing care to all neonates in need for care at the district of Sengerema
- To expand the building of the current department to create more capacity to meet current high demands
- To provide for sufficient equipment for good quality care
- To ensure sufficient staff is available and all staff members are well trained in providing neonatal care
- To provide for sufficient funds to ensure continuous availability of essential medicine and consumables

1.3 Stakeholders and roles

1.3.1 Sengerema Designated District Hospital

Sengerema Designated district hospital (SDDH) is a busy faith based district hospital in the north of Tanzania with a catchment area of 440.000 people. Due to its geographical location, it functions as a referral hospital for neighboring hospitals. The hospital serves as a training center for nursing, clinical officer and medical officer students and Dutch medical interns. The main workload is focused on maternal and pediatric care, combined these are two thirds of all admissions. The hospital is funded through government funding, income generated from patient fees, the catholic church and funding by external funders and foundations.

The hospital has taken the initiative to expand the NICU which was erected in 2015 because of continuously increasing number of patients. It is responsible for execution and coordination of the project within the hospital.

1.3.2 Friends of Sengerema Hospital Foundation

Friends of Sengerema Hospital Foundation (SVSH) was founded in 2011 by former Dutch medical interns from SDDH. The foundation structurally supports the hospital with well-defined projects that are aligned with local needs. The Foundation is supporting over ten local projects.

The initial start of the NICU in 2015 was supported through a collaboration in which SVSH provided equipment, funds, knowledge and skills needed to start the department. It has committed itself to continue to support this project to ensure continuity and sustainability. In the current project it has the role of project leader and it contributes knowledge, skills, training, funds and equipment.

1.3.3 Little Super Heroes Foundation

Little Super Heroes is a Dutch foundation that was founded in 2017 and is supporting healthcare, safety and education of children in Africa. They support small scale local projects in Africa. Little Super Heroes and Friends of Sengerema Hospital have agreed to collaborate for this project. Little Super Heroes will aid in finding the funds needed for this project, but will not have an active role in the project itself.

Chapter 2: current situation

2.1 Background:

The United Republic of Tanzania's neonatal mortality rate (NMR) is 25 per 1,000 live births. NMR in rural areas this is 24 deaths per 1,000 live births and 43 deaths per 1,000 live births in urban areas.[1] It has committed itself to the sustainable development goals which include the target to reduce neonatal mortality below 12 per 1,000 live births before 2030.

