



ESSENTIAL NEWBORN CARE QUALITY IMPROVEMENT TOOLKIT

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CHAPTER ONE: ESSENTIAL NEWBORN CARE: INTRODUCTION

Essential newborn care

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INTRODUCTON

The birth of a child is usually occasioned by a well term baby and a healthy mother. In the minority of cases the pregnancy may be complicated by maternal illness, preterm labour, difficult delivery or other problems and some babies will be unwell at birth.

Essential newborn care is the care required by all neonates (first 28 days of life) whether they are born healthy, small or unwell. It includes appropriate preventive care, routine care, and resuscitation at birth if necessary and care of sick and small babies. The success with which mortality and morbidity are prevented will depend to a large extent on the commitment and expertise of the health workers responsible for newborn care.

Essential maternal care is just as important in protecting the mother and the unborn child during the pregnancy and labour and requires the availability of adequate and appropriate obstetric services and delivery facilities. Essential maternal care is not covered by this toolkit.

The table below shows neonatal mortality for South Africa from 1999 – 2008. There has been very little improvement over the last 10 years.

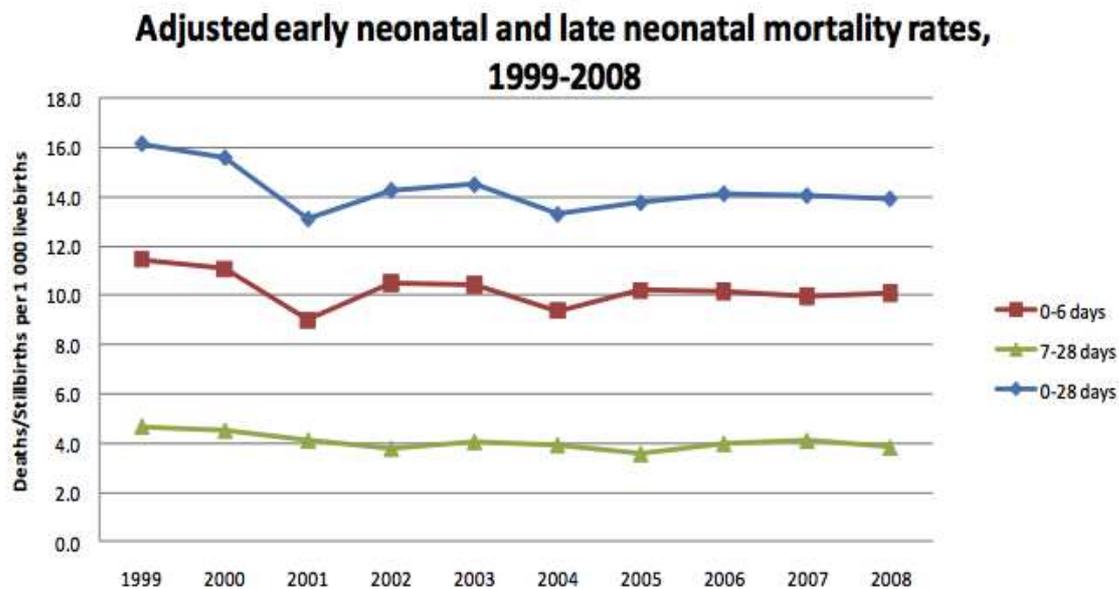


Figure 1. Neonatal Mortality Rates 1999 - 2008 South Africa. From National Perinatal Morbidity and Mortality Report 2008 – 2010. June 2011

58.7% of all deliveries in South Africa happen at district hospitals and clinics. This implies that these facilities have the greatest responsibility in terms of newborn care. District Hospitals have the highest number of neonatal deaths. At the same time they are modestly staffed and equipped, and in particular there are no specialists on site to provide assistance when babies follow an untoward clinical course.

Table 4.7. Early neonatal death rates per birth weight category

Weight category	CHC	DH	RH	PT	NC
500 - 999g	339.71	578.13	533.50	430.30	308.79
1000 - 1499g	82.25	230.94	163.64	115.17	70.06
1500 - 1999g	18.08	137.38	41.25	19.94	23.20
2000 - 2499g	2.88	14.73	11.63	9.77	13.89
2500g+	0.64	5.34	4.21	3.63	6.38

Table 1. Early Neonatal Death rates per weight category. From National Perinatal Morbidity and Mortality Report 2008 – 2010. June 2011

Figure 14. Early neonatal death rates in birth weight categories and levels of care

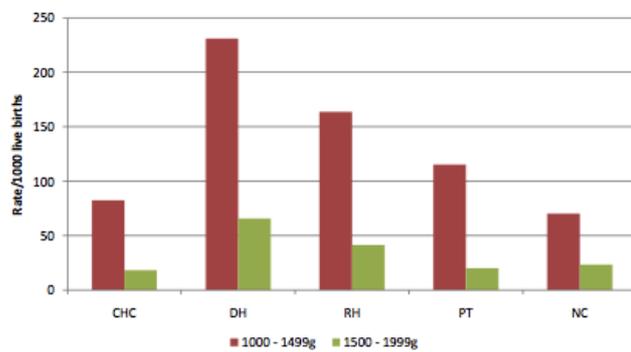


Figure 2. Early Neonatal Death rates in birth weight categories and levels of care. From National Perinatal Morbidity and Mortality Report 2008 – 2010. June 2011

Deaths of infants and newborns, 2008
Stats SA (N=45 316)

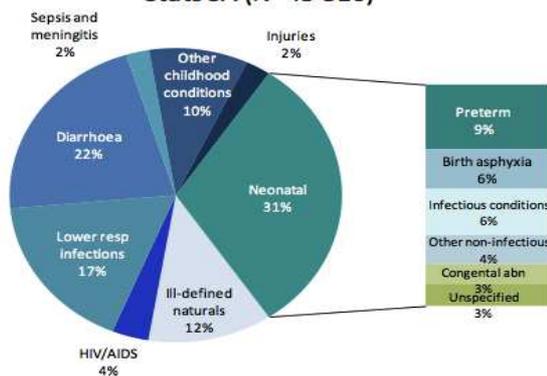


Figure 4: Cause of death profile for infants and newborns, 2008

Source: Own calculations from data provided by Statistics South Africa

Figure 3. Causes of death for infants and newborns. From National Perinatal Morbidity and Mortality Report 2008 – 2010. June 2011

The figure above shows that 31% of under five deaths in South Africa are due to neonatal causes, with prematurity, birth asphyxia and infection being the top 3 neonatal causes of death.

THE LINC INITIATIVE

The authors have been working with doctors, nurses and managers in Clinics, Midwife Obstetric Units, District, Regional and Tertiary Hospitals for many years and have collectively identified how newborn care can be improved through the implementation of a number of organizational changes.

There work has included supporting Limpopo Initiative for Newborn Care (LINC), a comprehensive initiative to improve newborn care that started in 2003 in Limpopo Province. LINC has sought to improve newborn care in hospitals by visiting managers and health workers to share a vision for newborn care and to advise on standards and improvements to services facilities. Neonatal skills were improved through training and mentorship and guidelines and job aids developed. Lessons learned from LINC can be found in the attached booklet “Improving Newborn Care in South Africa: Lessons learned from Limpopo Initiative for Newborn Care.”

Innovations and advances such as kangaroo mother care, continuous positive airway pressure, the prevention of mother to child transmission of HIV and the increasing availability of a variety of monitoring devices have fuelled opportunities for effective change.

These ideas and some of the resources that have been developed to support implementation are contained in “Essential Newborn Care”. Improvements require commitment from managers, doctors and nurses in equal measure but it is hoped that the guidance and tools provided in this book will facilitate and encourage the process of optimizing newborn care.

OVERVIEW OF ESSENTIAL NEWBORN CARE

Essential newborn care embraces the following important activities:

NEONATAL RESUSCITATION

Most babies will start breathing adequately within one minute of birth and require little or no immediate assistance. Some babies, for a variety of reasons, but most commonly because of in-utero hypoxia, sedation or prematurity, will lack the normal respiratory drive required to successfully establish respiration at birth. It is not always possible to predict antenatally which babies are likely to encounter this problem and so it is crucial that each delivery facility has personnel and equipment capable of providing neonatal resuscitation at birth. A small investment of time and effort can ensure that resuscitation is competently provided and has the potential to save many lives and prevent neurological injury.

ROUTINE CARE AT BIRTH

All newborns babies need to be assessed at birth to triage those that are apparently healthy from those needing resuscitation or other care for illness or low birth weight. The mothers of well babies will need support with initiation of breast feeding. The babies themselves need routine eye care and vitamin K and will need to be fully examined at a convenient time in the first 24 hours. Some well babies will need additional care for prevention of mother to child transmission of HIV or the treatment of possible congenital syphilis. Others may be recognized as being at high risk of neonatal problems such as jaundice or sepsis and additional monitoring or care may be needed. In some institutions there may be additional routine screening procedures such as screening for hypothyroidism and hearing screening. Finally all babies will need polio and BCG vaccination before discharge from the health facility.

INPATIENT CARE OF SICK AND SMALL NEWBORNS

Newborn babies who weigh less than 2 kg or who are unwell for whatever reason will need to be admitted to the neonatal unit of the health facility where they are born for appropriate inpatient care. For most ill newborns this will be a level I facility. However some will need to be transferred to a level II or level III facility for specialist care. It is sometimes possible to identify the need for specialist neonatal care antenatally. When this is the case, it is preferable to arrange for the mother to be admitted to a level II or III facility for the delivery.

Expert guidelines are available to facilitate the provision of standard neonatal care for most neonatal problems encountered at the District hospital level. Norms and standards for staffing, facilities, drugs and equipment help to support health workers by ensuring the presence of an adequate working environment. These environments will ideally include space for both high care and kangaroo mother care.

Very ill babies needing additional support in the form of cardiac monitoring, nasal CPAP or oxygen in concentrations over 40% should be cared for in a high care section of the neonatal unit. This includes babies with convulsions or frequent apnoea.

Kangaroo mother care provides warmth, stability, nutrition and infection prevention for medically stable low birth weight babies.

Advanced and sophisticated neonatal care such as would be provided in neonatal units under the guidance of Neonatologists falls outside the ambit of this book. Progress in medical care has provided the opportunity to prevent morbidity and mortality in babies born with life-threatening congenital abnormalities or extreme prematurity and those who develop unusual medical or surgical complications during the neonatal period. In the realm of highly specialized services opportunities tend to outstrip the resources to provide them and this results in the need for rationing. Decisions about which babies should be treated and which not, require rigorous ethical debate. In South Africa where highly specialized services are national resources but available in only a few major centres it is inevitably easier for those babies born closest to the centres to access care. Policies and monitoring procedures are crucial to protect against rationing based on geographical proximity or administrative boundaries.

ESSENTIAL MATERNAL CARE

A discussion of essential neonatal care would be incomplete without mentioning essential maternal care. Such care will include:

- Attendance at an antenatal clinic (ANC)
- Having a birth supervised by a qualified health professional
- At all stages to be monitored for abnormalities and referred or treated appropriately

STRUCTURE OF HEALTH SERVICES

The structure of health services provides the context within which neonatal services are provided. Health services in South Africa are provided at three levels - these are within communities or households, at clinic or community health centres and at hospitals. Most newborn care services are provided at hospital level although the other levels play an important role in ensuring that newborns survive and thrive.

As part of the restructuring or re-engineering of Primary Health Care (PHC), PHC Outreach Teams are being established. These teams include Community Health Workers who will play a key role in ensuring that pregnant women access antenatal, intrapartum and postnatal services. They will also play an important role in promoting and supporting appropriate home care of newborns following discharge of the mother and newborn from the health facility, especially with regard to supporting mothers to exclusively breastfeed their infants.

District Clinical Specialist Teams will also be appointed as part of the PHC re-engineering process. These teams, which will include maternal and child health specialists will play an important role in improving the quality of maternal and newborn health services through improved clinical governance, and provision of support to all levels of the health service.

Hospitals in South Africa are stratified in to 3 levels:

Level I or district hospitals are run by generalist doctors some of who may have a special interest in the area of neonatal care. This is the level that deals with the greatest number of ill newborns and is pivotal in meeting the challenges of improving neonatal outcomes.

Level II or Regional Hospitals will usually have one or more specialist paediatricians on the staff establishment and should offer a 24 hour specialist supervised clinical service. A full spectrum of neonatal high care and some neonatal intensive care will be provided at this level.

Level III Hospitals provide a full neonatal intensive care service although certain highly specialized services may be available only at specific level III hospitals.

Although level I, II and III hospitals have been designated for all districts, the ability of any given facility to provide the appropriate services depends on the status of its staffing, equipment, medicines availability and infrastructure. Some level II hospitals are without paediatric specialists and neonatal intensive care equipment. Where this is the case the level I and level III hospitals need to restructure the way they work together to compensate for the gap at level II. Often this means that the level I (district) hospital would best serve their community by providing a slightly extended service. The ability to do so will depend on the ingenuity and energy of the staff and the support of management in providing the necessary facilities.

Provision of care should be viewed as a team responsibility with the team being constituted of all practitioners from level I to level III who are responsible for newborn care. Communication is a critical aspect of teamwork and congenial and professional relationships should be encouraged. Prompt consultation and carefully planned referrals save lives. Equally the senior clinicians on the team have a responsibility to support the vocational growth of their less experienced colleagues through outreach, teaching and the sharing of useful resources.

OVERVIEW OF NEONATAL TOOLKIT

The aim of the toolkit is to provide provincial, district and facility managers as well as paediatricians and senior clinicians with a set of tools they can use to improve newborn care in their facilities, and as a result decrease the mortality and morbidity of newborns.

This toolkit has been compiled by a group of people who have worked and supported work in Limpopo to improve newborn care over the last decade. We have used the experience and lessons learned, the materials developed over the decade, and considerable experience of the team as a whole to put together a toolkit that we trust you can use to improve newborn care in your setting. We have also drawn on the expertise and work of colleagues in other parts of the country who also share their work and experience. Read about the contributors in the appendix. International reviewers have reviewed the Chart Book on the Management of the Sick and Small Newborn, and we would like to thank Save the Children and Unicef for their ongoing support.

The materials are presented in the following sections

1. Standards for Newborn care services: The requirements for essential newborn care services, the infrastructure, equipment, staffing, competencies, policies and monitoring.
2. Implementation of essential newborn care
Essential qualities for enabling essential newborn care: Vision, Leadership and Mentorship
Steps for improving
Step 1: Set up a team, provide leadership and undertake advocacy.
Step 2: Do a situation assessment and engaging in advocacy for action.
Step 3: Develop an action plan for newborn care improvement.
Step 4: Implement the action plan through
 - health systems improvement
 - support for the provision of standard neonatal care.Step 5: Monitor and evaluate the intervention.
3. Tools for support, training and job aids

USING THE TOOLKIT

The toolkit is intended both for a Paediatric district specialist support team, as a guide to improving newborn care in their district, and to any individual in the health service who wants to be a change agent for neonatal care.

You are welcome to go through the entire package or just the section you require.

In order to effect change in the health system it is vital that there is a planned process of improvement and that this improvement is taken to scale, i.e. all health facilities are involved in the improvement process. We have used methods and content that is evidence based and if implemented will result in improvements.

CHAPTER TWO: RECOMMENDED STANDARDS FOR ESSENTIAL NEONATAL CARE

Essential Newborn Care

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INTRODUCTION TO RECOMMENDED STANDARDS

A standard is a statement about a desired and acceptable level of care. The standards for essential newborn care are derived from South African National and Provincial standards, global standards and the experience of senior clinicians working in neonatal care in South Africa for many decades.

We believe that they form a good baseline from which to work and would like to recommend that you use these standards as a starting point for the provision of essential newborn care. Your district or province may want to adjust the standards to your particular service.

1. ESSENTIAL NEWBORN CARE

Essential newborn care is the care required by all newborns in the first 28 days of life, if they are healthy, or if they are sick or small. It includes the care they require to prevent illness in the newborn period and later on in life. This care takes place at home, in clinics, and in hospitals. Some newborns require intensive or specialised care in a tertiary unit. We strive for equal access to essential and specialised newborn care.

1.1 ESSENTIAL MATERNAL CARE

A discussion on newborn care cannot leave out maternal care. If the mother is not well and has not accessed essential maternal services, the baby may be affected in the neonatal period and later in life. Essential maternal care includes

- Attendance at Antenatal Clinic from the first trimester of pregnancy and for at least 5 good quality antenatal visits
- Identification of high risk maternal and neonatal situations with access to appropriate care
- Recognition of HIV positive women, assessment and care of the mother including antiretroviral treatment or prophylaxis
- Recognition and treatment of syphilis
- Prenatal folate administration and adequate maternal nutrition
- Recognition and treatment of maternal illness, e.g. diabetes, pregnancy induced hypertension
- Prevention of prematurity and care of the mother in preterm labour to prevent Hyaline Membrane Disease in the baby
- Monitoring and care in labour to prevent foetal hypoxia and neonatal asphyxia
- Early referral of the mother to level II or III centres if a difficult maternal or neonatal course is anticipated

1.2 ESSENTIAL NEWBORN CARE SERVICES

1.2.1 NEONATAL RESUSCITATION AT BIRTH

Most babies will not need help to breathe, but 6 – 9% do and can be helped to breathe within 1 minute of birth.

Every clinic, casualty, emergency service and labour ward must be prepared for a baby at delivery, and ensure that the baby breathes within the first minute of life. All staff need training in Basic Neonatal resuscitation and need regular drills to ensure the skills are maintained. Basic essential equipment is required at every labour ward bed, and an advanced resuscitation trolley in the unit. Helping Babies Breathe, a training programme of the American Academy of Paediatrics is an example of training that should be rolled out to all staff. Advanced midwives and doctors require skill in advanced neonatal resuscitation.

1.2.2 ROUTINE CARE

Routine care at birth is all the care an apparently well newborn requires to be healthy. It excludes the care that is required for those identified as sick and small babies. Routine care happens in the maternal service at clinics, in labour ward, and postnatal ward, and is provided by these staff in concurrence with the mothers care.

In labour ward routine care is newborn resuscitation, triage of babies to identify those sick or small babies needing more care, initiation of breast feeding within 30 minutes of birth, administration of eye prophylaxis and administration of Vitamin K to prevent haemorrhagic disease of the newborn. The first dose of antiretroviral treatment to HIV exposed infants is given in labour ward. Documentation of care is in the maternal record.

In postnatal ward routine care includes a full assessment of the baby to detect and manage risk factors such as HIV, any predisposition for jaundice, and a thorough examination to look for illness and abnormalities. Babies' room in with their mothers, there is no "well baby nursery". Additional screening may be done according to local protocols e.g. saturation measurement for cyanotic congenital heart disease and thyroid and hearing screening. Breastfeeding is supported for all babies, except in rare cases, where medically indicated, the mother will be assisted with formula feeding. Information is documented in the newborn section of the maternal record and the Road to Health Booklet. If well, the baby is referred to the Primary Health Care service for follow up on the third day.

A 3-day visit – either by the mother to the clinic, or clinic to the mother, is essential to support feeding, reinforce preventive care and further screen for jaundice and illness.

Routine care of the newborn is provided by the staff that provides the maternal care to the mother at primary health care facilities or hospitals. If risks or illness are identified, the baby is referred to the paediatric and neonatal service.

1.2.3 INPATIENT CARE OF SICK AND SMALL NEWBORNS

At birth babies are examined in labour ward and again in postnatal ward to assess the care they require. Babies who are less than 2kg as well as babies who are sick, e.g. have neonatal asphyxia, respiratory problems, infection or a major abnormality are admitted to the neonatal unit for further assessment and management.

Inpatient neonatal care is provided in the neonatal unit of a hospital. As most babies in South Africa are born in district hospitals, district hospitals need to have the services and a skilled team to manage sick and small babies. Certain babies require further care at regional and tertiary hospitals. Where possible, neonatal

problems are anticipated in utero, so that the baby can be born at the appropriate level to receive the care they require.

About 10– 15 % of babies will require inpatient neonatal services. This is in the hospital Neonatal Unit. All hospitals must have a neonatal unit for sick and small babies, but not for well babies. This document refers to the Neonatal Unit that may be synonymous with, or inclusive of, the following terms, nursery, premature unit, NICU, KMC.

STANDARD INPATIENT NEONATAL CARE

Standard inpatient care is the care of a baby who has been identified as sick or small and referred to the neonatal unit for special care. It includes the care of babies who are less than 2 kilograms at birth, those that have asphyxia, infections or a congenital abnormality. Standard care includes Kangaroo Mother Care.

Kangaroo Mother Care (KMC)

Provide KMC care to low birth weight and preterm babies, who have been stabilized in standard inpatient care, NICU or high care and are now ready to receive care in the Kangaroo position with their mothers. KMC is part of Standard Inpatient Care. The Kangaroo position provides, warmth, stability, nutrition and infection prevention to the low birth weight babies. All low birth weight babies once stabilized will receive KMC until the baby is well and big enough to be discharged home. The Kangaroo Mother Care Unit is part of the Neonatal Unit.

NEONATAL HIGH CARE

Neonatal High care is the care of sicker babies and includes those who require cardio respiratory monitoring, oxygen therapy of more than 40%, Nasal prong CPAP, those who have recurrent apnoea and convulsions, or who may need an exchange transfusion.

INTENSIVE AND HIGHLY SPECIALIZED CARE

Intensive care is required for babies who need mechanical ventilation, total parenteral nutrition, or who have a complex problem requiring further investigation and management or who have a neonatal surgical problem. Advanced care is a scarce resource, and much money can be spent on managing babies who are very small and immature, or whose long term outcome may be poor.

Limiting care needs consideration and is discussed under referral. Essential care includes guidelines on which babies should access advanced care.

TABLE 1: LEVELS OF NEWBORN CARE AT FACILITIES

	ROUTINE CARE (RC)	STANDARD INPATIENT CARE (SIC)	HIGH CARE (HC)	INTENSIVE AND HIGHLY SPECIALISED CARE (NICU)
	<ul style="list-style-type: none"> • Most Full term infants • Most low birth weight infants > 2kg 	<p>Babies with</p> <ul style="list-style-type: none"> • Low Apgars • Congenital abnormalities • LBW 1500 – 1999g • Gestational age 32 – 36 wks • Birth weight >4000g • Meconium staining • Wasting • Possible infection • Jaundice 	<p>Babies with</p> <ul style="list-style-type: none"> • LBW < 1500g • Gestational age < 32wks • Encephalopathy • Meconium aspiration • Septicaemia / meningitis • Recurrent apnoea • Moderate and severe respiratory distress • Convulsions • Severe jaundice • Simple neonatal surgical problems 	<p>Babies with</p> <ul style="list-style-type: none"> • A need for assisted ventilation • Complex Surgical problems • Persistent hypoglycaemia • Cardiovascular problems • Multisystem problems • Problems requiring specialist intervention e.g. ambiguous genitalia
	<ul style="list-style-type: none"> * Safe, clean delivery * Apgar score * Basic newborn resuscitation * Initiation of Breast feeding at birth and further support * Maintenance of warmth * Emergency care before referral * Vitamin K, eye care, immunisation, cord care, measurement, * Examination of newborn * Care to baby whose mother has HIV, TB or syphilis * Skin to skin care and KMC 	<p>IN addition to routine care</p> <ul style="list-style-type: none"> • Maintenance of thermo-neutral environment. • Oxygen administration and monitoring • Monitoring glucose and correcting abnormalities • IV Fluid administration • Tube feeding • Bilirubin monitoring and Phototherapy • Drug administration 	<p>In addition to routine and standard care</p> <ul style="list-style-type: none"> • Cardio-respiratory monitoring • Oxygen therapy > 40% Head box • Nasal prong CPAP • Short term IPPV • Blood transfusion • Chest drains • Exchange blood transfusion 	<p>In addition to other neonatal care</p> <ul style="list-style-type: none"> • IPPV, and advanced techniques for respiratory support • Total parenteral Nutrition • Arterial catheterization • Therapeutic cooling • Advanced neurological monitoring • Ultrasound and Echo-cardiography • Sophisticated diagnostic investigation • Sub-specialist consultation • Neonatal surgical intervention

2. HOSPITAL FACILITIES: NEONATAL UNIT AND MATERNITY

2.1 POSITION OF THE NEONATAL UNIT

The neonatal unit is ideally located as a stand-alone unit between the labour ward and postnatal ward. When making alterations to existing buildings, plan to incorporate as many of the elements of the service in one geographical area, but this may not always be possible. In most district hospitals the neonatal unit is located in the postnatal ward. This is acceptable if there is adequate space for all component of the unit. If there is inadequate air and oxygen supply or space, neonatal high care beds may be placed in the hospital high care or ICU.

2.2 SIZE OF THE NEONATAL UNIT

The number of deliveries in the catchment area that the hospital serves determines the projected size of the neonatal unit. A hospital requires 3 - 4 beds per 1000 annual deliveries to provide level I inpatient newborn care services. The delivery numbers include all the deliveries in the catchment or sub-district i.e. in the hospital, feeder clinics and home deliveries. Additional 2 – 3 beds per 1000 deliveries are required for high care and 0.5 beds per 1000 deliveries for intensive or highly specialized care. High care and intensive care are usually provided at regional (Level II) and tertiary hospitals (Level III).

The current shortage of regional hospital newborn facilities and staff, and difficulty in transporting babies mean that district hospitals in rural provinces, need to plan for some high care services.

Before planning the number of beds and configuration of the beds ask yourself a number of questions

- ✓ How many deliveries in the hospital, clinics and at home?
- ✓ Is the number of deliveries expected to increase or decrease over the years?
- ✓ Is there a regional hospital service in the district to refer high care patients or should we be planning for some high care beds?

Example:

If a district hospital delivers 3000 babies in a year the hospital will require (12 inpatient neonatal beds.

- $4 / 1000 \times 3000 \text{ deliveries} = 12 \text{ beds}$

We have used 4 not 3 per thousand deliveries, as home and clinic deliveries are probably about 20% of deliveries in South Africa. If the hospital also provides limited high care to the catchment population, the hospital may require an additional 1 per 1000 high care beds i.e. 3 additional high care beds.

- $1 / 1000 \times 3000 \text{ deliveries} = 3 \text{ beds}$

The hospital will require 15 inpatient neonatal beds.

Efficiency dictates that district hospitals should not have less than 9 beds or more than 24 beds. The following model is given as a guide to hospitals, based on the number of deliveries.

< 2000 deliveries	9 beds
2000 – < 3000 deliveries	12 beds
3000 – <4000 deliveries	18 beds
4– <5000 deliveries	24 beds
>5000 deliveries	36 beds *

A hospital this size would usually be a Level II hospital

A regional hospital will require 4 inpatient beds for each 1000 deliveries in the sub-district and 2 inpatient beds for every 1000 deliveries in the whole district. If the hospital delivers 4000 babies they need 16 beds level 1 beds, and if the district delivers 20 000 babies, they need an additional 40 level II beds for the district. They thus need 56 beds. If the district hospitals are providing high care, they may require fewer beds.

Regional services are best planned as 36, 48 and 60 bed units. A 48 and 60 bed unit would also provide some intensive care service, but not neonatal surgery and highly specialized care, as the specialists required for this service are usually only at the tertiary hospital.

The beds in the neonatal unit are divided into Standard Inpatient Care (SIC), Kangaroo Mother Care (KMC), High Care (HC) and Intensive care (NICU). Lodger mother beds are needed for mothers not in KMC and not themselves admitted in postnatal ward.

In a district hospital approximately a third of beds will be HC, a third SIC and a third KMC.

EXAMPLES OF DISTRIBUTION OF BEDS

DISTRICT HOSPITALS

9 bed Neonatal Unit = 3 SIC beds + 2 HC beds + 4 KMC beds + (3 lodger mother beds)

12 Bed Neonatal Unit = 3SIC beds + 3 HC beds + 6 KMC beds + (4 lodger mother beds)

18 Bed Neonatal Unit = 6 SIC beds + 4 HC beds + 8 KMC beds + (6 lodger mother beds)

24 Bed Neonatal Unit = 8 SIC beds + 6 HC beds + 10 KMC beds + (10 lodger mother beds)s

REGIONAL HOSPITALS

36 bed Neonatal Unit = 4 NICU beds + 8 HC beds + 12 SIC beds + 12 KMC beds + (16 lodger beds)

48 bed Neonatal Unit = 6 ICU beds + 12 HC beds + 12 SC beds + 18 KMC beds + (24 lodger beds)

60 bed Neonatal Unit = 12 ICU beds + 12 HC beds + 24 SC beds + 12 KMC beds + (36 lodger beds)

2.3 CONFIGURATION OF THE NEONATAL UNIT

The design of the neonatal unit may depend on the space available to build or make alterations and the preferences of individuals. Whatever the opportunities or constraints the following should be considered. Work flow patterns should allow for efficient patient and staff movements

- The need for constant surveillance of each bed from the nurses' station.
- All sections of the neonatal unit in one physical area, including the KMC area where possible
- Area should be restricted to general traffic
- A dual corridor rather than a central corridor is ideal
- All mothers should lodge near the neonatal unit
- Babies partitioned into functional units of 4 – 8 babies per area.
- Access for mothers on wheelchairs
- Access for portable Xray and ultrasound machines

The neonatal unit includes a number of areas

STANDARD INPATIENT (SIC) AREA

The standard inpatient care area of the neonatal unit requires a minimum space of 5m² per bed. The service panel requires oxygen and suction and 6 plugs. Infants are usually nursed in a closed incubator or a bassinette. No more than 6 babies should be in one standard inpatient care area.

KANGAROO MOTHER CARE (KMC) AREA

In the KMC area babies are nursed skin-to-skin with their mothers in the KMC position. Each mother requires a bed, with 7.2 – 10m² of space. Each cubicle can accommodate 2 - 6 beds. A lounge and dining area with television, fridge, microwave and kettle help make the unit homely. Ablutions are required as well as a washing area with washing machine and tumble dryer.

Each KMC bed requires a service panel with lights, oxygen, and suction and 4 plugs. The KMC area is ideally adjacent to the neonatal unit with an inter-leading door. If the KMC unit is a distance away from the neonatal unit, it will require additional administrative and utility areas as well as an emergency resuscitation area.

HIGH CARE (HC) AREA

The high care area is for unstable babies e.g. those requiring cardio- respiratory monitoring, on more than 40% head box oxygen and babies on CPAP. In a small neonatal unit there will be designated high care beds in the neonatal unit. In a larger neonatal unit, there can be a high care cubicle. High care beds require a space of 7.2 – 10 square metres and the service panel requires 6-12 electric plugs as well as medical air, oxygen, a blender and suction.

INTENSIVE AND HIGHLY SPECIALISED CARE (NICU)

Intensive care will be in regional and tertiary hospital only. Intensive care is for infants requiring IPPV, arterial catheterization, those that have complex medical problems and neonatal surgical problems. Each bed requires a minimum of 10- 15 m² of space, and the service panel requires 12 - 24 plugs, 2 oxygen points, 2 air points and a suction point.

ADMINISTRATIVE WORK AREAS

Reception Area

Larger neonatal units require a reception area, which is the organisational centre for welcoming patients, and doing administrative work. The reception needs a work area for 2 to 4 people, telephones, computer and data points as well as storage space for stationary.

The Nursing station and unit office

The nursing station is situated so that patients can be seen and traffic controlled. Space is required for workstations appropriately equipped with computers and internet connections. Storage is required for records and stationary.

Larger units require a unit office and a doctor's office with work a relevant number of workstations.

Counselling room

A counselling room where you can talk to parents and family about the child's condition is needed. It should be comfortably and tastefully decorated. Smaller units may share a space with maternity.

STORAGE, UTILITY AND PREPARATION AREAS

Multiple storage and utility space is needed, large units need a separate room for each function whereas small units may combine space or utilise a cupboard. The following areas are required.

- A **lockable drug trolley or cupboard** to store medication.
- A **Clean utility area** to store consumables and supplies
- **Alien cupboard for clean linen and nappies**
- An **equipment store** to clean and keep equipment ready for use
- A **dirty utility area** for dirty linen, so that dirty linen can be removed without going through the neonatal unit.
- A **cleaners room** to place and keep cleaning materials
- A **milk preparation** or storage area. Smaller hospitals will have a 24 hour central milk kitchen, that can deliver the occasional formula that may be required, large units may have their own unit. If flash heat treatment is done, a milk kitchen is required. Larger hospitals may have breast milk banks.

NURSES AND DOCTORS REST AREAS

A rest room with comfortable chairs, lockers and a dining area with fridge, microwave and kettle are required for staff.

Regional hospitals and large units require a doctor's overnight room for 24-hour medical officer cover. The overnight room should include a bed, table and chair, internet connection, television and en-suite bathroom.

FAMILY FACILITIES

Mothers who are no longer admitted to the postnatal ward or not providing KMC need rooms and facilities where they can lodge until their babies are ready to go home. The facility needs ablutions, a day room and laundry area.

A visitor's lounges required for family and visitors to support the mother. Comfortable chairs, hot and cold water are required.

ADDITIONAL FACILITIES

Mobile Xray facilities require storage and in bigger units a place to process the XRay.

An outpatient area for babies to be seen at follow up is required in bigger units.

A laboratory side room is required in larger units for blood gas analyser, microscopy and bilirubin measurement.

2.4. ENVIRONMENTAL DESIGN

2.4.1 HAND WASH FACILITIES

A hand washbasin is placed at the entrance to the neonatal unit and each baby should be within 6 metres of a hand washbasin, and there should be at least 1 basin for every 4 – 6 babies. The hand washbasin must have elbow operated taps and be large enough to contain splashing, but not be too deep. There should be no surrounding counter surface but space for soap, towel dispensers and trash receptacles.

2.4.2 ELECTRICAL NEEDS

The unit should have a 24 hour uninterrupted power supply, as well as a backup power supply.

In order to handle equipment each bed needs a number of central voltage stabilized outlets.

- Intermediate care beds: 4 – 6 per bed
- High care beds: 6 – 8 per bed
- ICU: 12 per bed
- KMC: 4 per bed

Each area should have 2 additional plugs for cleaning equipment and mobile X ray units.

The ward air conditioning ducted system on central supply and switched on permanently.

2.4.3 LIGHTING

Lighting should be carefully planned. Plan for the ability to have adequate procedure light, as well as to be able to achieve darkness. Each light must be individually switch controlled. The unit should have adequate daylight, and artificial light should be indirect, lights should be direct up to illuminate the ceiling. The newborn's direct line of sight to the fixture should be protected to prevent retinal damage. Each bed requires a procedure light with adjustable direction, intensity and field size. Lighting should provide adequate skin tone recognition, usually a white light, and be free of glare. Light fixtures should be easy to clean.

2.4.4 FLOORING AND WALLS

Floor surfaces should be easily cleanable without use of chemicals, and be highly durable, impervious and jointless. Walls also need to be durable with washable paint or tiles. Walls should be white or light for skin tone recognition. Acoustic properties need to be considered for floors and walls to diminish noise.

2.4.5 WINDOWS

At least one source of daylight should be visible from the baby area. External windows should ideally be glazed to avoid heat gain or loss, and should be situated at least 0.6m from an infant's bed to minimize radiant heat loss or gain.

2.4.6 VENTILATION AND TEMPERATURE

Temperature and humidity control in the neonatal unit is extremely important. The air-conditioning system needs to be of the highest quality and must be one that has air-mixers so that the air coming into the room is at the right temperature, and hot or cold air is not blown across the babies. The air conditioning must be able

to keep the temperature of the unit at between 22 and 26 degrees at all times. The air conditioner should supply 6 air changes per hour minimum, the humidity should be between 30 and 60%, there should be minimal draft and filtration should be 90% efficient.

2.4.7 SOUND CONTROL

Noise generating activities, phones, staff areas – should be away from the babies to reduce noise. The unit needs to be quiet and staff should be able to hear each other without raising their voice. Alarms should be appropriately set for new-borns and attended to immediately. Soft music may be played.

Walls, floors, sinks and ceilings can all be designed to absorb sound.

2.4.8 SECURITY

Careful consideration should be given to security, with access control to protect the security of the infants' family and staff. Closed circuit television access can be considered.

EXAMPLE OF A NEONATAL UNIT DESIGN

12 Bed Neonatal Unit = 3 SIC beds + 3 HC beds + 6 KMC beds + (4 lodger mother beds)

24 Bed Neonatal Unit = 8 SIC beds + 6 HC beds + 10 KMC beds + (10 lodger mother beds)

(still to be inserted)

2.5 MATERNITY FACILITIES

2.5.1 CLINIC, COMMUNITY HEALTH CENTRE OR MIDWIFE OBSTETRIC UNIT.

Clinics, Community Health Centers' or Midwife Obstetric Units' require 1 labour ward bed for every 500 deliveries a year and 1 postnatal bed for every 300 deliveries per year. Most clinics deliver less than 500 babies a year, but they are usually designed to have 2 maternity beds for labour and postnatal care. A space of at least 10 – 12m² (3m x 3.5 – 4m) is required for each bed. Each service unit / bed requires oxygen and suction points, 2 electric plugs and 1 light. The room needs to have air conditioning.

A space for resuscitation of the newborn of 7.2m² per is required. There should be one resuscitation area for each labour ward bed, usually one per clinic. The resuscitator requires oxygen and suction points and 2 electric plugs.

A transport, or standard closed incubator is also required, should the infant be small and sick and need monitoring before transfer.

2.5.2 HOSPITAL MATERNITY FACILITIES

LABOUR WARD

Hospitals require one labour ward bed for every 500 deliveries a month. Each control panel requires Oxygen with a double flow controller and suction, 4 electric plugs and an extra electric plug for cleaning equipment. Air conditioning is needed. The space required per bed is 10 – 12m² (3m x 3.5 – 4m)

Each labour ward bed requires a resuscitator with basic resuscitation equipment and an advanced neonatal resuscitation trolley for every 6 beds. Theatres require a resuscitator with advanced neonatal resuscitation equipment. The theatre should be able to accommodate an additional mobile resuscitator in the case of twin deliveries. Regional and tertiary hospitals require medical air and oxygen in the labour ward high care area

For each resuscitation area there should be a transport incubator for the care of the small or sick baby while waiting to be moved to the neonatal unit.

POSTNATAL WARD

Hospitals require 6 postnatal beds per 1000 deliveries per year. Standard care beds require 4 electric plugs per bed and a light. Space required is 7.2 – 10 m² per bed. The baby rooms in with the mother and can "lie in" with the mother or be in a bassinet next to the mother. Bathing facilities are not required for babies, neither is a transitional or well baby nursery area, as the baby should either be with the mother, or in the neonatal unit. If phototherapy is required this can be given next to the mother's bed.

3. EQUIPMENT AND RENEWABLE RESOURCES FOR NEONATAL CARE

Equipment is needed in the neonatal unit to assist in the care of newborns e.g.

- To administer oxygen, monitor oxygenation and provide ventilator assistance
- To administer feeds and fluids
- To monitor vital signs
- To provide warmth through an incubator or other source
- To monitor and manage jaundice

When purchasing equipment for the neonatal unit consider:

- The quantity required based on the current and projected bed space
- The electrical or mechanical requirements to operate the equipment
- Any pre- purchase installation requirements
- After sales support including installation, training, and immediate back up and repair
- Maintenance contracts for the equipment
- Consumables that the device will require in order to function, look at cost and availability and compare with alternative options
- Specifications required, and specifications of the item
- Durability of the item. An item may cost less than another item, but the durability of some items makes them more cost effective.
- The advice of paediatricians and neonatal nurses

Table 2 lists the equipment and consumable requirements. Calculate what you need for your facility.

Additional specifications for equipment, lists of manufacturers and prices are included in Appendix 2.

TABLE 2: EQUIPMENT FOR NEWBORN CARE

Equipment	Labour unit and postnatal ward	Level I Neonatal Unit	Level II Neonatal Unit	Level III Neonatal Unit
Incubators, bassinets, and general neonatal equipment				
Closed incubator		1 per SIC bed	1 per SIC bed	1 per SIC bed
Bassinet (Washable)	4 per 1000 deliveries / month	1 per SIC bed		
Transport incubator	1 per 3 LW beds 2 per Theatre			
Overhead servo incubator	0	1 per HC bed	1 per HC/ICU bed	1 per HC /ICU bed
Heat Shield	0	1 per HC bed	1 per HC/ICU bed	1 per HC/ICU bed
Wall suction unit	1 per suction point	1 per suction point	1 per suction point	1 per suction point
Phototherapy units	1/ Health centre 1/ 6 PN beds	1 per 2NNU beds	1 per 2 NNU beds	1 per 2 IC and HC beds
Transcutaneous bilirubin meter	1 / Health centre 1 /Postnatal ward	1 per NNU	1 for KMC and SC 1 for HC and ICU	1 for KMC and IC 1 for HC and ICU
Electronic scale	1 per 6 LW beds 1 per 6 PN beds	1 per NNU cubicle	1 per NNU cubicle	1 per NNU cubicle
Equipment for respiratory support and oxygen therapy				
Ventilators (Complete)		0	1 – 2 for short term ventilation	1 per ICU bed
Nasal CPAP (Complete)		1 per HC bed	1 per HC bed	1 per HC bed
Head boxes	1 for LW / clinic 1 for Postnatal Ward	1 per SIC and HC bed	1 per SIC and HC bed	1 per SIC and HC bed
Pulse oximeters*	1 per Health Centre 1 for Labour ward 1 for postnatal ward	1 per HC beds 1 per 2 SIC beds	1 per HC beds 1 per 2 SIC beds	1 per HC / ICU beds 1 per 2 SIC beds
Oxygen flow meter	1 double per oxygen point	1 double per NNU bed	1 double per NNU bed	1 double per NNU bed
Oxygen blender		1 per HC bed	1 per HC bed	1 per HC bed
Oxygen analyser		1 per 2 HC bed	1 per 2 HC bed	1 per 2 HC bed
Apnoea monitors		1 per 2 HC bed	1 per 2 HC bed	1 per 2 HC bed
Trans-illumination light		1 per NNU	1 per HC unit 1 per ICU unit	1 per HC unit 1 per ICU unit
Chest drain kit		1 per NNU	1 per NNU	2 per NNU
Fluid controllers and cardiac monitors				
Intravenous infusion controllers		1 per NNU bed	1 per NNU bed	1 per NNU bed
Multi-parameter monitors		1 per HC bed	1 per HC / ICU bed	1 per HC / ICU bed
BP monitor - portable		1	1	1
Syringe pumps			1 per ICU bed	1 per ICU bed