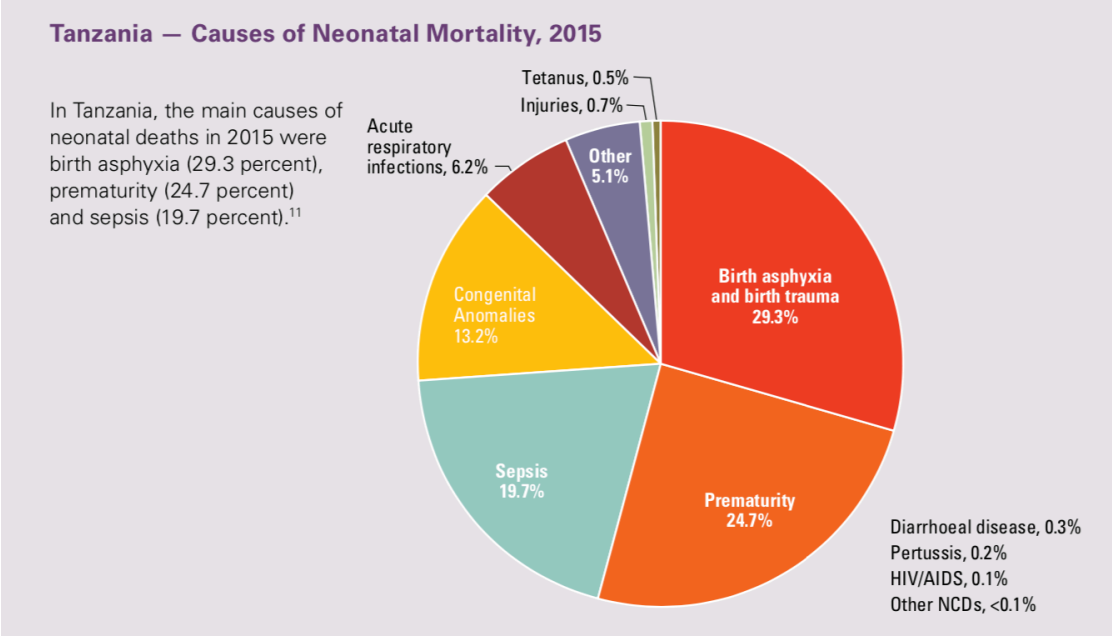


Figure 1: causes of neonatal mortality in Tanzania, Unicef, 2015

In SDDH there are over 10.000 deliveries per year. Over the last years the hospital has intensified their effort to reduce maternal and neonatal deaths in line with the government policies and targets. After expanding the labour ward, opening a new theater dedicated to obstetric procedures and a new post-natal ward in 2014, SDDH has taken up the challenge to improve neonatal care.

[1] United Republic of Tanzania Demographic and Health Survey 2015-2016 via the DHS Program STATcompiler. (http://www.statcompiler.com).*

2 United Nations Inter-agency Group for Child Mortality Estimation (UNICEF, WHO, United Nations Population Division and the World Bank).

With the support of Friends of Sengerema Hospital Foundation a Neonatal Intensive Care Unit (NICU) was opened in November 2015 in addition to the already existing premature unit. Since then the project has served as a showpiece of the hospital towards visitors and government officials. Additionally it has an important function in creating more awareness about the importance of good quality neonatal care amongst staff, patients, nursing students and medical officer students.

In 2014 there were 500 neonatal admissions with a mortality rate of 17,9%. Currently there are over 1300 admissions per year with a neonatal mortality of 10,9%. The spectacular rise in admission rate and the decrease in mortality were unanticipated at the start of the project in 2015. Because of these tremendous successes the NICU is already in dire need for expansion. The original capacity was 6 beds and 4 incubators intended for 6-10 neonate admissions, currently up to 20 neonates have been admitted simultaneously in the same room. If an expansion is not done the NICU may implode under the pressure of its own success, which is something all parties and stakeholders wish to avoid.

2.2 level of care:

The level of care we pursue as the minimum standard is basic neonatal care: doctors and nurses need to be able to recognize danger signs and act on those following the available guidelines. The maximum respiratory support is nasal Continuous Positive Airway Pressure (nCPAP) by Dolphin. Doctors and nurses need to be aware when to start and stop nCPAP, know how to use the nCPAP machine properly and will be able to monitor the patient closely. The most critically ill new-borns in NICU will be monitored and the monitor is well understood by the staff.

2.3 population:

The main reason for admission is perinatal asphyxia followed by respiratory distress and sepsis. Other reasons for admission are: prematurity, congenital malformations, neurological patients, icterus, anaemia, malaria, trauma, malnutrition, hypoglycaemia, skin conditions and non-registered problems.

2.4 equipment:

The following table shows the current NICU-equipment.

NICU materials	Amount
HEBI Incubators	4
Oxygen concentrator	3
nCPAP Dolphin	3
Monitors	8
Pulse Oxymeters	10
Resuscitation tables	3
Resuscitation set	1

2.5 NICU staff

In 2015 a dedicated NICU team was composed. The NICU staff (dedicated NICU-team) is trained in neonatal care, which includes basic homeostasis concerning glucose, temperature, fluid management; most common conditions and how to recognize and manage them. The medical staff of the hospital was trained in 2015 to perform Neonatal Life Support following 'Helping Babies Breath' guidelines. The dedicated NICU team daily routine is based on specific NICU guidelines. In 2017 Neonatal Training was given to Medical Attendants.