Equipment	Labour unit and postnatal ward	Level I Neonatal Unit	Level II Neonatal Unit	Level III Neonatal Unit
Other equipment				
Portable suction apparatus	1 per clinic 1 per labour ward	1 per Neonatal unit	1 per 6 beds	1 per 6 beds
Mobile X Ray		1 in the hospital	1 in the unit	1 in the unit
Ultrasound machine			1 mobile with neonatal and echo probe available in hospital	1 in NNU with neonatal and echo probes
Blood gas analyser		1 in large hospitals	1 in the hospital	1 in the unit
Resuscitation equipment				
Resuscitaire	1 per labour ward bed 2 per theatre 1 per postnatal ward	1 per unit	1 per unit	1 per unit
Self-inflating neonatal bag and mask and masks 00,0/1,2	2 per resuscitaire 2 per advanced resuscitation trolley	2 per advanced resuscitation trolley	2 per advanced resuscitation trolley	2 per advanced resuscitation trolley
Advanced Resuscitation trolley	1 per health centre 1 per 6 labour ward beds	1 per unit	1 per 6 HC/IC beds	1 per 6 HC/IC beds
Neopuff			1 per ICU unit	1 per ICU unit
Laryngoscope, straight miller blade size 00, 0, spare batteries and bulb	1 per health centre 1 per 6 labour ward beds	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley
Endotracheal tubes	3 size 2.5, 3.0, 3.5 and 4,0 per resuscitation trolley	3 size 2.5, 3.0, 3.5 and 4,0 per resuscitation trolley	3 size 2.5, 3.0, 3.5 and 4,0 per resuscitation trolley	3 size 2.5, 3.0, 3.5 and 4,0 per resuscitation trolley
Introducer	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley
Mcgills forceps	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley
Suction catheters	Size 10 3 at each resuscitaire	Size 10 3 at each resuscitaire	Size 10 3 at each resuscitaire	Size 10 3 at each resuscitaire

Equipment	Labour unit and postnatal ward	Level I Neonatal Unit	Level II Neonatal Unit	Level III Neonatal Unit
Consumables				
Oxygen tubing*	2 per oxygen point	2 per oxygen point	2 per oxygen point	2 per oxygen point
Nasal prongs*	2 neonatal / preterm per oxygen point	2 neonatal / preterm per oxygen point	2 neonatal / preterm per oxygen point	2 neonatal / preterm per oxygen point
Venturi's*	1 full set per oxygen point	1 full set per oxygen point in SC /HC	1 full set per oxygen point in SC /HC	1 full set per oxygen point in SC
CPAP circuit		4 circuits / machine available for reuse	4 circuits / machine available for reuse	4 circuits / machine available for reuse
Ventilator circuits		4 circuits / machine available for reuse	4 circuits / machine available for reuse	4 circuits / machine available for reuse
Neonatal saturation probes	2 per machine available for reuse	2 per machine available for reuse	2 per machine available for reuse	2 per machine available for reuse
Neonatal incubator probes		6 per incubator	6 per incubator	6 per incubator
Infusion sets*	5 x 60 dpm set	5 x 60 dpm or Correct set for infusion controller	5 x 60 dpm or Correct set for infusion controller	5 x 60 dpm or Correct set for infusion controller
IV cannulas	5 x 24 and 22 G	Many 24 and 22 G	Many 24 and 22 G	Many 24 and 22 G
Dial – a – flow	5 per clinic 5 in labour ward, and postnatal ward	Infusion controllers are preferable	Infusion controllers are preferable	Infusion controllers are preferable
Consumables for bilicheck				
Iv fluids	10% Neonatolyte, N Saline, 10% dextrose 5% dextrose	10% Neonatolyte, N Saline, 10% dextrose 5% dextrose	10% Neonatolyte, N Saline, 10% dextrose 5% dextrose	10% Neonatolyte, N Saline, 10% dextrose 5% dextrose
Feeding equipment				
Breast pumps	Not recommended in clinics and hospitals as they are difficult to clean and sterilise. Express milk by hand into a cup			
Equipment for flash heat treating milk 2 plate stove, aluminium pots	Nil	1 per 12 beds	1 per 12 beds	1 per 12 beds
200ml and 50ml feeding cup	4 per 10 deliveries	8 per bed	8 per bed	8 per bed

For consumable equipment, this is the number that must be available every day, ensure adequate stocks for this to happen

4. HUMAN RESOURCES FOR NEWBORN CARE

Guidelines are given for nursing and doctor norms, as well as competencies and suggested training and learning.

4.1 NEONATAL UNIT NURSING NUMBERS

A neonatal intensive care should have 1 professional nurse per patient. It is acceptable to have one nurse for 2 patients.

A high care unit requires 1 Professional Nurse (PN) per 2 patients but one per 3 patients is acceptable. If you have one PN and one Enrolled Nurse (EN) for 4 babies this is also acceptable, as long as the EN is experienced in newborn care.

A standard inpatient care unit and KMC unit should have one PN for each 6 babies as well as one EN for each 6 babies. Having one PN to cover 12 standard and KMC babies during the day is acceptable, if there are 2 Enrolled nurses.

A neonatal unit requires a unit manager. In a smaller unit, the unit manager may be part of the staff complement, but in larger units an additional post is necessary.

To provide 24-hour cover every day for each nursing shift, 6 posts are required for each position.

4.2 NURSE SKILLS, TRAINING AND DEVELOPMENT

A diploma in neonatal ICU or paediatrics is recommended for the professional nurses in the intensive care unit and the unit manager.

As a minimum requirement PN's should undergo in-service training in newborn care such as the one week LINC training and be engaged in self-study or an ongoing in-service training programme at the facility e.g. Perinatal Education Programme.

Non-rotation of professional nurses in the neonatal unit is essential. Working in a neonatal unit requires specific skills, and nurses with a passion and interest in newborns are needed. Once you have found good nurses, develop their skills further, and do not rotate them.

4.3 DOCTORS

There must be a doctor responsible for the neonatal unit in the hospital. The doctor must do a daily ward round, and a problem round in the afternoon and evening. The larger the unit, the more of the doctors time will be spent in the neonatal unit. Large neonatal units with 18 or more beds require a medical officer to be present at all times during the day.

A regional hospital neonatal unit, requires a permanent medical officer to be allocated to every 18 babies, and a paediatrician to provide advice, support and training. A 24hour paediatric medical officer cover for the neonatal unit is needed.

Doctors should have an interest in newborns, should have undergone as a minimum a neonatal resuscitation course and the 2-day LINC training, and should participate in on-going learning. Doctors at regional hospitals are encouraged to work towards a Diploma in Child Health.

4.4 SKILLS DEVELOPMENT

There are a number of competencies required to work with newborns and a number of ways to assist your health workers in acquiring these competencies. These are listed in the resource chapter and summarised here.

ADVOCACY

Before embarking on any skills development ensure that staff are interested in newborn care, committed to learning, and want to further their skills. You can do this by introducing them to newborn care through advocacy materials, preparing topics and bringing in an outside expert to talk about newborn care.

NEONATAL RESUSCITATION TRAINING

Helping Babies Breathe (HBB) training is a basic resuscitation training required by all nurses and doctors who work in the maternity and neonatal unit. Doctors, advanced midwives and neonatal nurses should have skill in advanced neonatal resuscitation that can be achieved by sending them on a NRP course, or training your province provides. HBB training can be done on-site in each facility. Ongoing on-site drills and skills revision on neonatal resuscitation is required at facilities.

BASIC NEWBORN CARE COURSES

LINC has developed basic newborn care learning and training materials and suggestions for courses or in-service training.

A Module on Routine care can be taught as a one or two day course or as part of in-service training in the facility. The Routine Care assumes that participants have already done an HBB course. It is best that this learning is facility based.

Charts and modules that can be adapted to teach nurses, doctors and enrolled nurses cover the management of sick and small babies. A 5-day course schedule for nurses is provided that includes interactive adult learning and practical. This course can be run as a 5 day course, as self learning or as a facility based in-service training programme.

DISTANCE BASED LEARNING

There are a variety of distance based learning materials for nurses and doctors. The Perinatal Education Programme is such a course and can be used as self learning or group learning in a facility.

FURTHER DIPLOMA TRAINING

Various universities offer diploma training in Neonatal Intensive care or Paediatrics. Regional hospitals should arrange study leave for nurses to undergo this training. Doctors are encouraged to study for the diploma in Child Health.

ATTENDANCE AT CONFERENCES AND UPDATES

A variety of conferences are held every year, that will encourage learning. These include

1. Perinatal Priorities Conference

-
2. Biannual paediatric conference
 3. Paediatric refresher course
 4. Various updates

Guidelines, training materials and resources are attached.

MENTORING AND SUPPORTIVE SUPERVISION

Clinical mentoring is an important way of learning, and traditionally this is how nurses, interns and junior doctors do most of their learning, from experienced colleagues. Many institutions have experienced a loss of skilled health workers, and health workers have not always kept up to date. In these instances, outside mentors can assist with skills development. More information can be found in Chapter 3.

4.5 NURSING NORMS FOR MATERNAL CARE

Newborn care starts during pregnancy! Pregnancy is about having a baby, and it is the responsibility of everyone involved – parents and health workers to do everything possible to ensure that, at the end of the pregnancy, there is a healthy baby. This also means that there must be a healthy mother.

The key to a good outcome of pregnancy is the care that the mother gets during pregnancy and labour. There must be sufficient staff available for this care to be provided.

All staff providing maternity care, from booking to discharge after delivery, must not be “rotated”. They must be permanently allocated, unless the staff member requests to be moved.

MATERNITY STAFFING

This staffing refers to hospital staffing of antenatal clinic, labour ward and postnatal ward. It does not include staffing for the neonatal unit. The maternity staff are responsible for the care of the mother in the high risk antenatal clinic, in the labour ward and in postnatal ward, as well as the routine care of the baby in utero, in labour ward and postnatal ward.

The neonatal unit requires a separate staffing, unless the hospital is very small and there are fewer than 1000 deliveries a year.

MIDWIVES

The staff establishment requires 16 midwives for every 100 deliveries per month. A unit manager, who is clinically involved, is needed in addition to this number. In order to have 1 nurse on duty 24 hours in the day, there must be 5 nurses on the staff establishment

There should be an advanced midwife on duty 24 hours per day as part of this number – therefore at least 5 advanced midwives on the staff establishment.

ENROLLED NURSES AND ENROLLED NURSING ASSISTANTS

10 – 12 enrolled nurses per 100 deliveries per month are required on the staff establishment. This allows for 1 to be working in the labour ward and 1 to be working in the postnatal ward to provide 24 hour cover.

DOCTORS

There must be a designated doctor responsible for patient care in the maternity ward as his / her first responsibility. *Doctors doing their community service year do not need to be “rotated”. They are medical officers as any other.*

STAFFING FOR PHC CLINICS

Norms cannot be specifically provided for maternity care at PHC clinics as this is integrated into the work done at a PHC facility. Many PHC clinics conduct fewer than 5 deliveries a month. Where clinics are bigger or there are health centres that do deliveries the same norm will apply for professional nurses, i.e. 16 midwives for every 100 deliveries a month.

5. INFECTION PREVENTION AND CONTROL IN THE NEONATAL UNIT

Newborns are at high risk of acquiring infection due to their immature immune system. They are usually protected from infection through exclusive breastfeeding, and limited contact with other individuals.

The neonatal unit or any facility predisposes the baby to infection. In this environment the baby is handled by many people, exposed to different surfaces and probes, and the integrity of their skin or mucous membrane may be broken by procedures. Most organisms are transmitted by hands onto the baby or equipment in the environment.

This guide applies to all levels but is intended mainly for level I and II facilities with units from 6 – 36 beds. Larger level II and Level III facilities may require additional infection control measures to be put in place.

HAND WASHING IS THE SINGLE MOST IMPORTANT WAY TO PREVENT INFECTION.

- *Strict hand washing, before touching a baby*
- *Adequate soap, water and paper towels*
- *Prevent overcrowding*
- *Feed babies breast milk only*
- *Be obsessive with housekeeping and asepsis*

5.1 FACILITIES: SPACE, STAFFING, POLICIES

5.1.1 SPACE

Infection is reduced if there is adequate space for nursing, and only a few people with clean hands touch the baby. Adherence to the norms and standards for staff and facilities that are outlined will prevent infection. The key factors that prevent infection are

- Adequate space for each incubator or bassinet so that there is space for the mother, the medical staff and the required equipment
- Having 4 - 8 babies per functional area, even without dividers, so that there is one hand wash basin for each 4 – 8 babies, and that the nursing staff work only with 4 – 8 babies each
- The unit is air-conditioned and that this is kept between 24 and 25 degrees Celsius
- Adequate ventilation in the unit
- Limit the number of people coming into the unit
- Swing doors, or no doors between sections to prevent having to handle doors

5.1.2 PERSONNEL

Personnel with airborne infections and skin infections should not work directly with patients until they are better.

Personnel should be allocated to patients not tasks, and should ideally not care for more than 6 babies.

Personnel should be immune to measles, rubella, and varicella.

Personnel should receive annual influenza vaccinations.

5.1.3 HAND WASHING FACILITIES

Hand washing facilities need to include

- A hand wash basin with elbow operated taps at the entrance to the neonatal unit
- Each cubicle of 4 – 8 babies to have a hand wash basin with elbow operated taps, and each baby should be less than 6 metres from a hand wash basin
- A hand washing poster with clear instructions posted above or next to each basin
- Antiseptic soap and clean disposable towels at each basin
- Alcohol hand spray
- A peddle operated refuse bin at each basin

5.1.4 ISOLATION

- Most infections in newborns do not require special isolation precautions
- General newborn care measures will prevent transmission of most infections between newborns
- Examples of babies who may need special precautions are a baby with infective diarrhoea, RSV or staphylococcal skin sepsis. They can be nursed in a closed incubator, and a distance of 1 metre should separate them from other patients in the nursery.
- Babies who are deemed to have a serious infectious risk, e.g. varicella or measles require isolation outside the neonatal unit.
- No special restrictions should be applied to babies born outside the hospital. They should be treated the same as babies born in the hospital.
- If there is an outbreak of an infection, then the staff and babies involved in the outbreak are kept as a cohort in a single cubicle until discharge.

5.1.5 ADMISSION CRITERIA

Babies are usually born without infections and are gradually colonised by organisms from their mothers and the environment. Babies who have been home may be colonised by community-acquired organism that may be less problematic to treat than those with hospital acquired infections. There is no justification to excluding babies who come from home or other environments or nursing them in a separate area.

- All neonates irrespective of where they are born, or have been, are admitted to the neonatal unit
- Other “infected babies” can be nursed in a closed incubator with attention to infection control. These include babies with staphylococcal skin sepsis and possible RSV infection

Wash your hands before and after touching a baby

5.1.6 VISITING CRITERIA

Parents are free to visit at any time. They need to adhere to hand washing guidelines. Other visitors including grandparents, important care givers and siblings can visit for short periods, as long as they have no respiratory infection, wash their hands and the unit is not overcrowded.

5.1.7 CLOTHING

The routine use of gowns is of no proven value. Studies have shown that routine use of gowns does not reduce colonisation or infection in newborns

Personnel should wear comfortable short-sleeved clean clothes daily, and may choose to wear a uniform scrub dress or suit.

Doctors must remove white coats as they enter, as these may be contaminated from other areas in the hospital

Gowns are only used for sterile procedures, e.g. exchange transfusion.

Lodger mothers should wear clean clothes every day.

5.2 CLINICAL PROCEDURES FOR INFECTION CONTROL

5.2.1 HAND WASHING

Wash hands for one minute on entering the neonatal unit

Wash hands for 30 seconds or do an alcohol rinse between touching each baby.

HAND WASHING PROCEDURE

- Roll sleeves to elbow
- Remove watch, bangle
- Use water and soap and wash hands in the following sequence
 - Palms and fingers in web spaces
 - Backs of hands
 - Fingers and knuckles
 - Thumbs
 - Finger tips
 - Wrists and forearms to elbows
 - Keep elbow lower than hands
- Close the tap with elbow, or with paper once hands are dry
- Dry hands with single use clean paper
- Discard in the peddle bin

When using alcohol hand spray, follow the same procedure

5.2.2 SEPARATE BASIC EQUIPMENT FOR EACH BABY

The following equipment and supplies should be assigned to a single patient and kept below the incubator or bassinette

- Stethoscope
- Tape measure
- Cotton wool swabs
- Swabs
- Thermometer
- Alcohol

Clean with alcohol between patients.

Keep records, files and Xrays on the nurses' station, not on the incubator

5.2.4 SKIN AND UMBILICAL CORD CARE

Clean umbilical cord and umbilicus with 70% alcohol 4 times a day

5.2.5 MANAGING IVI INFUSIONS, OXYGEN, MEDICATIONS

- Change IV lines after 72 hours
- Change all vacolitres after 24 hours
- Label the bag with date and time of opening
- Change buretrols after 24 hours
- Change suction bottles after 24 hours
- Do not use humidification bottles unless the patient is getting nasopharyngeal oxygen.
- Change oxygen humidification bottles and water every day and replace with clean bottles, and sterile water daily.
- Change ventilator and CPAP circuits once a week
- Change nasal prongs and cannulas every 3 days
- Changed porthole cuffs every day or do not use
- Discard antibiotic vials after 24 hours
- Use syrups for one week after opening and then discard

5.3 CLEANING EQUIPMENT

5.3.1 SMALL EQUIPMENT

Wipe down swab container, injection and medicine tray each day with soap and water

Clean the following daily with spirits if used for the same patient

- Stethoscope
- Measuring tape
- Thermometer
- BP cuffs

-
- Radiant warmer probes
 - Pulse oximeter

If used for different patients, wipe with spirits between patients.

Oxygen hood: wipe with soap and water each day, and clean with 0.5% chlorhexidene between patients and after 7 days

5.3.2 INCUBATORS AND BASINETTES

Clean incubators every day with a damp cloth soaked in mild detergent, don't use chemicals or spirits

Clean incubators thoroughly with 0.5% chlorhexidene after use by a patient and after 7 days. Allow to dry before using.

Replace waterproof mattresses when waterproofing is broken

Disinfect bassinets daily using detergent solution or disinfectant solutions

5.3.3 OXYGEN TUBING AND RESPIRATORY CIRCUITS

If baby has had a Gram negative infection discard oxygen tubing and respiratory circuits

OTHERWISE

- Clean oxygen tubing and respiratory circuits with soap and water
- Rinse with clean water
- Dry thoroughly by hanging to dry for 24 hours or blow dry with air or oxygen
- Pack and gas sterilise

OR

- Soak in hibiscrub (4% chlorhexidene gluconate) for 30 minutes
- Soak in Cydex (10% isopropyl alcohol) mixed with a bucket of water for 30 minutes
- Rinse in water, hang on a stand and allow to dry

5.3.4 CPAP GENERATORS AND NASAL PRONGS FOR CPAP

- Wash with soap and water to remove secretions, blood and dirt
- Rinse and dry thoroughly
- Pack
- Gas sterilise

5.3.5 HUMIDIFIER CHAMBERS

- Fill with sterile water daily
- After each baby or after one week, wash with soapy water, rinse, dry thoroughly
- Gas sterilise

5.3.6 INFANT FEEDING CUPS

- Wash and sterilise cups used for feeding
- Discard disposable syringes after use if used for feeding

5.4 HOUSEKEEPING

5.4.1 CLEANING

- Keep the nursery clean and dust free.
- Cleaning methods that minimise dust dispersal should be used.
- Have a housekeeping schedule
- Clean floors and horizontal surfaces once or twice daily with an EPA approved disinfectant. Phenolic solutions should not be used.
- Clean and dust windows and blinds weekly
- Clean from top to the bottom
- Ensure that a fresh bucket containing disinfectant solution is available at all times;
- Immediately clean up spills of blood or body fluid with disinfectant solution (0.5% chlorhexidene
- Dustbins should be washed daily with soap and water, and the bags changed daily or when full.

5.4.2 LINEN

- Wash linen at 60 degrees Celsius and infected linen at 93 degrees Celsius
- Clean linen must be available at all times
- Linen to be transported in covered laundry bags
- New linen to be laundered prior to use
- Contaminated linen to be placed in a yellow plastic bag and taken to the laundry twice a day

5.4.3 WASTE HANDLING

- Soiled nappies and medical waste to be collected 3 hourly after every feeding round
- Separate contaminated waste from non-contaminated waste
- Use a puncture proof container for contaminated sharps, and empty when 2/3 full

5.5 NOSOCOMIAL INFECTIONS AND OUTBREAKS

A presumptive epidemic is two or more babies with in a neonatal unit with the same condition at the same time. Strict control measures need to be put in place and monitored to resolve the problem.

- Isolate the baby and mother in a private room or place in a closed incubator
- Or place all babies with the same infection in the same room
- Or do not admit new babies to that room

When entering the room

- Wear clean gloves and change gloves after contact with infectious materials (secretions, gauze)
- Wear a clean gown when in contact with the baby

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- Remove the gown and gloves after contact with the baby
 - Wash hands when leaving the room
 - Avoid touching potentially contaminated surfaces

 - Reserve non critical equipment for use only with the infected baby

Review Compliance with infection control procedures.

6. STANDARD CLINICAL CARE

Newborn care is to be provided according to set standards. These standards can be made into guidelines, protocols and policies for care. They require implementation strategies, training, support and monitoring.

Standard clinical guidelines have been developed in order to facilitate standard care. Hospitals need to adopt the national standard clinical guidelines. Adjustments to the guidelines may be made into protocols to facilitate local implementation of the guidelines.

Examples of standard clinical guidelines include

1. Standard clinical guidelines and EDL for Paediatric Care
2. LINC guidelines for district hospitals (Limpopo)
3. LINC Charts on routine care and the care of the sick and small newborn.

These guidelines are attached to the toolkit, in hardcopy and on the CDROM

Tertiary units develop their own standard clinical guidelines. While these are not for use in district hospitals, we have included electronic versions of some of these guidelines for reference.

Support for the implementation of standard care is important. Ways to do this include

- Clinical support visits by a paediatrician
- Clinical audit
- Clinic supervision
- Record reviews
- Mortality audits

7. NEONATAL TRANSFERS

Referral of patient occurs in 2 directions:

A critically ill neonate referred from a district to a tertiary service eg: Neonate born at a district hospital requiring surgery for a congenital abnormality at a tertiary hospital.

A high risk neonate born at a tertiary hospital referred from a tertiary service once stable to a district hospital to receive Kangaroo mother care.

The decision to refer a patient should be telephonically discussed between the doctor from the referring hospital and the doctor at the receiving hospital.

For certain critically ill newborns transfer and referral may not be the best form of management. These newborns might be served better by providing comfort or palliative care at the birthing unit. Babies born at the extreme end of viability or with congenital abnormalities incompatible with survival are some examples.

In a situation where no bed may be available at the time of referral, ongoing management of the neonate must be continued at the place of delivery in liaison with the specialist at the receiving hospital. It is the duty of the referring doctor to update the doctor at the receiving hospital of the patient's condition. Transfer should happen once a bed becomes available.

The following guidelines are suggestions to facilitate the referral and transfer of the correct patient to the correct level of care. They may not be applicable to every district and province, and local guidelines for referral are necessary. There is inequitable access to standard care for newborns in South Africa and equity across provinces needs to be discussed.

7.1 FROM A CLINIC TO A LEVEL 1 DISTRICT HOSPITAL

Indications for referral to a district hospital are the same as for any baby referred to the neonatal unit from maternity and include the following

- Babies with Apgar scores less than 8
- Babies with birth weight < 2kg
- Baby with a priority sign or congenital abnormality
- Baby with a risk factor that cannot be adequately managed at clinic level

7.2 FROM A LEVEL I TO A LEVEL II HOSPITAL

Some of the indications for referral from Level I to Level II care.

- Babies with a birth weight of 1000g - 1500g who **are unwell** at DISTRICT hospitals
- Babies with Respiratory distress with saturations < 80% on Head Box oxygen at > 60% oxygen in head box, and CPAP is not available
- Baby with severe respiratory distress, grunting, severe indrawing and RR > 70
- The baby is receiving CPAP, and the inhaled oxygen is > 60% to maintain oxygen saturation at 88 – 92% or a baby on CPAP is having recurrent apnoea requiring mask ventilation.
- Baby with uncontrolled seizures
- Hypoglycaemia not responding to treatment in 1 hour
- Jaundice with bilirubin levels indicating imminent exchange transfusion

- Persistent vomiting
- Asphyxiated patients are not usually considered but some infants with a Thompson HIE score of 10 – 15, or Sarnat grade 1 – 2 may benefit from therapeutic cooling started within 4 hours of birth, if this service is available.
- Dismorphic babies need to be seen by a paediatrician but this is not a reason for urgent transfer to a level II or level III hospital

7.3 FROM LEVEL I OR II TO LEVEL III HOSPITAL

Level 3 space is a limited, a costly resource, and not available in all provinces. The decision to refer a patient to a tertiary hospital must be discussed with the specialist in the NICU. Some patients e.g. patients with surgical problems such as gastroschisis, will benefit from going directly to a tertiary unit. Some patients who may qualify include

- Failed CPAP if no ventilation is available at level II
- All VLBW requiring ventilation beyond 72 hours
- Congenital abnormalities requiring surgery
- Long term feeding problems requiring Total Parenteral Nutrition (TPN)
- Severe Persistent Pulmonary Hypertension (PPHN) requiring ventilation **and** inotropic support

When the bed capacity at the referral hospital has been reached, the receiving doctor will need to be involved to identify an alternative bed at the appropriate level of care. If no bed is available the patient may have to stay at the referring hospital until such time that a bed becomes available.

7.3 LIMITATION OF CARE GUIDELINES

“Limitation of care” is a decision to not offer active resuscitation or continued ventilation. It may include the limitation of escalation of care or withholding of antibiotics, oxygen and monitoring.

The decision to limit care is based on a combination of limited resources and expected long term outcome. These guidelines are subject to change depending on availability of resources and further information regarding the prognosis of the clinical condition. It is difficult to give absolute guidelines but it is important to recognize when the offered therapy is failing and the situation is now futile. It is critical to treat the patients and their families with the utmost respect and empathy and to accommodate baptism or other religious or cultural ceremonies where possible.

Preferably two named doctors should agree on a DECISION to limit care and it should be considered in the following scenarios

- Chronic IPPV > 14days and not steadily improving in the absence of a known treatable condition with expected good long term outcome
- Infants with Necrotising Enterocolitis (NEC) who fail conventional ventilation
- Multisystem disease and deteriorating after a week of treatment
- Congenital/Metabolic abnormalities with a known or expected poor outcome
- Chronic neuromuscular disorders with expected duration of ventilatory support > 30days.
- Expected poor neurological outcome, eg: Bilateral grade 3 or unilateral grade 4 intraventricular haemorrhage (IVH) or unilateral periventricular leucomalacia (PVL) in the parietal / occipital regions
- Asphyxiated infants who do not establish sustained spontaneous respiration by 20 minutes of life or who have continuous, persistent profound bradycardia < 60bpm beyond 10 mins of life despite the usual, appropriate resuscitative measures (In the absence of reversible maternal medication influence)

-
- Severe Hypoxic Ischaemic Encephalopathy (HIE) i.e.: Sarnat grade 3 or Thompson HIE score 15 or more.
 - Prolonged profound hypoxia/acidosis/seizures not responding to treatment within 6 hours (and metabolic disease unlikely).

8. NEONATAL TRANSPORT

In South Africa critically ill neonates are born at all levels of care. Where there is effective screening and referral of high-risk mothers antenatally to Level II or level III services, these infants have a better chance of survival as they are delivered where there is a specialized neonatal unit staffed by specialist paediatrician or neonatologist.

Critically ill neonates who are born at a district facility have to be transferred to a secondary or tertiary centre and are dependent upon emergency transfers to a referral hospital. The neonatal outcome is directly related to efficient and rapid transport time, and the care that they receive before and during transport.

Vehicles for ground transport of neonatal patients have historically been general-purpose ambulances, with or without a transport incubator.

We need to work towards **dedicated neonatal ambulance services**, with vehicles fitted with specialized neonatal equipment and skilled neonatally trained ambumedic personnel to staff them.

There are two main components involved in the transport of a patient. These are:

8.1 THE REFERRAL SERVICE

The referral system consists of the personnel, vehicles, and protocols for transfer

8.1.1 PERSONNEL

There are

- the personnel manning the office at the “ambulance” call centre,
- the clinical staff at the hospital
- the personnel manning the ambulance.

The call centre staff receive the call to fetch a patient and pass this on to the staff manning the vehicles. These calls are prioritised according to a list. Neonatal transfer should be high on the priority list. Clear protocols for transporting newborn infants, which include urgency must be in place and be available to the “ambulance” staff.

The ambulance personnel usually consists of the driver of the vehicle and a colleague who may, or sometimes may not, have had only basic first aid training. For transporting newborn babies, there is a need to have a person who has had training in the care of a newborn baby during transport.

The doctor at the receiving hospital is in the best position to advise the ambulance personnel on the urgency of transport and any special management which the baby could need during transport.

It is essential that all three categories of staff meet on a regular basis to discuss problems, develop protocols, and form plans to improve the service.

8.1.2 MODE OF TRANSPORT

Ground ambulances are used for relatively short-distance transport when surface transportation is more efficient and often more rapid than air transport. It must also be used when climactic conditions preclude air transport.

Helicopter or fixed-wing airplane transport may be used for medium-distance transfers. They result in rapid transfer but are costly, and weather does not always permit their use.

8.2 CARE OF THE NEWBORN DURING TRANSPORT

COMMUNICATION

The doctor who has been looking after the baby should make a request for transfer of a sick baby to the receiving doctor. This should be as early as possible before the baby deteriorates. The most senior doctor should make the decision about referral

The receiving doctor will

- Give advice on pre-transport stabilization prior to the arrival of the transport team.
- Decide whether transfer is appropriate
- If indicated, authorizes or recommends a mode of transport
- Advise the transport team on the care needed during transport.
- Inform the nurse in charge of the neonatal unit that the baby is being transferred in

PRE-DEPARTURE STABILIZATION

The condition of the baby must be stabilised before transportation. The following aspects of care are essential for the baby:

- The baby must be kept warm.
- Ensure that the baby is getting sufficient oxygen. The oxygen saturation should be kept between 88 and 93% (preterm infant) or 94 – 96% (term infant).
- The blood glucose level must be maintained in the normal range.
- The baby must have a secured airway. This may mean endotracheal intubation.
- All the documentation (copies of all the patient notes, observation charts, and the results of special investigations) must be ready for the transport team when they arrive.

CARE OF THE NEONATE IN THE TRANSPORT ENVIRONMENT

PERSONNEL NEEDED

The most reasonable option is to have a suitably qualified paramedic as part of the transport team. This, in South Africa, is most often not possible.

The alternative is to send a qualified nurse with the baby. This usually results in the staffing of the referring hospital being depleted. The nurse also needs to be returned to her hospital. This is a far from ideal situation.

EQUIPMENT

The ambulance needs to have basic equipment for transporting newborns. This consists of:

- A transport incubator which can plug into the vehicle's electrical system
- A source of oxygen, usually a cylinder, with a means of controlling the flow and the percentage being administered. The former is usually present on the cylinder gauge head, but the percentage administered will need venturis, if a head box is being used.
- A pulse oximeter (oxygen saturation monitor)
- A drip stand
- An IV infusion rate controller, or suitable alternative
- A place for the baby's mother, and the accompanying health professional to sit.

-
- Adequate resuscitation equipment – a minimum of a bag and mask.
 - Transport ventilators are available, and will definitely be needed if a baby needs to be ventilated on the way.

THERMAL CONTROL

Thermoregulation is vital to both morbidity and mortality in the critically ill neonate. Ways of keeping a baby warm during transport

- Transport incubator: The temperature of the baby must be checked ½ hourly and the incubator temperature adjusted according to the baby's temperature.
- Using a polythene bag or "sheet". This can be used even if the baby is in an incubator, as it reduces the heat loss from the baby.
- Keeping the baby in the KMC position. Unless there is a special reason for not being able to do this, it is a **safe** method of keeping the baby warm during transport. It will be essential to do this if a transport incubator is not available.
- The temperature of babies with HIE should be kept between 34 – 35⁰C for the duration of the transport.

VENTILATION AND AIRWAY MANAGEMENT

The first level of intervention is bag-valve-mask ventilation. This is acceptable for short transfers if transferred by unskilled transport staff. However, it is an unacceptable practice for prolonged airway management during transport.

If ventilation is needed or anticipated, the baby will need to be intubated with an endotracheal tube, before the journey, and a transport ventilator is required with personnel who can support ventilation

MONITORING DURING TRANSPORT

Monitoring the vital signs of a neonate in an ambulance has its challenges. The following observations need to be done: Temperature, Respiratory rate, Heart rate, Oxygen saturation, IV line running correctly (Check drip site). These observations must be recorded and the record put with the babies documents.

ARRIVAL AT THE REFERRAL HOSPITAL

On arrival at the referral hospital, the baby should be taken **directly to the Neonatal Unit**, and **NOT** via the out-patient department or casualty. All the necessary observations must be commenced immediately on arrival. As soon as the baby has been settled into an incubator, the responsible doctor must be called to assess the baby. There should be a report back to the referring doctor by the receiving doctor within 24 hours of the baby arriving at the referral hospital. This should initially be by telephone, and a brief written note also sent.

QUALITY ASSURANCE

Regular meetings need to be held between the neonatal service and the transport service, and guidelines for monitoring quality assurance put in place.

8.4 THE CASE FOR A NEONATAL RETRIEVAL TEAM (NRT)

Paramedics, nurses and doctors, have the role of rapidly stabilizing critically ill newborn patients for immediate transfer. The services of a specialized neonatal transport team has been shown to be associated with reductions in hypothermia and acidosis, as well as reduced mortality in low birth weight infants.

A number of transport team configurations are used for neonatal transport. Critical care transport teams are not common in the public sector. However, in the private sector, the most common crew configuration is an experienced professional nurse working with a paramedic, and an emergency specialist or a doctor if required. However, in developed countries, many neonatal transport programs include a respiratory therapist as the second crew member because of airway management expertise. Adding a specialist to the team is very costly and South Africa has taken the route of providing advanced training for paramedics in neonatal conditions as a cost effective alternative.

9. REFERENCES

Barlow HJ. An Evaluation of Neonatal Nursing Care in Selected Hospitals in the Western Cape, 2003. M Cur Thesis, University of Stellenbosch

Bryan L Ohming. Guidelines and Transfer Protocols – Maternity and Neonatal Transfers, Child Health Network for the Greater Toronto Area 2010 – 2011

Greenfield DH. Midwifery Staffing Needs in a Maternity Ward. Proceedings of the 25th Conference on Priorities in Perinatal Care in South Africa, Champagne Sports Resort, KwaZulu-Natal March 2006

Laing, I, Ducker T, Leaf A, Newmarch P. Designing a Neonatal Unit. Report for the British Association of Perinatal Medicine. May 2004

Malan A, Woods D, Cooper P, Adhikari M. Health Plan for Neonatal Care. 1997 Priorities in Perinatal Care Conference.

Eastern Cape Hospital Design Guide Ver 2.1 May 2011

Infection Prevention and Control in the nursery, Chapter 24 of KZN Health Manual

Guideline for Neonatal Care. June 2008. Department of Health, Republic of South Africa

Managing Newborn Problems: A guide for doctors, nurses, and midwives: World Health Organisation 2003 (Integrated Management of pregnancy and childbirth)

Newborn Care Charts: Management of the sick and small newborns in hospital. 2008. Limpopo Initiative for Newborn Care

Quality standards for specialist neonatal care: Standards for hospitals providing neonatal intensive and high dependency care (Second Edition)NICE/BAPM(in consultation)

Service standards for hospitals providing neonatal care. 3rd edition 2010. British Association of Perinatal Medicine.

Toolkit for Setting Up Special Care Newborn Units, Stabilisation Units and Newborn Care Corners, Unicef, India

Appendix 2.1

Essential Newborn Care Standards for Newborn Care

This document is intended to provide guidelines to health service managers, doctors and nurses in charge of neonatal facilities when planning and improving facilities and services for newborns. The information is based on National Standards and work done in Limpopo Province by the Limpopo Initiative for Newborn Care (LINC) team

1. LEVELS OF CARE AND BED NUMBERS

The Levels at which Newborn services are provided are described below as well as the number of beds for sick and small newborns at each facility. The number of neonatal beds¹ required is expressed as beds per 1000 live births. Table 1 shows the number of recommended beds found in the document “Health Plan for Neonatal Care” produced by the 1997 Priorities in Perinatal Care Conference.

TABLE 1: RECOMMENDED NEONATAL BED NUMBERS

Level of care	National Recommendation	Practical number used
L I	3 – 4 / 1000 live births	4 / 1000 live births
L II	2 – 3 / 1000 live births	3 / 1000 live births
L III	0.5 – 1 / 1000 live births	0.5 / 1000 live births

TABLE 2: CALCULATION OF THE NUMBERS

Level I: Level I services are provided at clinics and district hospitals
4 level I beds / 1000 births (clinic, hospital and home births) in the sub-district And if level II services are not fully available 1 level II (HC) beds / 1000 births in the sub-district – in the district hospital
Level II : Level II services are provided at Regional hospitals
4 level I beds / 1000 births in the sub-district 3 Level II beds / 1000 births in the district
Level III : Level III services are provided at Tertiary hospitals
4 level I beds / 1000 births in the sub –district 3 level II beds / 1000 births in the district, if this hospital also provide level II services 0.5 level III beds / 1000 births in the province
Level IV
Level IV services are provided at Central Hospitals and include complex surgery and investigations. Additional bed may be needed, as this service should span across provincial boundaries.

Every hospital has a neonatal unit or nursery for sick and small babies. The extent of the unit depends on the level of care provided and number of deliveries in the area served. The unit is ideally kept in one area, but can be divided or partitioned into the following grades of care: Kangaroo mother care (KMC), Standard care (SC), High care (HC), and Intensive care (ICU). If you cannot include high care beds in your renovations, neonates requiring high care must be accommodated in the main HC and ICU. Well newborns are roomed in with their mothers and never enter the neonatal unit / nursery.

TABLE 3: LEVELS OF CARE

Level of care	Level I	Level I	Level II	Level III
Facility	Clinic / health centre	District hospital	Regional Hospital	Tertiary Hospital
No of beds	1	4 / 1000 births in the sub-district	4 / 1000 births / sub-district + 2 / 1000 births in the district	4 / 1000 births / sub-district + 2 / 1000 births in the district + 0.5 / 1000 birth / province
Neonatal care that should be delivered. ** See table 4	Routine care Initiating KMC	Routine care Kangaroo Mother Care (KMC) Standard inpatient (SIC) High care (HC)	Routine care Kangaroo Mother Care Standard care High Care Intensive care (Short term)	Routine care Kangaroo Mother Care Standard care High Care Intensive care
Ratio of beds / 10* KMC : SIC : HC : ICU	* Approximate ratio	KMC : SIC : HC 4 : 4 : 2	KMC : SIC : HC : ICU 4 : 3 : 2 : 1	KMC : SIC : HC : ICU 2 : 3 : 3 : 2

TABLE 4: CARE REQUIRED

	Routine care	Standard care	High care	Intensive and highly specialised care
Category of baby requiring care	<ul style="list-style-type: none"> Most Full term infants Most low birth weight infants > 2kg 	Babies with: <ul style="list-style-type: none"> Low Apgars Congenital abnormalities LBW 1500 – 1999g A Gestational age 32 – 36 wks Birth weight >4000g Meconium staining Wasting Possible infection Jaundice 	Babies with: <ul style="list-style-type: none"> LBW < 1500g Gestational age < 32wks Encephalopathy Meconium aspiration Septicaemia / meningitis Recurrent apnoea Moderate and severe respiratory distress Convulsions Severe jaundice 	Babies with: <ul style="list-style-type: none"> A need for assisted ventilation Complex Surgical problems Persistent hypoglycaemia Cardiovascular problems Multisystem problems Problems requiring specialist intervention e.g. ambiguous genitalia
Care provided	<ul style="list-style-type: none"> Safe, clean delivery Newborn resuscitation Identification Apgar score Vitamin K, eye care, cord care Thermal support Emergency care Assess growth Full examination Breast feeding Immunisation Care of baby exposed to HIV, TB and Syphilis Education and follow up plan 	In addition to routine care: <ul style="list-style-type: none"> Thermal Support Oxygen Support Glucose Monitoring IV Fluid administration Tube feeding Bilirubin monitoring and Phototherapy Drug administration 	In addition to routine and standard care: <ul style="list-style-type: none"> Cardio-respiratory monitoring Oxygen therapy > 40% Head box Nasal prong CPAP Short term IPPV Blood transfusion Chest drains Exchange blood transfusion 	In addition to other neonatal care: <ul style="list-style-type: none"> IPPV Total parenteral Nutrition Arterial catheterization Therapeutic cooling Advanced neurological monitoring Ultrasound and Echo-cardiography Sophisticated diagnostic investigation Sub-specialist consultation Neonatal surgical intervention

TABLE 5: NEWBORN FACILITIES

Level of care	Level I (Clinic / Community Health Centre)	Level I (District)	Level II (Regional hospital)	Level III (Tertiary hospital)
Facility required	Emergency space next to resuscitation	A single neonatal unit with areas for different levels of care. The neonatal unit is best situated between the labour ward and postnatal ward.		
Facility design		<ul style="list-style-type: none"> The neonatal unit is ideally be in one area, with a central nurses station Glass partitions by grade of care with 6 – 8 babies in an area The area should be restricted to general traffic. A dual corridor rather than a central corridor is ideal. The KMC unit is part of the neonatal unit and is ideally interleading or adjacent. It should have a bathroom, and lounge / dining room area. All mothers should have lodger facilities nearby. 		
Areas required in the unit	Next to resuscitation	<ul style="list-style-type: none"> KMC Standard care (SC) High care (HC) Lodger mothers Counselling room Central Nurses station Utility / storage areas Unit manager's office Staff rest room Milk preparation area 	<ul style="list-style-type: none"> KMC Standard care (SC) High care (HC) Intensive Care (NICU) Lodger mothers Counselling room Central Nurses station Utility & storage rooms Unit manager's office Staff rest room Milk preparation area Doctors Office Meeting room Doctors overnight 	<ul style="list-style-type: none"> KMC Standard care (SC) High care (HC) Intensive care (NICU) Lodger mothers Counselling room Nurses stations Utility & storage rooms Unit manager's office Staff rest room Milk preparation area Doctors Offices Meeting room Doctors overnight
Minimum Space required for each level of care	7.2m ² / mother and baby	<ul style="list-style-type: none"> 6m² / baby for SIC 7.2 m² / mother and baby for KMC 7.2 - 10 m² / HC 	<ul style="list-style-type: none"> 6m² / baby for 6IC 7.2 m² / mother and baby for KMC 7.2 - 10 m² / HC 10 - 15 m² / ICU 	<ul style="list-style-type: none"> 6 m² / baby for SIC 7.2 m² / mother and baby for KMC 7.2 - 10 m² / HC 10 - 15 m² / ICU
Hand washing sinks with elbow or foot controls	1 per 6 Beds or per cubicle	1 per 6 Beds or per cubicle	1 at entrance of unit PLUS 1 per 6 Beds	1 at entrance of unit PLUS 1 per 6 beds
Temperature	~24° C	~24° C	~24° C	~24° C
Heating / cooling	Heaters	Air-conditioning	Air-conditioning	Air-conditioning
Lighting	Daylight White fluorescent light White / off white walls	Daylight White fluorescent White /off white walls	Daylight White fluorescent White/off-white walls	Daylight White fluorescent White/off white walls
Electrical points		KMC 4 / bed IC 4 - 6 / bed HC 6 – 8 / bed	KMC 4 / bed IC 4 - 6 / bed HC 6 – 8 / bed ICU 12 / bed	KMC 4 / bed IC 4 - 6 / bed HC 6 – 8 / bed ICU 12 / bed
Oxygen points	1 O ₂ point per / 1000 deliveries / year, plus 1	1 per KMC / SC beds 2 per HC beds	1 per KMC / SC beds 2 per HC beds	1 per KMC / SC beds 2 per HC / ICU beds
Air points		1 per HC bed	1 per HC bed	1 per HC and ICU bed
Suction points		1 per 2 IC beds 1 per HC bed	1 per 2 IC beds 1 per HC / ICU beds	1 per 2 IC beds 1 per HC / ICU beds

2. EQUIPMENT

The equipment required is outlined in the table. Buy good quality equipment and ensure adequate in-service training on its use as well as an efficient system of repairing equipment.