Name	Occupation
Caroline Mtani	AMO
Anna Micomangwa	Registered Nurse, in charge
Idda Mgata	Registered Nurse
Salome Thobias	Registered Nurse
Matthew Dickson	Registered Nurse
Samweli Kalidushi	Registered Nurse
Anna Chalya	Medical attendant
Demetria Daniel	Medical attendant
Tatu Herman	Medical attendant

Since the opening of the NICU doctor Caroline is Assistant Medical Officer in charge of the NICU. She's doing rounds on a daily base. Special cases are reviewed by the paediatrician. She's also in charge of the outpatient clinic. Her specialty is 'Helping Babies Breathe', which she's teaching all over Tanzania.

Anna Micomangwa is registered nurse in charge. She was trained in 'teach the teacher' in context of future sustainability. She's training new collegues and students in 'Helping Babies Breathe'.

The remaining team do all belong to the 'dedicated NICU team'. They've followed the extensive NICU training. They are allround in NICU care and well trained in Helping Babies Breathe. The also function as consultants for Labour Ward to support in neonatal life support.

2.6 Overview NICU 2018:

Admissions: 1365

Mortality: 8,2% (2017) to 10,9% (2018) increase

Main admissions: perinatal asphyxia

	N	%	N †	% †
Perinatal asphyxia	884	65%	74	8,8%
Respiratory distress/pneumonia	97	7,1%	7	7,2%
Prematurity	89	6,5%	38	42,6%
Sepsis	168	12,3%	12	7,1%
Congenital	39	2,9%	10	25,6%
Anemia	28	2,1%	3	10,7%
Jaundice	15	1,1%	0	0%
Hypoglycemia	4	0,3%	0	0%
Bleeding	13	1%	1	7,7%
Bowel obstruction	12	0,9%	3	25%
Unknown diagnosis	54	4%	2	1,8%
Unknown outcome	191	14 %		

Table 1: overview of admissions and deaths in NICU 2018

2.7 Outpatient Clinic

In January 2019 the outpatient clinic for NICU opened with financial support from the Dutch Albert Schweitzer Foundation. A medical research student attended the first six months and did research about the follow up:

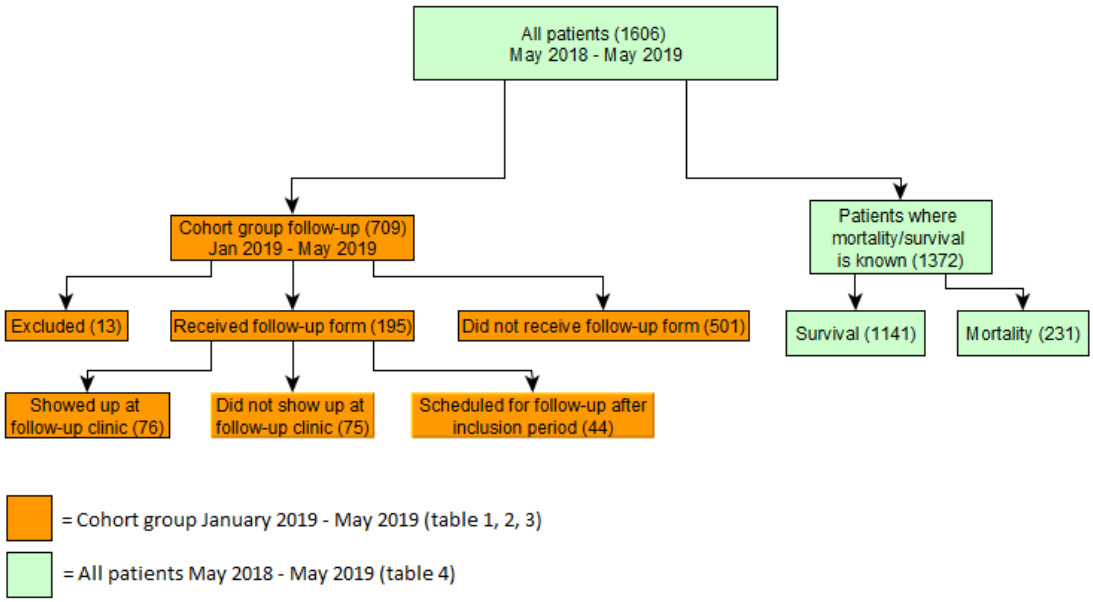


Table 1 – Baseline characteristics of all included patients. January – May 2019

Variable		All patients (n = 696)	Invited for follow up (n = 195)	Showed up at follow up (n = 76)
Sex	Male: n (%)	354/678 (50.9)	101/182 (51.8)	46/74 (60.5)
	Female: n (%)	324/678 (46.6)	81/182 (41.5)	28/74 (36.8)
Admission	Admission from home: n (%)	102/692 (14,7)	17/195 (8.7)	12/76 (15,8)
	Time in days between home and admission (only for home borns): median (iqr 25%-75%), n	7 (3-14), 93/102	2,5 (1-12,25) 16/17	3 (1-14) 11/12
	Days of admission in hospital: median (iqr 25%-75%), n	3 (2-5), 434	4 (3-8), 133	5 (3-9), 55
Gestation	Gestation period in months, median (iqr 25%-75%), n	9 (8-9), 195	9 (8-9), 187	9 (8-9), 73
	Multiple gestation, n (%)	100/696 (14,4)	42/195 (21.5)	14/76 (18.4)
	Number of multiple births, median (iqr 25%-75%), n	2 (2-2), 65/100	2 (2-2), 28/42	2 (2-2), 10/14
Parity	Median (iqr 25%-75%), n	1 (1-5), 62	1 (1-5), 62	1 (1-4), 27
Birth weight (kg)	Median (iqr 25%-75%), n	2,7 (2-3,2), 547	2,2 (1,74-3), 190	2 (1,78-3), 75
Treatment	Antibiotics, n (%)	619/626 (88,9)	147/149 (75.4)	64/66 (84.2)
	Oxygen n (%)	68/165 (9.8)	40/137 (20.5)	16/56 (21.1)
	CPAP, n (%)	60/174 (8.6)	22/135 (11.3)	9/55 (11.8)
Convulsions	n(%)	28/68 (4)	8/47 (4.1)	3/42 (3.9)
Referral to another hospital	n (%)	9/534 (1.3)	NA	NA
Mortality	Mortality in hospital, n (%)	67/527 (9,6)	NA	NA

Baseline characteristics of all included patients, divided into subgroups: invited for follow-up clinic and the ones who showed up at the follow-up clinic. Data are presented as numbers (percentages) or median with an interquartile range, since the data was not normally distributed. Note: the second group contains also 44 patients who received a follow up form but from whom the follow-up date had not yet passed at the time of data collection.

Table 2 – Overview of admission indications. January – May 2019

Indication	All patients (n = 709)	Mortality	Invited for follow up (n = 195)	Showed up at follow up (n = 76)
Prematurity, n (%)	157 (22.6%)	16 (10.2%)	82 (42.1%)	29 (38.2%)
Asphyxia, n (%)	402 (57.8%)	45 (11.2%)	86 (44.1%)	35 (46.1%)
Respiratory distress	21 (3%)	1 (4.8%)	16 (8.2%)	7 (9.2%)
Neonatal sepsis	90 (12.9%)	10 (11%)	24 (12.3%)	8 (10.5%)
Meconium stained fluids	58 (8.3%)	0 (0%)	25 (12.8%)	7 (9.2%)
Pneumonia	31 (4.5%)	5 (16%)	6 (3.1%)	4 (5.3%)

Overview of indications of admissions, mortality rates and how many patients have been invited and showed up at the follow-up of all patients between January – May 2019

Chapter 3: the project

Introduction:

The initial setup of the NICU, including equipment, was based on an estimated 500 admissions per year and a ward population of six neonates. In the first year after opening there were 1000 admissions, since then the number continued to rise up to 1365 in 2018.

This rise in patients puts enormous stress on available resources. Beds, incubators and even respiratory support are shared by 2-3 and sometimes even 4 patients. In the current setting there is a lack of incubators, respiratory support, beds for the caregivers , monitors and medication and consumables to treat patients admitted at the NICU.