EQUIPMENT	Maternity service Clinic, Labour ward, Theatre and postnatal ward	Level I Neonatal Unit	Level II Neonatal Unit	Level III Neonatal Unit
Incubators, bassinets, and general neonatal equipment				
Closed incubator		1 per SC bed	1 per SC bed	1 per SC bed
Bassinet (Washable)	4 per 1000 deliveries	1 per SC bed		
Transport incubator	1 per 3 labour ward beds 2 per maternity theatre			
Overhead servo incubator	0	1 per HC bed	1 per HC / ICU bed	1 per HC / ICU bed
Heat Shield	0	1 per HC bed	1 per HC / ICU bed	1 per HC / ICU bed
Phototherapy units	1/ Health centre 1/ 6 postnatal beds	1 per 2 NNU beds	1 per 2 NNU beds	1 per 2 IC and HC beds
Transcutaneous bilirubin meter	1/ Health centre 1/ Postnatal ward	1 per NNU	1 for KMC and SC 1 for HC and ICU	1 for KMC and IC 1 for HC and ICU
Electronic scale	1 per clinic 1 per 6 labour ward beds 1 per 12 postnatal ward beds	1 per Neonatal unit cubicle	1 per Neonatal unit cubicle	1 per Neonatal unit cubicle
Equipment for respiratory support and oxygen therapy				
Ventilators (Complete)		0	1 – 2 for short term ventilation	1 per ICU bed
Nasal CPAP (Complete)		1 per HC bed	1 per HC bed	1 per HC bed
Head boxes	1 per Clinic 1 for Labour Ward 1 for Postnatal Ward	1 per IC and HC bed	1 per IC and HC bed	1 per IC and HC bed
Pulse oximeters*	1 per Health Centre 1 for Labour ward 1 for postnatal ward	1 per HC beds 1 per 2 SC beds	1 per HC beds 1 per 2 SC beds	1 per HC / ICU beds 1 per 2 SC beds
Oxygen blender		1 per HC bed	1 per HC bed	1 per HC bed
Oxygen analyser		1 per 2 HC bed	1 per 2 HC bed	1 per 2 HC bed
Apnoea monitors		1 per 2 HC bed	1 per 2 HC bed	1 per 2 HC bed
Trans-illumination light		1	1 per HC unit 1 per ICU unit	1 per HC unit 1 per ICU unit
Chest drain kit		1	1	2

EQUIPMENT	Maternity service Clinic, Labour ward, Theatre and postnatal ward	Level I Neonatal Unit	Level II Neonatal Unit	Level III Neonatal Unit
Fluid controllers and cardiac monitors				
Intravenous infusion controllers		1 per NNU bed	1 per NNU bed	1 per NNU bed
Multi-parameter monitors		1 per HC bed	1 per HC / ICU bed	1 per HC / ICU bed
BP monitor – portable		1	1	1
Syringe pumps			1 per ICU bed	1 per ICU bed
Mobile suction apparatus	1 per clinic	1 per Neonatal unit	1 per 6 beds	1 per 6 beds
Mobile X Ray		1 in the hospital	1 in the unit	1 in the unit
Ultrasound machine			1 mobile with infant probe available to the neonatal unit	1 in the unit with neonatal probes, including echo-cardiography
Blood gas analyser		1 in large hospitals	1 in the hospital	1 in the unit
Resuscitation equipment				
Resuscitaire	1 per clinic 1 per labour ward bed 2 per theatre 1 per postnatal ward	1 per unit	1 per unit	1 per unit
Self-inflating neonatal bag and mask and masks (sizes 00, 0, 1)	2 per resuscitaire 2 per advanced resuscitation trolley	2 per advanced resuscitation trolley	2 per advanced resuscitation trolley	2 per advanced resuscitation trolley
Suction catheters	Size 10 3 per advanced resuscitation trolley 3 at each labour ward bed	Size 10 3 per advanced resuscitation trolley 3 at each labour ward bed	Size 10 3 per advanced resuscitation trolley 3 at each labour ward bed	Size 10 3 per advanced resuscitation trolley 3 at each labour ward bed
Advanced Resuscitation trolley	1 per health centre 1 per 6 labour ward beds	1 per unit	1 per 6 HC / IC beds	1 per 6 HC / IC beds
Neopuff			1 per ICU unit	1 per ICU unit
Laryngoscope handle and straight miller blade size 00, 0, 1, spare batteries	1 per health centre 1 per 6 labour ward beds	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley
Endotracheal tubes	4 sizes 2.5, 3.0, 3.5 and 4.0 per resuscitation trolley	4 sizes 2.5, 3.0, 3.5 and 4.0 per resuscitation trolley	4 sizes 2.5, 3.0, 3.5 and 4.0 per resuscitation trolley	4 sizes 2.5, 3.0, 3.5 and 4.0 per resuscitation trolley
Introducer	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley
Mcgills forceps	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley	1 per advanced resuscitation trolley

EQUIPMENT	Maternity service Clinic, Labour ward, Theatre and postnatal ward	Level I Neonatal Unit	Level II Neonatal Unit	Level III Neonatal Unit
Consumables				
Oxygen tubing*	2 per oxygen point			
Nasal prongs*	2 neonatal and preterm per clinic 2 neonatal / preterm per oxygen point	2 neonatal / preterm per oxygen point	2 neonatal / preterm per oxygen point	2 neonatal / preterm per oxygen point
Venturi's*	1 full set per oxygen point	1 full set per oxygen point in SC / HC	1 full set per oxygen point in SC / HC	1 full set per oxygen point in SC
CPAP circuit		4 circuits / machine available for reuse	4 circuits / machine available for reuse	4 circuits / machine available for reuse
Ventilator circuits		4 circuits / machine available for reuse	4 circuits / machine available for reuse	4 circuits / machine available for reuse
Neonatal saturation probes	2 per machine available for reuse			
Neonatal incubator temperature probes		1 spare per servo incubator	1 spare per servo incubator	1 spare per servo incubator
Infusion sets	5 x 60 dpm set	60 dpm or Correct set for infusion controller	60 dpm or Correct set for infusion controller	60 dpm or Correct set for infusion controller
IV cannulas	5 x 24 and 22 G	Many 24 and 22 G	Many 24 and 22 G	Many 24 and 22 G
Dial – a – flow	5 per clinic 5 in labour ward, and postnatal ward	Infusion controllers are preferable	Infusion controllers are preferable	Infusion controllers are preferable
Consumables for bilicheck				
IV fluids	<ul style="list-style-type: none"> •10% Neonatolyte, •N Saline, •10% dextrose •5% dextrose 	<ul style="list-style-type: none"> •10% Neonatolyte, •N Saline, •10% dextrose •5% dextrose 	<ul style="list-style-type: none"> •10% Neonatolyte, •N Saline, •10% dextrose •5% dextrose 	<ul style="list-style-type: none"> •10% Neonatolyte, •N Saline, •10% dextrose •5% dextrose
Feeding equipment				
Breast pumps	Not recommended in clinics and hospitals as they are difficult to clean and sterilise. Express milk by hand into a cup			
Equipment for flash heat treating milk 2 plate stove, aluminium pots		1 per 12 beds	1 per 12 beds	1 per 12 beds
200ml and 50ml feeding cup	4 per 10 deliveries	8 per bed	8 per bed	8 per bed
Disinfection	Autoclave at clinic	Autoclave	Autoclave and gas steriliser	Autoclave and gas steriliser

3. STAFFING, SKILLS, GUIDELINES AND TRAINING

Nurseries at Level II and III hospitals and larger Level I hospitals need permanent nursing staff whose only duty is the care of ill neonates. Professional nurses at level II and III facilities should be trained in Neonatal Intensive Care.

TABLE 7: STAFF REQUIREMENTS: SKILLS, GUIDELINES AND TRAINING

	Level I (Clinic / Community Health Centre)	Level I (District)	Level II (Regional hospital)	Level III (Tertiary hospital)
Medical Staff		Medical officer	Medical officer / full time Paediatrician	MO's / Registrars Paediatricians and Neonatologist
Nursing staff requirements	Professional nurses with midwifery training, EN / ENAs	Permanent nurses (Professional nurses and EN / ENA)	Permanent nurses PN with Neonatal (NICU) training	Permanent nurses PN with Neonatal (NICU) training
Nurses per shift		1 PN per 6 babies in SIC 1 PN per 3 HC babies 1 Nurse per 6 KMC	1 PN per 3 HC / ICU babies 1 PN per 6 beds 1 Nurse per 3 HC babies 1 Nurse per 6 babies SIC, KMC	1 PN per 2 ICU 1 PN per 3 HC babies 1 nurse per 3 ICU / HC babies 1 nurse per 6 babies SIC, KMC
Skills required	<ul style="list-style-type: none"> • Resuscitation of newborn • Examination of newborn • Routine care • Observation • Measure blood glucose and treat hypoglycaemia • Commence IV infusion • Monitor and maintain baby's temperature • Assess breast feeding • Administer oxygen and monitor • Kangaroo Mother Care 	<ul style="list-style-type: none"> • As for level clinic + • administer parenteral antibiotics • nasogastric feeding • provide phototherapy and monitor bilirubin • Perform lumbar punctures, U&E, Ca, Mg, FBC • Nasal Prong CPAP 	<ul style="list-style-type: none"> • As for District Hospital + • chest drains • cardiorespiratory monitoring • Initiate IPPV 	<ul style="list-style-type: none"> • As for regional hospital + • Ventilator support • Ultrasound examination • Total parenteral nutrition • Exchange transfusions • Care of neonates with surgical problems
Professional nurse competency required	Midwifery Neonatal resuscitation Routine Newborn Care	Midwifery Neonatal resuscitation Routine Newborn Care Basic newborn training	Midwifery Neonatal resuscitation Routine Newborn Care Basic newborn care Neonatal Intensive care	Midwifery Neonatal resuscitation Routine Newborn Care Basic newborn care Neonatal Intensive care

	Level I (Clinic / Community Health Centre)	Level I (District)	Level II (Regional hospital)	Level III (Tertiary hospital)
In-service training or self study courses recommended	Routine newborn care (LINC) Helping Babies Breathe PMTCT Lactation management PEP ₂ – Primary newborn care	Routine newborn care Helping Babies Breathe MSSN(LINC) PMTCT Lactation management PEP ² – Newborn Care	RNC (LINC) Helping Babies Breathe MSSN (LINC) NRP or equivalent PMTCT Lactation management PEP ² – Newborn care	RNC (LINC) Helping Babies Breathe MSSN (LINC) NRP or equivalent PMTCT Lactation management PEP – Newborn care

2 PEP =Perinatal Education Programme, MSSN = Management of Sick and Small Newborns, RNC = Routine Newborn Care, NRP = Neonatal Resuscitation Programme, PMTCT = Prevention of Mother to Child Transmission

3. PROTOCOLS AND POLICIES

Newborn protocols and policies need to be in place at each hospital. Review and adopt policies and protocols for your service. The following guidelines are recommended.

- Essential Newborn Care Charts: Management of the sick and small newborns in hospital.
- Essential Newborn Care Charts: Routine Newborn Care
- Limpopo Guidelines for Newborn Care
- Standard Treatment Guidelines and Essential Drug List for South Africa: Hospital Level Paediatrics

4. REFERRALS

Referral policies need frequent review. As services at Level II hospitals develop, more babies with severe problems can be transferred for high care and Neonatal Intensive care. There are still some services that are only available at the tertiary or quaternary levels and referral should be expedited without unnecessarily going via all the levels. Good communication is essential for referral services to work well and for equity of care. The following must exist.

- Telephones at all facilities.
- District hospitals and clinics to have access to ambulances with portable incubators and portable oxygen to transport ill neonates.
- Regional and tertiary hospitals to have access to ambulances with advanced neonatal care including portable incubators, IV flow controllers, pulse oximeters and ventilators

5. NEWBORN RECORDS

A uniform newborn admission record as that developed for Limpopo Province:

- Ensures that there is adequate perinatal information
- Facilitates the management of patients
- Diminishes missed opportunities
- Makes transfer of patients more efficient.

6. MONITORING AND EVALUATION

Regular monitoring and evaluation of the neonatal service involves the following

- Correct documentation of births and perinatal deaths in the maternity register and then in DHIS and PPIP
- Review of perinatal deaths using the PPIP format, assessing obstetric cause, neonatal cause of death and avoidable factors
- Complete recording of Neonatal Admissions in the Neonatal Admission Register, and Neonatal Deaths in the Neonatal Death Register
- Monthly summary of Neonatal admission and Deaths
- Meetings within 24 hours of a death with the relevant role players to determine the cause of death
- Monthly neonatal and perinatal improvement meetings to discuss progress with improvements, new improvements, good and adverse outcomes.
- Documentation of Birth Defects in Monthly Summary Form and Notification

Appendix 2.2

Essential Newborn Care Equipment Specifications

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1. INTENSIVE CARE CRIB

The mattress platform has the following features:

- Adjustable tilt with reliable locking mechanism to keep the mattress platform locked.
- Provision for X-ray film cassettes beneath the mattress. The mattress is radiolucent.
- All four sides of the mattress platform fitted with transparent panels and have clear measurements on the panels for X-ray placement. The front end and two side transparent panels hinged.
- The heat must be provided by radiant heaters housed in an overhead canopy and the overhead canopy must be mounted level at the top of the rear mainframe at an angle of 90°.
- The overhead canopy must include an inspection light, which could be switched on, when required.
- The overhead canopy must be able to swivel to the left or right and lock in desired position.

The temperature controller

- must incorporate two (2) modes of temperature control as follows:
 - Manual mode.
 - Skin temperature control (Servo mode) utilizing a skin temperature probe.
- The manual heat control mode must provide user selectable heater power from zero (0) to maximum.
- Skin temperature control (Servo) mode must utilize a small disposable temperature probe which will attach to the skin of the infant to monitor and assist in maintaining and controlling the infant's temperature by varying the intensity of the heat according to the selected set point temperature
- The skin temperature set point must be user selectable in the range of at least 34°C to a maximum of 38°C, in 0,1°C increments.
- The minimum temperature measurement range must be from 30°C to 40°C, and the measured temperature must be clearly displayed on a digital numerical display.
- Audible and visual alarms when the skin temperature deviates by +/- 0,2°C from the set point temperature.
- An alarm must sound and power to the heater circuit automatically shut off if the skin temperature probe becomes open circuit and faulty or accidentally disconnected from the controller whilst the unit is being operated in the skin temperature mode.
- Supplied and fitted with an oxygen flow meter, with a range of 0 to 15 litres per minute to supply the resuscitation devices.
- The pressure-limiting device of the resuscitation system must prevent pressures greater than 35cm H₂O occurring.
- A flow meter mounted onto the accessory rail / bar of the unit and utilising a snap-lock is preferred.
- Fitted with an approved suction regulator providing 0 to 60kPa and a minimum size of an 850ml receiver bottle fitted with an overflow stop valve.
- Supplied with a robust mount for holding oxygen cylinders.
- Supplied with a monitor shelf which can be easily cleaned and will support a multi-parameter monitor.
- Supplied with a syringe pump mounting arm long enough to hold at least 4 syringe pumps.
- The Intensive care crib must be mobile with the provision of 4 (four) castors of suitable diameter and at least two of which must be lockable. The unit is well balanced on the castors.
- Phototherapy must be provided by the unit offered. The phototherapy must be either built into the OVERHEAD HEATER CANOPY or it must be a separate dedicated module/s that mounts onto the side of the overhead heater canopy unit and it must provide effective phototherapy.

2. TRANSPORT INCUBATOR

- Double wall transparent canopy with mattress, mounted on stretcher
- Front and head access door, slide-out mattress tray
- Baby restraining straps
- Warm air circulation system
- Bacterial filter to remove air born particles
- Incubator air temperature monitoring and servo control: 25 to 38 C, increments 0.1C
- Digital displays outside shows air temperature
- Two 10 L integrated oxygen cylinders, regulator and flow meter
- Audiovisual alarms: high/low air temperature, temperature sensor failure, power failure and low battery
- Can be dismantled to allow frequent washing and disinfection of the incubator
- Battery and AC supported
- Supplied with:
 - 1 x spare air temperature probe
 - 1 x spare rechargeable battery
 - 2 x empty 10 L oxygen cylinders

3. THERMOMETER CLINICAL DIGITAL 32 – 43 DEGREES

- Digital thermometer Celsius scale
- Safe to use, atraumatic, no glass, no mercury
- Measurement range: 32⁰C – 43⁰C
- Accurate measurement: +/- 0.1 between 35⁰C to 41⁰C
- Liquid crystal display, easy to read
- Beep sound and switch off
- Water proof for ease of cleaning
- Battery powered
- Low battery indicator
- Supplied with:
 - 1 x NiCad battery

4. EXAMINATION LIGHT

- Mobile light for medical examination
- Stand with 5 anti-static swivel castors
- Articulated arm 105 cm, spring loaded, with on/off switch and integrated transformer
- Halogen bulb: 12V/20W
- Light intensity approx: 20.000 Lux at 40 cm
- Natural white light: colour temperature 4000 K
- Reflector adjustable for positioning
- Power cord: length approx 3 m
- Supplied with:
 - 1 x spare halogen bulb
 - 1 x spare set of fuses

5. ELECTRONIC BABY SCALE

- Measuring range 0 to 10 kg
- Minimum graduation: 5 g

- On switch and auto-off
- Auto-calibration with each switch-on
- Large LED display readable in low light working situations, display cover durable plastic
- Display in kg
- Reading time max 5 seconds
- Zero weighing adjustment
- Freeze reading feature
- Smooth surface, finishing allows for easy cleaning and disinfection.
- All vital parts made of rust proof materials
- Horizontal levelling with height adjustable feet
- Splash proof and shock resistant light-weight body
- Power supply connects to wall sockets and internal rechargeable battery

6. INFANTOMETER, 105CM

- Portable infant length-height measuring system
- Measures laying length of neonates and babies
- No need for calibration as all parts have prefixed position
- Reads in centimetres
- Minimum graduation: 1 mm
- Long-lasting hard-wearing ruler/graduation is fully integrated with device
- Measuring slide/wedge glides smoothly and close via ruler, avoiding reading parallax
- Measuring slide/wedge wobbles max 2 mm, over full length
- No sharp edges or corners
- Low stable board, width: 30 cm
- Length, measurement range, approx: 100 cm
- Head/footplate, board and slide/wedge made of quality laminated wood or plastic
- Wood parts should be treated and finished/protected with varnish to prevent chipping of edges and allow easy cleaning
- All connections should be screwed/nailed plus glued

EQUIPMENT FOR BILIRUBIN MONITORING AND PHOTOTHERAPY

1. TRANSCUTANEOUS BILIRUBINOMETER

- Measure the transcutaneous bilirubin level of the newborn with measurements up to a minimum of 40 mmol/l
- Handheld and lightweight in order to facilitate measurements to be carried out within an Infant incubator.
- Operates off a rechargeable battery / battery pack.
- The measurement probe must be built onto the unit and the measurement must be by means of a simple technique.g
- The measured value is clearly displayed under all lighting conditions on a three digit numerical display and provides measurement values equivalent to laboratory values for serum bilirubin levels.
- The unit offered must provide an accuracy of typically +/- 5% at a reading of 0 to 529 mmol/l and an accuracy of +/- 10% at a reading of 530 – 684 mmol/l
- The unit must be provided with a known test measurement value to confirm the calibration accuracy.
- All essential accessories in order to put the unit into operation immediately must be supplied.
- A protective carry case must be supplied

2. PHOTOTHERPAY UNIT

- Heavy sturdy mobile stand phototherapy unit Antistatic castors, 2 with breaks
- Single head, surface size, approx: 0.50 x 0.75 m
- Head height adjustable, approx: 1.40 to 1.75 m
- Blue light, 4 Compact Fluorescence Tubes (CFL), approx: 20 W
- White light, 2 Compact Fluorescence Tubes (CL), approx: 20 W
- Tubes are protected by grill
- Irradiance at skin level, up to: 40 uW/cm²/nm
- Wavelength: 420 to 500 nm, with highest intensity at 470 nm
- Integrated cumulative hour timer

Supplied with

- 2 x spare blue CFL tubes
- 1 x spare white CFL tube

3. IRRADIANCE METER FOR PHOTOTHERAPY UNITS

- Handheld irradiance meter (spectro-radiometer) to measure the output of conventional phototherapy devices
- Band pass filter, max transmission: 425 to 475 nm
- Light detector, range: 0 to 2000 uW/cm² (full bandwidth), 0 to 40 uW/cm²/nm
- Minimal graduation: 1 uW/cm²/nm
- Accuracy: (±10%)
- Total block for IR and UV
- Large LED/LCD or needle/dial reports measurement
- On switch and auto-off
- Automatic zero setting between measurements
- Measuring time approx: 5 second

EQUIPMENT FOR OXYGEN ADMINISTRATION AND MONITORING

1. PULSE OXYMETER

- Compact portable bedside pulse oximeter with LCD display
 - Must provide the latest motion artefact detection software (e.g. Massimo)
 - Continuous monitoring of SpO₂ (arterial blood oxygen saturation), pulse rate and signal strength
 - Measuring range:
 - SpO₂: 30 to 100 %, minimal graduation 1%
 - Pulse rate: 30 to 250 bpm, minimal graduation 1 bpm
 - Accuracy SpO₂:
 - 50 to 69% (± 3%),
 - 70 to 100% (± 2%)
 - Audible adjustable bleep for heartbeat
 - Display shows SpO₂(%), HR(bpm) and signal strength bar
 - Large display readable from distance, display cover durable plastic
 - User pre-set of high/low alarms on SpO₂ and pulse rate monitoring
 - Audio visual alarm for SpO₂ and pulse rate in case measurements are outside pre-set range
 - Silencing feature for audio alarm
 - Display reports system errors, probe failure and built-in battery status
 - Internal rechargeable battery
 - Automatic switch from mains to batteries in case of power failure
- Supplied with:
- 2 x reusable SpO₂ sensors neonate, clip-on type (including connection cable)
 - 10 x reusable SpO₂ sensors neonate, wrap around type (including connection cable)
 - 1 x spare rechargeable battery

2. OXYGEN HOOD OR HEADBOX

- Round shape or have no joins or corners, and easy to clean
- 3 x size small, approx: height 22 cm, diam 25 cm
- 3 x size medium, approx: height 18 cm, diam 20 cm
- Made of autoclavable polycarbonate
- Trauma free silicone neck
- Fitted with oxygen connector
- An adjustable porthole on top for feeding and suctioning

3. OXYCHECK

- The monitor must be small and compact.
- The case made of flame retardant plastic or aluminium with provision to mount on to mounting bracket.
- The monitor must be able to work off dry cell batteries.
- The unit must have a battery duration of \pm 300 Hours continuous non-alarming condition, and a low battery indicator.
- The monitor must have an on / off switch and a calibration adjustment control.
- The unit must have a high and low alarm, with a 60 second alarm mute:
 - High: \pm 21% - 100% Low: 18% - 100%
- The monitor must have a digital display, showing measurements as a %.
- The unit must have a highly visible alarm indicator.

- The accuracy must be $\pm 1\%$ Linear on the measuring range 0% - 100%.
- The sensor type must be of the **R17** type.
- The sensor response time must be less than 6 (six) seconds at 90%.
- The sensor life must be 12 – 18 months under typical conditions.
- The monitor must come complete, with:
 - Batteries
 - O₂ Sensor
 - Sensor Cable

4. CPAP

- Nasal CPAP apparatus, which must be pneumatically powered and electronically controlled.
- The CPAP apparatus offered must have the following independent controls and operational characteristics:
 - Integrated air / O₂ blender must provide an O₂ concentration of 21% to 100%.
 - Air / O₂ flow must provide 0 to 15 LPM.
- The CPAP apparatus offered must be capable of monitoring the following parameters:
 - Mean airway pressure.
- The CPAP apparatus offered must have audible and visible alarm parameters for the following:
 - Low mean airway pressure.
 - High mean airway pressure.
- The CPAP apparatus offered must be supplied with silicone nasal prongs / masks in three sizes as well as with three neonatal circuits.
- The CPAP apparatus offered must come complete with colour coded air and O₂ hoses 3 metres long and fitted with Heyer type keys.
- The CPAP apparatus offered must include and be mounted on a height adjustable, stable, mobile stand manufactured from corrosion proof material with at least two of the casters fitted with brakes.
- The CPAP apparatus offered must include and be fitted with a humidifier, which includes all the necessary accessories, equivalent to the Fisher and Paykel MR 850.

5. NEONATAL VENTILATOR

- The following components must be included
 - Ventilator
 - Trolley
 - All essential accessories.
 - Starter pack of consumables.
- The material used for the construction of both ventilator and trolley must be corrosion resistant and suitable for use in an intensive care environment.
- Ventilator must be well secured on to the trolley.
- Castors must be at least 100mm in diameter with a brake on at least two castors.
- The trolley must be stable and suitable for moving the unit within the institution.
- Patient setting must be user friendly and must include the following:
 - a. Frequency: minimum range of 0 – 100bpm.
 - b. Inspiratory time: minimum range of 0.1s – 3.0s.
 - c. Inspiratory Pressure: minimum range of 0 – 60cm H₂O.
 - d. PEEP: minimum range of 0 – 20cm H₂O.
 - e. Flow: minimum range of 0 – 30L/min.
 - f. FiO₂: 21% - 100%.
 - g. Trigger Sensitivity: Flow or pressure trigger.
 - h. Any additional settings available on the unit offered must be detailed by the tenderer.

- The unit must operate off an Input voltage of 220Volt a.c. 50hz single phase allowing a variation of plus and minus 10%. The unit offered must be fused in both the live and neutral.
 - Battery back up must be provided to operate the ventilator for a period of at least one hour
- Pneumatic gas sources – oxygen and medical air.
- Unit must be supplied with hoses of at least 3 metres that are colour coded to the requirements of the South African Bureau of Standards and must be terminated with the specific gas SABS Number: 1409 probe.
- Essential Modes and features must be included as follows:
 - Time cycled pressure limited continuous flow. SIMV/AC.
 - Pressure support.
 - Flow measurement: A proximal flow sensor of the hot wire anemometry type must be used and supplied at no extra cost.
 - Continuous positive airway pressure.
 - Manual breath.
- Monitoring must be as follows:
 - Peak Airway Pressure
 - Mean Airway Pressure
 - PEEP
 - Expiratory / Inspiratory Tidal Volume
 - Minute Volume
 - Leakage in %
 - Total frequency
 - TI: TE
 - FiO2
 - Inspiratory / Expiratory Flow
- Display of the following waveforms must be included
 - Pressure, flow and volume waveforms
 - Loops
- Additional features must include
 - Control settings locking mechanism
 - Nebulizer
 - Internal blending system
 - Diagnostic Self-test after power switch on
 - Self - calibrating oxygen monitoring
- The following ALARMS must be provided
 - Audible and visible with manual override for audible alarm
 - Alarm silence must be for a maximum period of 60 seconds
 - Audible alarm volume control must be provided
 - High breath rate
 - Low battery warning
 - Loss of Power supply
 - Apnoea
 - Fail to cycle
 - High and low airway pressure alarm
 - Incompatible settings
 - Low PEEP
 - Loss of gas supply

- High and low FiO₂
- Minute volume alarm

The unit must be supplied with the necessary accessories in order that it can be put into use immediately.

- One complete Neonatal circuit must be supplied at no extra cost.
- Dual servo controlled humidifier (water bath type) similar or equivalent to Fisher & Paykel-MR850) must be supplied, complete, at no extra cost so that the unit can be put into operation immediately
- Supply details of the cleaning protocols between patients as per manufacturer's recommendation.
- Specify the details and cost of any consumables that may be required. State the price in the schedule at the end of this specification.

6. TRANSPORT VENTILATOR

- The ventilator must be a pneumatically driven transport ventilator suitable for both neonatal and paediatric ventilation during ambulance transport
- Ventilator must be purely pneumatic and powered by medical air with no electronics or electrical circuits.
- Construction: Must be corrosion resistant.
 - Must be robust.
 - It is desirable that a carry handle be provided.
 - Must be splash proof. (IPXO Rating or equivalent).
- Patient setting must be typically as follows:
 - Frequency range of: 0 to 120bpm
 - Tidal volume range of: 0 to 300ml
 - Flow rate range of: 1 to 15Lpm
 - Peak pressure range of: 0 to 70cm H₂O
 - PEEP range of: 0 to 18cm H₂O
- Mass should not exceed 10kg
- Medical gas sources – oxygen and medical air
- Unit must be supplied with hoses of at least 1.5 metres that is colour coded to South African standards.
- Pin index type Regulators must be supplied. These regulators must meet the CKS 605-1987 specification for medical gas pressure regulators.
- The ventilator must have the following modes:
 - IMV.
 - Time cycled, pressure limited
 - CPAP

ACCESSORIES:

- The unit must be supplied with all the essential accessories in order that the ventilator can be put into use immediately upon delivery.
- Supply detailed list of cleaning protocols between patients. Specify the details and cost of any consumables that may be required.

1. ELECTRONIC BP

- Digital electronic sphygmomanometer suitable for neonate
- Use the oscillometric method of measurement
- Cloth cuff with inflatable bag quick-connected via tube to main unit
- Cloth is washable, strong and reinforced at both ends
- Air hose must be a minimum length of 2 metres
- Strip of Velcro fastening; length can be adjusted to fit around neonate upper arm
- Measuring range: up to 300 mmHg
- Minimum graduation: 1 mmHg
- Accuracy: +/- 5%
- Large LCD display readable in low light working situations, display cover durable plastic
- Displays reports: systolic, diastolic and mean pressure and heart rate
- Power requirements: 220 V/50 Hz (with adapter), internal re-chargeable batteries or replaceable batteries (autonomy approximately 6 hours, automatic recharge)

2. SYRINGE PUMP, 10, 20, 50ML

Digital and self-regulating volume controlled portable syringe pump

- Can be mounted on bed/wall rail or mobile pole/stand (supplied with fixation)
- Suitable for all intravenous and intra-arterial infusions
- Continuous volumetric delivery with syringes 10, 20 and 50 ml
- Open system, suitable for different brands of syringes
- Programmable, user entry: infusion volume and time or flow rate
- Rate, adjustable: 1 to 999 ml/h, steps of 1 ml/h
- Accuracy: 1% of total volume delivered
- With occlusion detection and alarm
- Display reports systems errors, end of infusion and built-in battery status
- Audio visual alarm with silencing feature for audio alarm
- Automatic switch from mains to batteries in case of power failure
- Internal re-chargeable battery

3. MULTIPARAMETER MONITOR

- Compact portable, suitable for all patient categories, i.e. neonates and infants
- Parameters monitored: ECG, HR, Respiration rate, SpO₂, NIBP and temperature
- Display: colour TFT, approx. 7 inch, 4-channel
- Soft touch keys, durable and easy to clean
- Measurements, ranges:
 - ECG: I, II, III
 - HR: approx. 30 to 250 bpm<3 bpm>
 - NIBP: approx.20 to 290 mmHg (systolic) <1 mmHg>
 - SpO₂: approx. 40 to 100 % <1%>
 - ECG div. respiration: approx. 6 to 180 bpm<1 bpm>

- Temperature: approx. 10 to 45 degree Celsius <0.1 degree Celsius>
- NIBP oscillometric step deflation, manual/automatic, initial inflation pressure user selectable
- Sweep, adjustable: 12.5, 25 or 50 mm/s
- Sensitivity (amplitude) of all signals user adjustable
- Voltage marker, 1 mV
- User preset of high/low alarms on all monitored parameters
- Audio visual alarm in case measurements are outside preset range
- Silencing feature for audio alarms
- Trend display from 2 to 24 hours
- RS232 serial data output provision (peripheral printer or network), analogue output for ECG
- Defibrillator sync and protection
- Pacemaker detection/rejection
- Display reports system errors, leads and sensors failure and built-in battery status
- Unit can be mounted on bed/wall rail or mobile pole/stand
- Automatic switch from mains to batteries in case of power failure
- Monitor: constructed of durable shock proof plastic

Supplied with:

- 3 x cuff hose infant
- 2 x sets of 5 neonate BP cuffs (No 1 (3.1-5.7 cm), No 2 (4.3-8 cm), No 3 (5.8-10.9), No 4 (7.1-13.1cm), No 5 (9.6-14.3 cm))
- 1 x patient cable
- 1 x box neonatal ECG-electrodes (200 sets of 3 electrodes, chest and/or extremities, diameter approx 22mm, ultra soft gel, self adhesive)
- 2 x skin temperature transducers
- 2 x reusable SpO2 sensors neonate, clip-on type (including connection cable)
- 10 x reusable SpO2 sensors neonate, wrap around type (including connection cable)
- 1 x spare rechargeable battery

4. INFUSION CONTROLLER

- The unit must automatically regulate the user SET infusion rate during intravenous administration including blood administration. The type of giving sets required must be specified.
- Universal giving sets are preferred.
- The unit offered must also be capable of delivering a user selectable VOLUME at a desired user selectable RATE which must be automatically controlled by the internal circuitry employing a linear peristaltic drive mechanism. The linear peristaltic drive mechanism must have proven reliability..
- The internal rechargeable battery must be of a reasonable capacity, such that with battery power the unit must be able to operate continuously for a minimum of six (6) hours at a user set infusion rate of 125ml/h.
- If a drop / flow sensor is used to detect flow it must have the following features:
 - It must have an extensible cable.
 - It must be robust.
 - Detect fluid flow through a drip chamber.
- If a drop / flow sensor is not used, bidder must briefly describe how the flow is controlled and regulated.
- The unit must provide user selectable infusion **RATE** in a minimum range of 0.1 to 999ml/h.
- The unit must provide variable pressure settings which can be manually adjusted with a continuous on screen display.
- The unit must be provided with a user selectable infusion **VOLUME LIMIT** in the minimum range of 1 to 9999ml.
- The response time of the infusion pump to attain and maintain the user selected infusion **RATE** must be rapid. State the response time over the whole range.

- It must not be possible to change the RATE while the infusion is in progress, the infusion must first be stopped to allow user to select a new RATE before restarting infusion or alternately there must be ample safety precautions against unauthorized tampering of any infusion settings.
- The following must be clearly displayed on the front panel under all lighting conditions:
 - Pump is switched in the ON position
 - A.C. mains power supply operation
 - Battery power supply operation
 - Infusion RATE selected
 - Volume to be infused setting
 - Volume infused
 - Alarm condition and possible alarm / error messages.
 - Pressure reading
- The unit must be small and lightweight. Preferably the unit must be part of a stacking / docking system.
- All alarm conditions must be accompanied by an audible and visible warning
- A bolus function must be provided which is easily accessible with adjustable rate and volume settings.
- When an infusion is completed it must be accompanied by an audible warning
- On completion of an infusion, there must be provision for a KEEP VEIN OPEN (KVO) RATE. State the KVO rate on the unit offered.
- The unit must ensure automatic clamping of the line on removal from the unit to prevent free flow of fluid.
- The unit offered must activate alarms for the following minimum conditions:
 - Air in the infusion line / air in line detection
 - Closed clamp on infusion giving set during infusion start up attempt
 - Occlusion during infusion administration
 - LOW battery
 - Open door
 - Infusion set removed and also when not properly loaded
 - Mispositioned flow sensor / detector where applicable
 - Completion of selected volume to be infused
 - Zero infusion rate selected and start up attempted
 - Zero volume selected for infusion and start up attempted
 - Internal malfunction
 - Malfunctions detected during self test at power up
 - High pressure limit exceeded
- The LOW BATTERY alarm must alert the user that there is a limited duration of battery power operation left.
- At the COMPLETION OF THE SELECTED VOLUME TO BE INFUSED and where the unit goes onto the KVO rate, the unit must warn the user with an audible intermittent warning that the selected volume to be infused has been completed and that the instrument has now gone onto a KVO rate.
- All other alarm conditions must either prevent an infusion being started or must stop the infusion and deliver an audible warning.
- The infusion pump offered must deliver the preset volume with an accuracy of better than $\pm 5\%$ through out the whole range of infusion.

RESUSCITATION EQUIPMENT

1. RESUSCITAIRE

- The resuscitation unit must be designed to incorporate all the necessary requirements for the resuscitation of newborn infants.
- This unit must be a mobile resuscitator with provision for an O₂ Cylinder.
- This resuscitation unit must come complete with a regulated suction unit with bottle capacity of not less than 500ml.
- The unit must have a 0 – 15L/min flow meter and pressure compensated water manometer with pre-set levels of 25, 30, 35cm H₂O.
- The heating system must include a 400 Watt infrared ceramic type of heater element operating on 240 Volt 50hz a.c. single phase supply and temperature must be controllable.
- The inspection light system must also operate off 220 Volt 50hz a.c. single phase supply and must have a brightness control on the control panel.
- The unit must be supplied with an infant tray (adjustable) complete with mattress and also be supplied with the following:
 - Drip hanger.
 - Lockable castors.
 - Instrument rail
- Maximum height of the unit must not exceed 2 metre and the unit's maximum width must be 0,7 metres.

2. SELF INFLATING BAG AND MASK FOR RESUSCITATION, NEONATE, 500ML, 250ML

- Resuscitator for manual ventilation of neonates
- Ventilation can be done with ambient air or with oxygen
- Resuscitator can be totally disassembled, is easy to clean, disinfect and sterilize
- All parts can be autoclaved at 121 °C(except O₂ reservoir bag)
- Manufactured from durable high-strength synthetic not requiring special maintenance or storage
- Resuscitator is supplied as a complete set in a box
- Compressible self-refilling ventilation bag, capacity, approx. 500 ml and 250 ml with non-rebreathing patient valve with pressure limitation
- Intake valve with nipple for O₂ tubing
- O₂ reservoir bag complete, capacity approx.: 2000 ml
- Set of 3 cushioned silicone neonate size masks, translucent. Size 0/0, 0/1,0/2

3. LARYNGOSCOPE SET, NEONATE

- Laryngoscope set with neonate blade
 - Constituted of large hollow, cylindrical, slightly ribbed handle and a set of depressors in stainless steel
 - Handle is made of either chromium-plated or stainless steel and can be opened at an extremity to insert two alkaline batteries (LR14, size C, 1.5 Volts). The other end has a stud contact which fits the various sizes and types of depressors.
 - 2 x straight depressors, Miller type No. 0 and 1 with halogen bulb
 - Presented in suitable protective plastic box
- Supplied with:
- 2 x spare halogen bulbs

4. PUMP, SUCTION, PORTABLE, 220V W/ACCESS

- Portable suction pump with 1 litre plastic jar
- Dismantable for easy cleaning, jar autoclavable
- Shock resistance protects from dropping
- Light, easy to carry and keep clean
- Jar with plastic cover, gasket and overflow valve
- With suction regulator, vacuum gauge
- Size, approx: 260 x 180 x 220 (H) mm
- Suction power: 17 L/min
- Vacuum, max: 800 mmHg
- Supplied with:
- 1x set of silicone rubber suction tubing, approx: diam. 10 mm, length 1.5 m
- 1 x spare jar with cover
- 1 x spare set of fuses

RECOMMENDATIONS WHEN PURCHASING EQUIPMENT

- A Service Contract must be included and cover all periodical maintenance, service calls, spare parts and travel
- All equipment, materials and workmanship provided must be guaranteed for a minimum period of twelve (12) months
- The supplier must arrange with to commissioning the equipment at the facility
- The guarantee period must only take effect on successful commissioning at the facility
- The recommended number of services per annum, by the manufacturer, must be included during and up until the end of the guarantee period and all costs related to the provision of such service/s will be the suppliers
- Spares that may be required during the guarantee period will be at the expense of the supplier
- Downtime during the guarantee must extend the guarantee time on a day-to-day basis if a loan unit is not supplied during the downtime
- The supplier must supply, deliver, commission and install the equipment and will be required to demonstrate the product to the applicable staff at the Institution and costs for the abovementioned must be included in the price.
- Original service repair manual in English and in book form must be supplied
- Where Equipment operates off 220 Volt, 50Hz a.c. supplier must ensure that the product is fitted with a 16Amp SABS approved mains plug top, which is held together by two screws.
- The unit must comply with an acceptable International Safety Standard such as IEC 60601-1 and 60601-1-2 for Medical Equipment.
- The mains cable of the unit must be the Hospital Grade Type and it must be a minimum length of (3) three metres and be S.A.B.S. colour coded.
- The equipment must be protected against electromagnetic interference.

REFERENCES

1. Equipment specifications: Department of Health, KwaZulu Natal Province
2. Toolkit for Setting Up Special Care Newborn Units, Stabilisation Units and Newborn Care Corners, Unicef, India
3. Groote Schuur Hospital equipment recommendations.

CHAPTER THREE: IMPLEMENTATION OF ESSENTIAL NEWBORN CARE

Essential newborn care

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INTRODUCTON AND OUTLINE

Improving newborn care in your facility, district and province, requires change agents and leaders who have the vision, dedication and determination to nurture the implementation of essential newborn care. The commitment of management is a key factor for mobilising the necessary resources.

The intended purpose of introducing essential newborn care is to ensure that there are competent maternal and neonatal health care providers who are able to provide appropriate newborn care services in a well-functioning health system.

Once a vision of the desired service has been developed the situation assessment will help to identify what needs to be done. Identify small but significant activities you can do NOW whilst planning and mobilising resources for medium and long term interventions.

Five steps to achieving essential newborn care are outlined below together with suggestions from the experience of the LINC team and others who have been working to improve newborn care. We encourage you to adapt the tools and ideas provided or develop your own and start improving newborn care. We trust our experience will be useful to you.