The available ward is too small to host this many patients and the health care providers. Because of the high concentration of people and technical equipment, the humidity and temperature rise to alarming levels for both patients and healthcare workers. Temperatures of over 40 degrees were measured which is unhealthy for adults and can be life threatening for neonates. These working conditions were reported by staff to demotivate them in working in NICU-ward.

Lastly and most importantly the high patient load and the complexity of the patients puts significant stress on the healthcare workers in this department. Healthcare workers feel under pressure and report to be unable to take breaks. In addition they feel unable to finish all the work in working hours, which may harm patients if care is not provided adequately. In the long term this workload may cause these trained healthcare workers to leave this department, which will threaten continuity of the department.

3.1 Infrastructure; expansion of the department:

The proposal is to create more room for beds by expanding the ward. These extra beds are needed so patients can me admitted without lying with 2 or more patients in one bed. It is explicitly not the intention to continue to increase the

number of admitted patients per year as this does not seem feasible from the perspective of human resources and other recurrent costs.

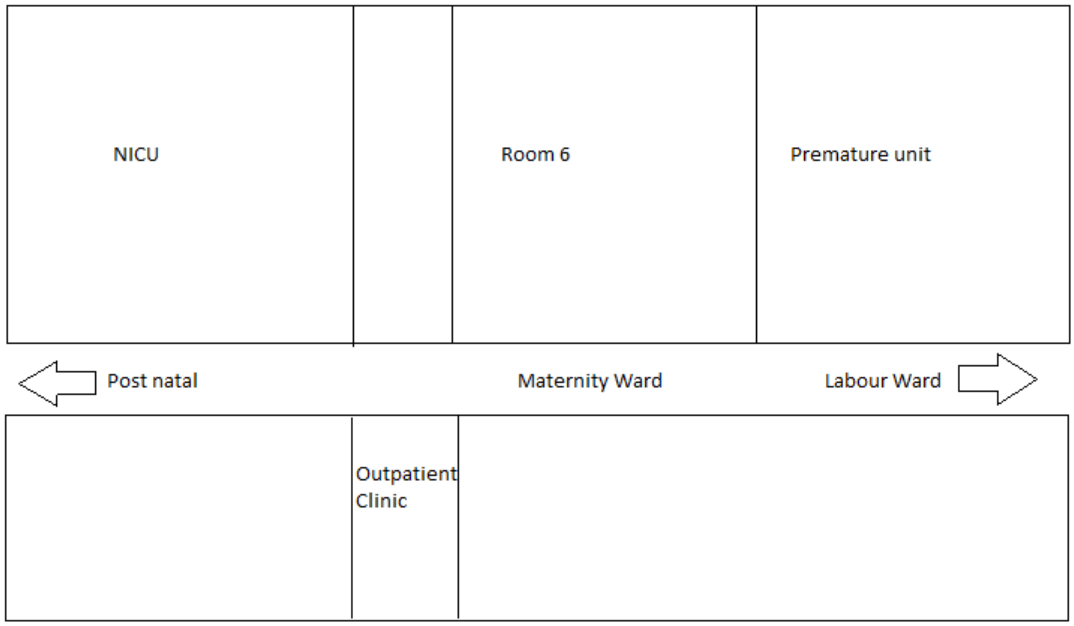
The current setup is; a NICU room in which all admissions of sick neonates and severe premature babies occur, a high care room (room 6) in which relatively healthy neonates are admitted that need attention but don't need continuous observation and a premature unit in which only healthy premature babies are admitted that need to be kept warm and grow but don't need much medical attention. Although in theory this works well, it has become clear that patients admitted in the high care unit are overlooked by staff because of the enormous workload in NICU.

Therefore the plan is to merge the high care room and the NICU into one large NICU space and in addition to that expand the building by 5 meters to create room for 8 more beds. In this new situation there will be more capacity to admit patients and nurses will be better able to keep the overview of all admitted patients. We also expect the climate of the ward will improve significantly because of this measure.