The steps for improvement are summarised in table 1

Step 1: Set up a team

Step 2: Assess the situation

Step 3: Develop an action plan

Step 4: Implement the action plan through

- Strengthening the health care environment

- Strengthening health worker competencies

Step 5: Track progress and undertake accreditation assessments

LEVEL OF IMPLEMENTATION	Single facility	District level	Provincial level and above
STEP ONE: SET UP A TEAM			
Leadership for process and planning	Focal person, to work with a medical or nursing management to lead the process and planning	District / regional paediatrician in place to provide leadership	Province to appoint a lead paediatrician and neonatal nurse to lead the process
Core group for implementation	Involve core role players to implement, nursing and clinical manager, responsible maternity and paediatric doctors and nurses	Regional paediatrician and neonatal nurse to work with district managers to form core group	Develop a core group of provincial paediatricians, neonatal nurses, managers and external experts to lead the process. Appoint a team of assessors and accreditors
Developing a vision for newborn care	Develop a vision for how newborn care should be by sharing ideas, visiting other sites	District to develop a shared vision, by workshops, visits, benchmarking	Develop a shared vision by listening to all, visiting, benchmarking
Advocacy for action	Share the vision to create awareness of need for change	Advocate to all relevant role players for change	Advocate to head of health, hospital managers, etc Advocate for financial and human resources
STEP TWO: ASSESS THE SITUATION			
Adapting norms and standards	Review available national and provincial norms and standards and revise them based on vision for newborn care		
Develop tools and process to assess the situation	Tool for self-assessment and arrange for external assessment	Based on norms and standards develop tools and arrange to assess newborn care in stages, adapt LINC, WHO or SNL tools	
Current status of births, admissions and deaths	Births in clinics, hospital and at home, LBW rates, admission, deaths and cause of death	For district and province review births, LBW rate, admissions, deaths, cause of death to have baseline of situation and priority areas for intervention	
Assess the services and facilities	Services and facilities for Resuscitation, Routine care and care of sick and small newborns	Assess all services and facilities and equipment at each district and provincial facility. Review current provincial plans for facility improvement and up-grading	
Assess the staffing and staff development	Assess staffing, rotation and competencies	Assess and compare staffing at facilities. Determine no. of Neonatal nurses and paediatricians required. Assess pre-service neonatal training and advanced neonatal training	
Assess the quality of care provided	Do a care audit based on standard guidelines	Arrange a record review or care assessment on key conditions on a sample of records	
Compile the data and undertake advocacy	Compile the data at each step and undertake advocacy for change	Compile and determine data and undertake advocacy for change	

STEPS THREE: DEVELOP AN ACTION PLAN			
Set priorities and develop a phased action plan	Develop an action plan; prioritise activities to immediate actions, medium and long term action.	Set up priorities, and put in place immediate actions, and then a plan for medium and long term work	Determine priorities and ensure support for short term plans whilst working on long term plans e.g. upgrading facilities
STEPS FOUR: IMPLEMENT THE ACTION PLAN			
1. Strengthening the health care environment			
Ward set up and processes	Re-arrange wards and facilities to create suitable NNU	Mobilise resources for refurbishment and establishment of regional hospital neonatal units Draw up plans for the services	
Inpatient newborn care unit	Set up NNU, with guidelines and job aids	Develop provincial records, set up provincial standards for NNU	
KMC unit	Re-arrange and organise KMC	Provincial standard for KMC	
At time of birth	Organise service	Ensure facilities and equipment for neonatal resuscitation	
Routine care	Put policies in place	Policies in place for rooming in and caring for well babies	
Staffing, equipment	Shift and retain staff and don't rotate staff	Determine norms for staffing and equipment and mobilise resources to achieve norms.	
Referral and transport	Strengthen neonatal transport	Provincial neonatal ambulance service	
2. Strengthen health worker competencies			
Review guidelines	Review guidelines and standing orders	Review provincial guidelines for routine care and care of the and sick baby care	
Assess key barriers to implementation	Assess key barriers to implementation	Assess barriers to implementation	Teams facilitates removal of barriers
Assess training needs	Assess needs	Assess provincial training needs, and identify resources for training	
Implement training if needed	Start with HBB and in-service training	Develop provincial and district training capacity of in-service and pre-service training	
Clinical supervision and audit	Commence supervision	Develop supervision and audit tools	
On site facilitation, mentoring	Work with one site facilitators and mentors	Regional Paediatrician to visit district facilities	Put in place district teams
STEP FIVE: TRACK PROGRESS AND UNDERTAKE ACCREDITATION ASSESSMENTS			
Inputs	Human and financial resources	District team in place	Number of district teams, regional and tertiary human resources
Process	Advocacy Action plans	Action Plans Teams in place Visits to facilities Equipment and facility needs identified	Equipment needs Transport needs Training needs
Outputs	Norms and standards Guidelines Tools used Number of health workers trained	Norms and standards Trainings conducted Referral and transport policies Neonatal ambulance in place	Provincial job aids
Outcome	Facilities accredited for newborn care Well equipped and staffed facilities Date properly collected	Quality of training No of facilities accredited Referral patterns Ambulance response	Accreditation

		times	
Impact	Neonatal mortality rates Perinatal mortality rates Admissions percentages and case fatality rates	Neonatal mortality rates Perinatal mortality rates Admissions percentages and case fatality rates	Neonatal mortality rates Perinatal mortality rates Admissions percentages and case fatality rates

STEP ONE: SET UP A TEAM

Set up a team in the province, in each district and each facility with responsibility for the implementation of essential newborn care.

LEVEL OF IMPLEMENTATION	Single facility	District level	Provincial level and above
STEP ONE: SET UP A TEAM			
Leadership for the process and planning	Focal person to work with medical and nursing management and to lead the process and planning	District / regional paediatrician in place to provide leadership	Province to appoint a lead paediatrician and neonatal nurse to lead the process
Core group for implementation	Engage with hospital staff who are key to implementation. Nursing manager and clinical manager, responsible maternity and paediatric doctors and nurses	Regional paediatrician and neonatal nurse to work with district managers to form a core group at district level	Develop a core group of provincial paediatricians, neonatal nurses, managers and external experts to lead the process. Appoint a team of assessors and accreditors
Developing a vision for newborn care	Develop a vision for how newborn care should be provided by sharing ideas, visiting other sites	District to develop a shared vision, by workshops, visits, benchmarking	Develop a shared vision by listening to all, visiting, benchmarking
Advocacy for action	Share the vision with a broader group in the facility to create awareness of need for change	Advocate the need for change to all relevant role players	Advocate to head of health, hospital managers, etc Advocate for financial and human resources

LEADERSHIP FOR THE PROCESS AND PLANNING

Health systems are complex and there are institutional cultures* as well as individual cultures and barriers to navigate until the institution adopts a culture of change. A culture of change exists when the key players in the environment are open to new possibilities to improve patient care. People begin to think more creatively about apparent insurmountable barriers. (*A culture is the attitude and behaviour that are characteristic of a particular group or organisation.)

On site facilitation by visiting health workers can provide the necessary leadership and technical expertise to district hospitals that do not usually have specialists or specialist nurses on their staff establishment. These facilitators should ideally be members of a district specialist team, who are chosen to be the drivers of change. In addition to technical expertise in neonatal clinical care and health system development they must show leadership skills. The facilitator must invigorate momentum and help the team to attempt to meet the time lines. When progress is slow and frustration or despondency threaten to set in the facilitator must maintain the morale of the team. Ideally the facilitator should identify an individual in management (the CEO or clinical manager, or nursing manager) in maternity and in the neonatal unit including a doctor who will share this responsibility for sustaining enthusiasm. These individuals may be termed site leaders.

Facilitators should also be mentors. Training, policies, guidelines and action plans alone don't address the many challenges that are associated with improvement and change in service-delivery. Implementing Essential Newborn Care requires a long-term commitment and ongoing support through advice, shared responsibility, collective accountability and advocacy with and for those introducing and providing it.

Leadership may be provided by an individual or a small team. The leadership must have credibility in terms of technical expertise in the area of essential neonatal care. For this reason the leadership will usually be or include a clinician with experience and interest in this field.

A provincial paediatrician or any health worker with technical expertise in newborn care and health systems improvement is well placed to lead the improvement process. It is very important that they receive support and backing from the province or region.

A district specialist team, including the paediatrician and paediatric and neonatal nurse can provide leadership in the district. They will work with each hospital to improve care at facility level.

CORE GROUP FOR IMPLEMENTATION

One of the first tasks of the leader is to identify a core group at province, district and facility level to implement essential newborn care.

In the province the core group may include the director or Manager of Maternal and Child Health, a paediatrician or neonatologist from the province, tertiary and regional hospitals and neonatal nurses. If you do not have the required expertise, look outside your province or district for paediatricians and neonatal nurses to assist on a part time basis. The implementation requires assessment, ongoing support, training and accreditation. A reference group that includes external members who can do the assessment and accreditation are useful.

The LINC team consisted of technical experts who visited a district for one week a month, to do assessments, provided training, and conduct support visits. They were key to the improvement of neonatal services in facilities. They assisted with norms and standards, policies and guidelines. While fulltime staff are ideal, if you don't have them, make a plan to get external assistance.

A core group at a district includes the district maternal and child health team, MCWH, and paediatrician and neonatal nurses from the district.

At hospitals the core group may include the clinical and nursing managers, a doctor and professional nurse responsible for newborn care.

DEVELOPING A VISION FOR NEWBORN CARE

To develop a vision is to anticipate how something will be, and to share that vision is to paint a picture in people's minds of what you want to achieve. The provincial paediatrician or expert team may help develop the vision. Take provincial, district and facility managers to visit other neonatal units, and explore what they would like their services to look like. There may be different perceptions of what newborn care is and should be in a particular area. In rural hospitals staff in the facilities and district may not have seen a Neonatal ICU or a Kangaroo mother care unit.

ADVOCACY FOR ACTION

Share your vision for newborn care services, with senior management in order to mobilise resources for the next implementation steps.

The LINC team held a series of district workshops for key role players where we discussed the importance of newborn care, the elements of newborn care, and painted a picture of the service required. E.g. What is KMC and why is it so important and effective.

Hospitals went back and advocated for further services. Some of them mobilised their core group to go and benchmark at another hospital nearby. Others recruited a neonatal nurse or doctor to help them develop their service.

Advocacy should continue until all health workers in maternity know why it is important to improve newborn care and want to get involved in it themselves, and management mobilises resources for you to act.

Resources useful for advocacy include:

1. Improving newborn care in South Africa: lessons learned from the LINC. This Unicef booklet outlines what LINC did in Limpopo Province to improve newborn care. It is especially useful for managers at district, province and the facilities to see what can be done in a rural province and to learn from the experience. Some of the vignettes from ordinary health workers will help to inspire other health workers to improve care.
2. Workshops by the LINC team in the district. LINC ran a series of 3 workshops in each district. The programme is in the CDROM.
3. Advocacy presentations that can help you introduce newborn care to managers and health professionals.
4. Helping Babies Breathe is an important basic newborn care resuscitation programme, an advocacy leaflet is attached.
5. KMC advocacy material
6. Breast feeding advocacy material

These resources are located in the Appendix and CDROM under “RESOURCES FOR ADVOCACY”

STEP TWO: ASSESS THE SITUATION

Adapting norms and standards	Review available national and provincial norms and standards and revise them based on vision for newborn care	
Develop tools and a programme to assess the situation	Tool for self-assessment and arrange for external assessment	Based on norms and standards develop tools and arrange to assess newborn care in stages, adapt LINC, WHO or SNL tools
Current status of births, lbw, admissions and deaths	Births in clinics, hospital and at home, LBW rates, admission, deaths and cause of death	For district and province review births, LBW rate, admissions, deaths and cause of death to have baseline of situation and priority areas for intervention
Assess the services and facilities	Assess services and facilities for resuscitation, routine care and care of sick and small newborns	Assess all services and facilities and equipment at each district and provincial facility. Review current provincial plans for facility improvement and up-grading
Assess the staffing and staff development programme	Assess staffing, rotation and competencies	Assess and compare staffing at facilities. Determine the number of neonatal trained nurses and paediatricians to support neonatal improvement and training. Assess pre-service neonatal training and advanced neonatal training
Assess the quality of care provided	Do a care audit based on standard guidelines	Arrange a record review or care assessment of the management of key conditions for a sample of records
Compile the data and undertake advocacy	Compile the data at each step and undertake advocacy for change	Compile and determine data and undertake advocacy for change

A baseline assessment of selected indicators of newborn care in the province, in each district and facility can be compared with the agreed vision for future newborn care. This will form the basis on which an implementation strategy will be planned.

ADAPTING NORMS AND STANDARDS

Recommended standards are outlined in Chapter 2. These may be adapted to align with the vision for the province, district and facilities. The norms and standards that have been adopted will be used to measure the current service and plan the future service. The norms and standards should be reviewed and adapted as the newborn care service develops.

When Limpopo started planning services the number of tertiary and secondary beds required seemed unbelievably high, but as the district hospitals have developed their services and beds there has been an increasing recognition of babies in need of level II and III care to the point that level II and III resources have been overwhelmed.

DEVELOP TOOLS AND A PROGRAMME TO ASSESS THE SITUATION

The LINC team found it useful to provide facilities with a basic self-assessment tool to conduct their own assessment. This assessment tool was used by facilities to identify problems and draw up an action plan. The LINC team then conducted a more detailed assessment. This provided a more specific second assessment that could be used to compare newborn services at different facilities.

A comprehensive assessment tools is attached for adaptation and use. (Appendix 1)

There are a numerous elements to a detailed assessment. An assessment may take more than a day to complete and it may be necessary to visit a facility repeatedly to complete an assessment.

An assessment tool for districts and province summarises information from each facility to aid district and provincial planning. (Appendix 2)

CURRENT STATUS OF BIRTHS, LBW, ADMISSIONS AND DEATHS

The following information should be collected and compared with the adapted norms and standards:

- The number of deliveries in the hospital/s, clinics in the catchment area. The number of born before arrivals deliveries and other home births that have been recorded at these facilities.
- The number of low birth weight babies and their distribution by weight bands (e.g. 1000 -1499 grams).
- The number of babies admitted to the neonatal unit.
- The reasons for admission to the neonatal unit. Are these appropriate indications? Are some avoidable?
- The number of stillbirths and the number of early and late neonatal deaths.
- The causes of the stillbirths and neonatal deaths.
- The birth weight of the babies that died.
- The place of death.

The following sources may be consulted for information:

- PPIP data
- DHIS data
- Check that the data on PIP and DHIS have been accurately recorded and are congruous
- Maternity records may be used to crosscheck this data
- The neonatal admission book
- The paediatric admission book. Were any neonates (<28 days) admitted to the paediatric ward? If so what was the reason for the admission and the outcome of the admission?

ASSESS THE SERVICES AND FACILITIES

The services and infrastructure available for newborns in the province and at each facility should be assessed.

At facility level

Assess the routine care.

- Readiness of labour ward and theatre for basic and advanced neonatal resuscitation
- Babies are kept skin to skin with their mother and breast feeding initiated within 30 minutes.
- Well babies room in with their mothers and receive and support is provided for breastfeeding
- Routine preventive care is provided and documented in the maternity care chart and road to health booklet
- PMTCT is provided to the mother and baby.
- When medically indicated formula is safely prepared and discretely administered.

The neonatal unit service and the facilities and equipment should be assessed.

- The norms are provided. Assess whether the services and infrastructure are appropriate for the level of care that is required.
- Is there oxygen and medical air in the neonatal unit? For units that provide or will provide CPAP the oxygen and medical air sources must be able to provide the required pressure for the CPAP device.
- Assess the care provided in the neonatal unit. A clinical audit form and record review are part of the assessment tool.

The **comprehensive facility situation assessment tool** will guide this process.

At provincial level

- Collate the information from facilities
- Assess what the district and provincial plans are for infrastructure development and hospital revitalisation.

Are there facilities that require improvement or are scheduled for improvements? Have the requirements of the neonatal services been adequately addressed in the plans? Do they meet the agreed norms and standards?

- Assess the tertiary and regional neonatal services. Are there enough beds and good care.
- Assess the neonatal transfer and transport in the province.

The provincial **newborn assessment tool** can be adapted for this purpose.

ASSESS THE STAFFING AND STAFF DEVELOPMENT PROGRAMME

At facility level assess the staff numbers and background training and experience in newborn care.

- Do staff rotate regularly or are they allocated only in the neonatal unit?
- What plan is in place for staff development at each facility?
- Do staff members have the core neonatal competencies?

At provincial level assess the provincial staffing for newborn care at the tertiary service, the regional services, the hospital and maternity services.

In the provincial office:

- Who is responsible for newborn care?
- Does this person have authority to act?
- Who provides technical assistance?

Tertiary and Regional care

- How many neonatologists are there?
- How many paediatricians?
- How many neonatal nurses?
- What is the plan to attract and retain paediatricians and neonatologists?
- What is the plan to train neonatal nurses?
- What training takes place in the province?
- Is this sufficient for the needs of the province?

ASSESS THE QUALITY OF CARE PROVIDED

Assess what guidelines and policies are in place to manage newborns at facilities and in the province.

In the province:

- What guidelines are in place for the province?
- Has there been a process of developing provincial guidelines based on the National standard treatment guidelines?
- Are policies in place for
 - Baby Friendly Hospital Initiative (BFHI)
 - Rooming in of babies with mothers
 - Lodger mother facilities

- Referral
- Transport of newborns

At facilities

- Are the neonatal guidelines in place?
- Are they up to date and used?

Conduct a clinical audit of the implementation of the guidelines. The clinical audit tool is part of the assessment. This may be used to determine if guidelines are being followed. A person conversant with the standard clinical guidelines should conduct the audit.

The LINC team has developed a record audit to assess the quality of clinical care. For each major clinical condition there is an assessment which gives a score for the care provided against the standard care required for that condition. A score of > 80% is regarded as good care, 60 – 80% acceptable care, and < 60% unacceptable care. The person conducting the assessment should be conversant with the standard care and would usually be a paediatrician or experienced doctor or neonatal nurse. These tools are attached. Teams are encouraged to learn from sites with experience of the assessment process.

COMPILE THE DATA AND UNDERTAKE ADVOCACY

Compile the collected data and write a report. Ensure that managers and health workers receive the report. Focus first on the strengths and then outline what needs to be done.

Conduct advocacy around the issues that need to be dealt with, for example:

- Visit a facility where a certain aspect of care is good, e.g. the KMC.
- Have a discussion about a contentious newborn care topic
- Invite an outside speaker to talk about an aspect of newborn care

STEP THREE: DEVELOP AN ACTION PLAN

Determine your goal for improvement in neonatal mortality	Determine a goal for the perinatal and neonatal outcomes in your facility	Determine a goal for neonatal outcomes in hospitals in each district	
Set priorities and develop a phased action plan	Develop an action plan; prioritise activities for immediate action, medium and long term action.	Set up priorities, and put in place immediate interventions, then plan for medium and long-term activities.	Determine priorities and ensure support for short term plans whilst working on long term plans e.g. upgrading facilities.

DETERMINE YOUR OVERALL AIM

Based on the perinatal and neonatal data you collected determine a goal for the improvement of perinatal and neonatal outcomes. These should be short terms goals (1 year) and long term goals next 3 – 10 years.

For example:

	Current level	Target for next year	Target for 3 years	Target for 10 years
NNMR	18	12	10	
NNMR >1000g	14	10	8	
ENMR	15	12	10	
LNMR	3	2	2	
NNMR (BW>2500g)	6	5	4	
NNMR (BW 2000g – 2499g)	40	25	20	
NNMR (BW 1500g – 1999g)	200	120	50	
NNMR (BW 1000g – 1499g)	500	300	150	
NNMR (BW < 1000g)	800	600	400	
% admissions to neonatal unit	10%	15%	15%	
For regional hospital % admissions from DH	2%		5%	
For district hospitals % transfer outs			5%	

SET PRIORITIES AND DEVELOP A PHASED ACTION PLAN

Identify the issues that require action. Prioritise them by importance. Categorise planned responses to each issue into immediate, medium and long-term interventions. Issues that may need interventions include:

- Advocacy
- Protocols and policies
- Labour ward resuscitation
- Postnatal ward care
- Medical Staffing

- Nursing Staffing
- Staff development
- Neonatal unit facility
- Equipment and supplies
- Infection control
- Quality of neonatal care
- Neonatal referral and transport

Plan immediate, medium and long-term interventions for each problem. Consider using the following format:

- Problem
- Intervention/s required
- Steps to be taken
- Person responsible
- Time frame
- Resources required
- Person responsible for monitoring intervention

At facility level begin with changes that can be made immediately and do not require significant additional resources. For example under facility, the problem may be inadequate space. Rearranging the nursery layout and removing unnecessary furniture and equipment may help. While waiting for provincial protocols other guidelines may be temporarily adapted.

Below is an example of an initial action plan from a district hospital.