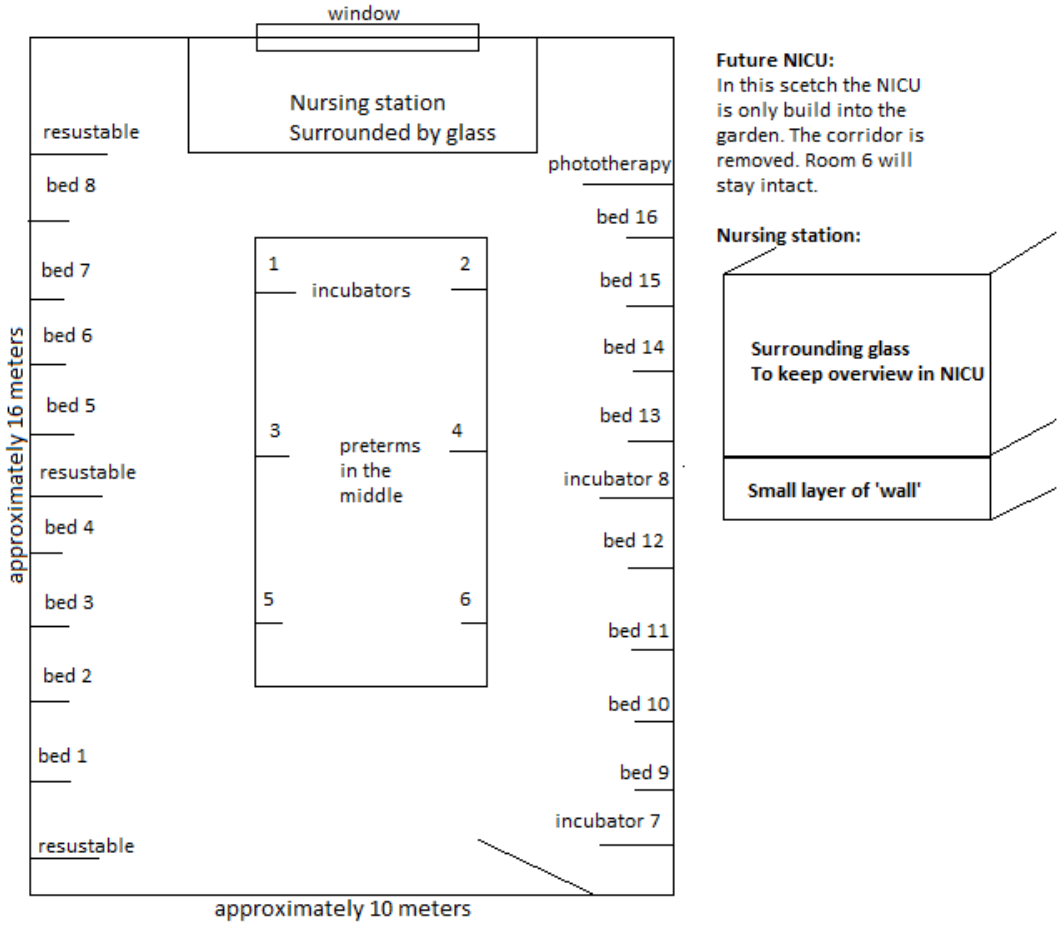
The costs of this expansion and renovation is 62.879.840 Tanzanian Shilling, which is approximately €25.000. The estimated time needed for this construction is 6 months.

In addition to this renovation the power supply to the neonatal intensive care unit needs to be revised. Because of the increasing numbers of medical equipment the power consumption is rising. Current power-infrastructure leading to the NICU is not sufficient to meet the demands of the NICU. To improve this situation part of the electricity network needs to be revised, which will be done by the technical department. The costs for this update were estimated at Tsh 6.800.000 (€2.704).

3.1.1 current situation:



3.1.2 intended situation:



3.2 Human resources; NICU staff:

The current NICU team exists of six trained nurses and one assistant medical officer.

3.3 Equipment:

Regarding equipment several items are needed. The goal is to buy similar equipment in relation to what is already on the ward. Firstly additional beds and incubators are needed to make sure not more dan 2 patients are lying in one bed.

Several medical items are needed, which mostly relate to airway management. To have good quality air supply is of vital importance for children at the NICU. Therefore we need to buy 5 double outlet 10 liter/minute oxygen concentrators. In addition to that we need to buy new CPAP machines which are more durable and easy to use than the existing ones.
All items we need are specified in the budget below.

3.4 Ensuring sustainability

Sustainability is a main priority regarding this project. As the NICU has an important exemplary role in providing neonatal care, it is of vital importance that daily routines are maintained and care can be provided continuously. This will benefit both training and education of nursing students as well as medical officer students. In addition to that it will contribute to the advocacy role the department has in demonstrating the benefits and importance of adequate neonatal care.

To ensure continuity and sustainability of care is a significant challenge as care to mothers and children below 5 years of age is provided free of charge as demanded by government regulations. This means that providing this care is costing the hospital money which is not compensated through other mechanisms. In effect this means that the successes celebrated by the NICU are resulting in a significant financial burden and workload for the hospital.

Despite these facts the hospital is highly motivated to continue to provide these services. This can only be done if financial mechanisms are in place to support this department. The increased demand for medication, consumables, equipment, staff and other costs need to be compensated to ensure a continuous standard of care.

This is the reasons that SVSH has been supporting the hospital with a compensation of some the recurrent costs. However, the funds provided previously have proven to be insufficient to compensate for the high number of neonates admitted currently. Therefore expansion of the compensation is needed. SVSH makes itself strong to support the hospital with additional budget for at least two years. During this time the hospital will have the opportunity to find funds with government and other organizations to share these costs with. After this period has ended the budget will be gradually decreased over time.

Chapter 4: Budget

4.1 Once-off costs

Description	Price/unit	Total price:	Price in euro (€1=Tsh 2515):
NICU renovation	Tsh 62.879.840	€ 25.000	€ 25.000
Add eight new adult beds including mattress	Tsh 400.000	Tsh 3.200.000	€ 1.272
Two HEBI Neonatal incubator (transport paid and arranged for by SVSH)	€ 325	€ 650	€ 650
Five 10 liter double outlet oxygen concentrator (transport paid and arranged for by SVSH)	€ 1.749	€ 8.745	€ 8.745
6 monitors (refurbished monitors from the Netherlands including transport)	€ 500	€ 3.000	€ 3.000
Furniture and accessories NICU department including personal clothing	Tsh 8.757043	Tsh 8.757043	€ 3.470
6 CPAP machines (Pumani)	$ 900	$ 5.400	€ 5.000
Revision of power supply for NICU	Tsh 6.800.000	Tsh 6.800.000	€ 2.704
Costs for retraining of 60 staff, neonatal care and neonatal resuscitation	Tsh 30.000	Tsh 1.800.000	€ 716
Unforeseen costs and overhead costs related to the project		10%	€ 5.056
Total costs:			**€ 55.613**

4.2 Recurrent costs for the NICU

Description	Price/unit	Price/year	Price in euro for two years:
Salary 2 nurses	Tsh 680.000 / month	Tsh 8.160.000	€ 12.978
Salary for Medical Officer	Tsh 1.480.000 / month	Tsh 17.760.000	€ 14.124
Cefotaxim ampule 40 per month	Tsh 1.100 / piece	Tsh 528.000	€ 420
Ampiclox ampule 120 per month	Tsh 600 / piece	Tsh 864.000	€ 687
Ampicilline ampule 120 per month	Tsh 600 / piece	Tsh 864.000	€ 687
Infant Formula (Lactogen 1) 8 needed per month	Tsh 25.000 / piece	Tsh 2.400.000	€ 1.909
Yellow cannula's (22 gauge) 250/month	Tsh 600 / piece	Tsh 1.800.000	€ 1.431
Various IV fluids (dextrose 10%, normal saline) 50/month	Tsh 1.500 / piece	Tsh 900.000	€ 716
Telephone connection in NICU	Tsh 40.000 / month	Tsh 960.000	€ 381
Total costs:			**€ 33.338**