Problem	Activity required	Steps to be followed	Person/s responsible	Time line	New resources required
1. Lack of information about neonatal care in community and hospital	Advocacy meeting with maternity staff, doctors and management Advocacy meeting with clinic nurses and IMCI HHCC groups	Plan meetings with management	N.S	1 month	Catering for community meeting
2. Inadequate numbers of professional nurses	Need dedicated staff 2AMW + 4 Prof.Nurses	-Discuss rescheduling of allocation -Draw training schedule & present it to supervisor	T. N Matron T M R. M T. N	3 August	
3. Lack of policies on referral	Develop referral policy to and from clinics and to regional hospital	-Discuss with unit manager -Meet with regional hospital -Meet with PHC -Draw up policy -Meet with all role players to implement policy	T.N	3 July	None
3. Protocols	Get appropriate written policies. Distribution & implementation of policies	-Discuss with unit Manager -Meeting with all staff nurses & doctors. -Discussion & formulation of protocols -Proper filing of protocols	N. T N. J		LINC charts Standard treatment guidelines PEP manual Notes on newborn care

An example of a blank action plan is part of the Situation Assessment tool

At provincial level set priorities and set targets for immediate, medium and long-term activities;

1. For Provincial coordination and support
2. For Provincial policies and protocols
3. For Provincial tools and job aids
4. For Tertiary services
5. For development of Regional services
6. For training
7. For equipment and supplies
8. For accreditation and monitoring

STEP FOUR: IMPLEMENT THE ACTION PLAN

1. System strengthening			
Ward set up and processes	Re-arrange wards and facilities to create suitable NNU	Mobilise resources for refurbishment and establishment of regional hospital neonatal units Draw up plans for the services	
Inpatient newborn care unit	Set up newborn care units, with guidelines and job aids	Develop provincial records, set up provincial standards for NNU	
KMC unit	Re-arrange and organise KMC	Provincial standard for KMC	
At time of birth	Organise service	Ensure facilities and equipment for neonatal resuscitation	
Routine care	Put policies in place	Policies in place for rooming in and caring for well babies	
Staffing and equipment	Determine standards and shift and retain staff	Determine standards for staffing and equipment and mobilise resources to achieve standards.	
Referral and transport	Strengthen transport for neonates from clinics and to referral hospital	Provincial neonatal ambulance service	
2. Strengthen skills to implement standard guidelines and protocols			
Review guidelines	Review provincial guidelines and standing orders for facility.	Review provincial guidelines for routine care and care of the and sick baby care	
Assess key barriers to implementation	Assess key barriers to implementation	Assess barriers to implementation	Team facilitates removal of barriers
Assess training needs	Assess needs	Assess provincial training needs, and identify resources for training	
Implement training if needed	Start with HBB and in-service training	Develop provincial and district training capacity of in-service and pre-service training	
Clinical supervision and audit	Commence supervision	Develop supervision and audit tools	
On site facilitation, mentoring	Work with on site facilitators and mentors	Regional paediatrician to visit district facilities	Put in place district teams

Implementation must be approached with the understanding that improvement of a service is a continuous process that must continue for the lifetime of that service. Because it requires a collective and unified effort the degree to which effective implementation occurs will depend on skilful leadership and the willingness of all role-players to respond positively to the challenges created. Persistence, compromise, adaptation and enthusiasm are among the characteristics that the team will need to display.

Having completed the assessment and action plan the process of implementation needs to be set in motion. Although a time line forms part of the action plan it is likely that deadlines and targets will be revised depending on circumstances at the particular facility.

The frequency of on-site facilitation will depend on the need, the availability of the team and the resources. Ideally monthly visits allow for on-site facilitation as well as in-service training and individual clinical mentoring. If possible, the facilitator should attend the perinatal review meetings, and should plan to do so by arranging visits on the days when the meetings are being held. This forms part of the clinical teaching and audit process.

1. SYSTEM STRENGTHENING

The system is the environment in which the healthcare worker provides care for the newborn. The importance of an efficient and ergonomic system is often overlooked to the serious detriment of staff productivity and satisfaction. Careful attention should be given to the facility in terms of space, lighting, workflow and physiological needs of the staff. The equipment should be properly maintained and adhere to the agreed standards. Staffing should be adequate and there should be an appropriate ambulance service in support.

In addition it is important that every newborn in the service area should be able to access the range of services available. This entails planning for all deliveries not only those that occur at facilities. There is a need for community engagement.

A facilitator or mentor from a district team may provide support for implementation, otherwise the resources that are available in this package or elsewhere may be useful.

COMMUNITY ADVOCACY

Communicate with the community about essential newborn care service, what is important, important messages to keep newborns healthy, how to use the service. Identify problems the community has with the service, cultural beliefs and practices that are good or possibly harmful. Community buy in is vital to maximizing the impact of the newborn service. Ensure an on-going communication channel with the community.

WARD SET UP AND PROCESSES

Standards for a neonatal ward have been provided. If the existing ward does not meet the recommended standards consider innovations that improve efficiency while motivating for a new ward or alterations. Can the incubators be re-arranged, or the nursing station re-positioned? Are there problems with infection control? Are there small structural changes that can be made at minimal cost? Is there an alternative space where equipment may be stored when it is not in use?

INPATIENT NEWBORN UNIT

Provincial level: Set up provincial standards for inpatient newborn care units. Develop a plan to ensure appropriate neonatal units at all levels of the service.

Identify job aids and tools required in the province, for example newborn admission book, newborn records and observation charts, discharge and transfer forms, posters. Attached are examples of job aids from Limpopo and other provinces. These may be used to assist with the development of provincial job aids.

At facility level adopt standards and ensure that there are appropriate daily routines in the neonatal ward. The provincial newborn admission book, newborn patient record, observation charts and standard guidelines for care should be available in the facility.

KMC UNIT

Establish standards for KMC units and work towards implementing these at each hospital. If no KMC facility exists identify a space (albeit temporary) for KMC. Most district hospitals in Limpopo have used a cubicle in the postnatal ward.

Set up the KMC unit and make it as homely as possible. Recruit help to make duvet covers. Request reading materials, motivate for a TV, DVD. Make baby wraps for the KMC mothers. Involve the staff and the community.

Several of the Limpopo KMC units have sewing projects, one makes dolls, and another duvet covers. This keeps the mothers and staff occupied and motivated.

AT THE TIME OF BIRTH

The labour ward must be adequately prepared to receive the baby. This includes providing for the possibility of neonatal resuscitation. A warm dry surface or resuscitaire must be available in the birthing area and an advanced resuscitation trolley should be on site or nearby. Suction, oxygen and a bag, valve, mask device should be on-hand and regularly checked, preferably before each delivery. A clock with an alarm set at 1 minute, 5 minutes, 10 and 30 minutes, if possible, will promote accurate monitoring of the newborn baby.

There should be appropriate job aids to support care at birth such as basic neonatal resuscitation charts, Apgar chart, hand-washing charts and breastfeeding charts.

ROUTINE CARE IN POSTNATAL WARD OR WELL BABY CARE

Most babies room in with their mothers in the postnatal ward. They require monitoring and care as does the mother. If needed make changes to the postnatal ward to accommodate the baby with the mother. Review the policy, practices and procedures. Communal bathing and practices that keep babies separate from their mothers should be stopped. Besides the benefits to the mother and baby, this will free up more space. The baby should be attended to together with the mother. Help the mother to establish breastfeeding, to recognise that the baby is well and to identify early signs of possible illness.

STAFF AVAILABILITY/ROTATION

Explore problems related to frequent staff rotation. Is it the result of a management decision, pressure from the union or do midwives not want to stay in the neonatal unit or maternity? Identify the root cause and work on finding and retaining staff that want to provide newborn care.

Is the staff establishment insufficient and are there vacant posts? Address these problems with management.

EQUIPMENT

Equipment norms and standards, and specifications are attached. Ensure that there is an equipment book in the neonatal unit to keep track of all equipment purchased and how it is functioning. Buying robust equipment and teaching health workers how to correctly use the equipment will extend its life. Some equipment requires dedicated consumables and the supply and affordability of these should be assessed before making an equipment purchase.

TRANSFER AND REFERRAL

Agree on referral policies for the clinics and between hospitals in the province. These should be communicated to all together with a system for reporting and monitoring disagreements or confusion. Set up and prioritise neonatal transport in the province so that babies can be competently transported to the appropriate level of care.

SUPPORT SERVICES

Work with the laboratory, radiology, dieticians, audiologists, physiotherapist and other support services on aspects of care that need improvement.

2. STRENGTHEN SKILLS TO IMPLEMENT STANDARD GUIDELINES AND PROTOCOLS

The care newborns receive is dependent on the experience, knowledge and skills of the health workers. In this regard the health workers act as a team and there should be a balanced spread of abilities across the whole staff complement.

2.1 REVIEW EXISTING GUIDELINES AND STANDING ORDERS WITH KEY USERS

Review the guidelines and protocols that are in use at facilities in the district and province.

Some guidelines that may be adapted for use are listed below and may be found on the attached CD ROM. Facility protocols are not essential if an acceptable standard national guideline has been adopted. The guideline should be acceptable to all the key role players at facilities and in the province so that mutual understanding and consensus is achieved.

- Paediatric Essential Drug List and Standard Treatment Guidelines (South Africa)
- LINC Newborn Care Charts: Routine Care
- LINC Newborn Care Charts: Care of the Sick and Small Newborn
- LINC Newborn Care Guidelines
- Most tertiary hospitals have their own guidelines for example
 - Notes on Newborn Care UCT
 - Stellenbosch guidelines

2.2 ASSESS KEY BARRIERS TO IMPLEMENTATION OF STANDARD CARE

The key barriers to the implementation of guidelines should be assessed before initiating a training programme. The advocacy workshops and situation assessment will have identified a number of key barriers to implementation. A SWOT (strength, weaknesses, opportunities, threats) analysis will help to determine the barriers and opportunities for implementation.

	Helpful to achieving objective	Harmful to achieving objective
Attributes of the organisation	S trengths	W eaknesses
Attributes of the environment	O pportunities	T hreats

Some of the barriers identified by the LINC team were:

- ❖ Rotation of staff in maternity, and in the neonatal unit. Some hospitals rotate staff frequently making it difficult for staff to be motivated, to learn guidelines and policies. Maternal and newborn care benefits when staff are permanently placed in the maternity or neonatal unit. Students and new staff may rotate through the unit. This is an opportunity to institutionalise good practice.
- ❖ Lack of availability of guidelines. Guidelines not displayed or available in casualty, maternity and neonatal unit.
- ❖ Lack of buy in to the protocols. Even when using provincial or national protocols these should be discussed with all the staff. Explain the rationale for the guidelines and where necessary draw up an adapted local protocol that will assist with implementation of the guidelines
- ❖ Guidelines may not be communicated to all doctors, including sessional and new doctors. Some doctors only look after newborns when they are on call, and are not aware of the guidelines. In small hospitals, standing orders for care of newborns by the nurses, with clear instructions for the doctors can facilitate implementation of the guidelines.
- ❖ There may be inadequate staff, equipment and facilities but this should not become an absolute barrier to implementation.
- ❖ The lack of continuous on-site support to promote the implementation of a new guideline can allow a reversion to old practises. This is particularly the case when the old practise is entrenched in the institutional culture.

2.3 ASSESS TRAINING NEEDS

Ensuring that doctors and nurses have the competencies to provide essential newborn care can be addressed through the training of motivated permanent staff. Newborn care competency requirements

should first be evaluated. *A competency is a blend of skills, abilities, and knowledge needed to perform a specific task.*

Identify the competencies required by different health workers, and plan training and learning to ensure that they are met. Acquiring and maintaining the competency requires the use of different teaching styles and reinforcement through practice and follow up. A programme of mentoring and support should parallel any training programme.

Basic neonatal resuscitation is a core competency for all health workers in maternity and neonatal. Helping Babies Breathe® is recommended as a course for all health workers. Where possible doctors, advanced midwives and neonatal nurses should attend an advanced neonatal resuscitation course.

The LINC charts and various LINC training packages were developed to address the competencies required to provide essential newborn care. These are basic competencies for newborn care that all staff working in maternity and the neonatal unit need to have. There are additional competencies that may be needed and other training packages such as the Perinatal Education Programme are alternatives that can build on the basic competencies.

At regional and large district hospitals that provide CPAP and high care, some of the nurses should have training in neonatal intensive care. Some tertiary centres offer this as a 1-year training course at intervals.

Doctors in paediatric wards are encouraged to obtain a Diploma in Child Health. This will provide vocational growth and improve the local skills and knowledge in paediatric and newborn care.

Some important training and updates may be available as short courses or integrated into other courses. For example:

- ❖ PMTCT
- ❖ Breast feeding
- ❖ EPI
- ❖ Genetics

The list below identifies the competencies addressed by the LINC training package. It also lists the competencies required for different categories of staff. A blank chart is included in the appendix and each facility is encouraged to draw up a similar list.

COMPETENCIES REQUIRED IN NEWBORN CARE

Competency	Sub competency	MO	Paediatric MO	Advance midwife	Neonatal PN	Mid-wife	Neonatal EN/ENA	MSSN module and lesson number	Other material
		✓	✓	✓	✓	✓	✓		
Resuscitate the newborn at birth	Basic resuscitation	✓	✓	✓	✓	✓	✓		Helping Babies Breathe
	Provide Advanced resuscitation	✓	✓	✓	✓				NRP APLS PALS SAMA/FM
Provide routine care to newborns at birth	Provide routine care and triage in labour ward			✓	✓	✓	✓	Mo	
	Assess the newborn after birth	✓	✓	✓	✓	✓		Mo	PEP
	Provide routine care in postnatal ward	✓		✓	✓	✓	✓	Mo	PEP
	Discharge and make a follow up plan	✓	✓	✓	✓	✓	✓	Mo	
	Assess and support breastfeeding	✓	✓	✓	✓	✓	✓	Mo	IMCI, Lactation management
Assess and classify the sick and small newborn	Assess and Classify need for emergency care	✓	✓	✓	✓	✓		M1, L2	
	Assess and Classify priority signs in newborns	✓	✓	✓	✓	✓		M1, L2	
	Assess abnormalities	✓	✓		✓	✓		M1, L3	PEP
	Assess local infections	✓	✓		✓	✓		M1, L3	PEP
	Assess risk factors	✓	✓	✓	✓	✓	✓	M1, L4	PEP
Provide supportive care to newborn to maintain homeostasis	Monitor, prevent, and manage hypothermia	✓	✓	✓	✓	✓	✓	M2, L5	PEP
	Monitor, prevent, and manage hypoglycaemia	✓	✓	✓	✓	✓	✓	M2, L7	PEP
	Provide safe Kangaroo Mother Care	✓	✓	✓	✓	✓	✓	M2, L5	
	Provide safe oxygen therapy	✓	✓	✓	✓	✓	✓	M2, L6	PEP
	Provide safe feeds and fluids to babies	✓	✓	✓	✓	✓	✓	M2, L8	PEP
	Safely transfer babies	✓	✓	✓	✓	✓	✓	M2, L10	
Diagnose and manage common specific newborn problem	Manage babies with respiratory distress	✓	✓	✓	✓			M2, L11	PEP
	Manage babies on CPAP	✓	✓	✓	✓			Additio nal Lesson	

								s	
	Manage low birth weight babies	✓	✓	✓	✓		✓	M2, L12	PEP
	Manage babies with infections	✓	✓	✓	✓			M2, L13	PEP
	Prevent and manage neonatal encephalopathy	✓	✓	✓	✓			M2, L15	PEP
	Prevent and manage neonatal jaundice	✓	✓	✓	✓	✓	✓	M2, L16	PEP
	Manage congenital abnormalities	✓	✓	✓	✓			M2, L17	PEP,
	Manage exposure to HIV, Tb and syphilis	✓	✓	✓	✓	✓	✓	M2, L18	PMTCT
Counsel mother to care for her newborn	Assess feeding and growth and counsel on feeding	✓	✓	✓	✓	✓	✓	M3, L19, L20, L21	IMCI Lactation management
	Counsel mother on care, when to return	✓	✓	✓	✓	✓	✓	M3, L22	
Ensure a clean, safe and friendly newborn environment		✓	✓	✓	✓	✓	✓	M2, L9	

Abbreviations

PEP: Perinatal education Programme

IMCI: Integrated Management of Childhood Illness

PMTCT:

NRP: Neonatal Resuscitation Programme

HBB: Helping Babies Breathe

MSSN: Management of Sick and Small Newborns

2.4 IMPLEMENT TRAINING

Suggested training and learning for different categories of health workers

Doctors:

- Diploma Child Health
- 2 day LINC training course
- Mother and Infant HIV course
- PMTCT training and updates
- Self study with Neonatal PEP

Professional Nurses

- Diploma in Advanced Midwifery
- Diploma in Neonatal Nursing
- LINC training for Professional nurses
- PMTCT training and updates
- Mother and Infant HIV course
- Lactation management / BFHI course
- Neonatal PEP course

Enrolled nurses

- LINC training course
- Lactation management / BFHI course

Below are some recommended training courses or programmes:

RESUSCITATION

HELPING BABIES BREATHE (HBB)

HBB is a basic neonatal resuscitation training programme. It is highly recommended for all health workers in maternity and neonatal care. The skills learned should be reinforced through regular updates sessions or drills at each facility.

“Helping Babies Breathe® (HBB) aims to help meet Millennium Development Goal 4 targets for reduction of child mortality by addressing one of the most important causes of neonatal death: intrapartum-related events (birth asphyxia). HBB is an evidence-based educational programme that teaches an effective stepwise approach for successful resuscitation of the majority of infants not breathing at birth.

Helping Babies Breathe is designed to be coordinated with other interventions in a package selected to improve neonatal and maternal health. HBB can be used as the resuscitation component in courses teaching Essential Newborn Care and courses in midwifery skills. HBB can be used at all levels in the health system. It enables the extension of resuscitation training to first-level health facilities and health workers in resource-limited settings, where these skills are most lacking. It also can be used in higher-level health facilities, including tertiary facilities, where it complements, but does not replace, comprehensive resuscitation programs such as the Neonatal Resuscitation Program (NRP). Both HBB and NRP teach the same first steps in resuscitation, but NRP also includes the use of supplemental oxygen, chest compressions, intubation, and medications.

HBB uses a learner-centered educational methodology with emphasis on mastery of key skills. Pictorial, color-coded print materials and a low-cost, high-fidelity neonatal simulator engage learners and empower them to continue learning in the workplace. HBB encourages frequent practice, using job aids, simulators, and mannequins available in the workplace to maintain skills.

As an integral element of maternal and neonatal care, HBB can act as a catalyst for broader improvements in these services, particularly at the periphery of the health system.

Further advocacy and information about HBB, the training methods, and an implementation package are in the Resource section and CD ROM.

It is recommended that there should be 2 Helping Babies Breathe facilitators at each district hospital. These facilitators can run regular courses for maternity and primary health care staff. 4 – 6 participants can be trained in one day by a facilitator.

ADVANCED NEONATAL RESUSCITATION

Ensure that all advanced midwives, and senior doctors are trained in advanced neonatal resuscitation, and maintain their skill and accreditation for resuscitation. Several accredited courses are offered throughout the country and include the American Academy of Paediatrics courses the Neonatal Resuscitation Program (NRP), and the British Paediatric Association Course, Advanced Paediatric Life Support (APLS) course that includes neonatal resuscitation. ESMOE E includes a module on neonatal resuscitation.

ROUTINE CARE

All maternity staff provide routine care to newborns. This includes identifying risk factors and illness, supporting breastfeeding and providing routine preventive care. The care given is documented and information is provided to the mother. Routine care includes lactation management and PMTCT.

Training can be provided as part of in-service training or on an integrated 1 – 3 day training course that incorporates all the aspects of care including HBB.

A separate PMTCT and lactation management course may be offered in the district or province.

LINC provides charts on routine care of newborns with a learner module and training that can accompany the charts. Training may be provided as part of a course or as an in-service training module or as self – learning.

The Perinatal Education Programme has a module on Primary Newborn Care that covers routine care of the newborn.

LINC TRAINING

The LINC training is based on the principle that there are different styles and domains of learning and different methods engage different learners.

Adult learners bring prior knowledge and experience to the learning situation and new knowledge should be presented in a fashion that facilitates assimilation and integration. Different learners learn in different ways and training programmes need to include visual, auditory and interactive methods.

Adult learners are motivated by tasks perceived as meaningful. They are decision makers and self-directed learners. Presented with new information they benefit from opportunities to put it into practice through carrying out new tasks and competencies. This can be through simulations or appropriate workplace exposure with the oversight of a mentor if necessary.

LINC training incorporates:

- A needs assessment
- Pre-reading and additional reading
- Presentations
- Small group learning to allow for sharing of ideas, discussion and refocusing the learning on expressed learner needs.
- Visual demonstrations and practical sessions for the rehearsal of new skills.

The LINC Newborn Care Charts are designed as personal aids to guide the health worker in maternity and the neonatal unit in providing care for newborns. The training materials refer to the charts, and learners are encouraged to have them open at all times during the course. This develops familiarity with the charts and provides a context for the guidelines.

Reading learner manual

The learner manual explains the charts and provides background information. The manual is read before the course, and summarized in class by the group. It can also be used for self-study. Sections can be read before coming to class, or individually for distance-based learning.

Introduction to Tools for newborn care

The manual introduces a number of tools that are used to facilitate the care that is provided to newborns. These include:

- Newborn record as part of the maternity chart
- Observation chart for newborn as part of maternity chart
- Newborn Admission Record for sick and small newborns
- Initial assessment form for sick newborns
- Admission / Discharge summary
- Weight, feeding and treatment summary
- Ballard score
- Fetal-infant growth chart for preterm infants
- Bilirubin charts
- KMC score chart
- HIE score chart
- Health worker notes
- Newborn Observation Chart

LINC training uses the charts developed for use in Limpopo. If different suitable charts are in use these may be used instead. The Limpopo charts are provided for adaptation.

Written case based exercises

Written exercises are interspersed in the manual. The written exercises usually refer to a clinical case and are used to reinforce the learning in the modules by theoretical application of the information to the assessment and care of a newborn. A separate exercise book is given to each participant. Facilitators have the answers to the exercises in their lesson plans.

Role-plays

Role-plays are used to explore counseling and interactions between health workers.

Visual learning

Powerpoint presentations or slide shows are used to demonstrate clinical signs and care. This reinforces learning such as the recognition of clinical signs. A number of videos are in development as an alternative to the power point presentation. This will enable easier self-learning and aid facilities that do not have experienced facilitators.

Clinical Sessions

The clinical sessions are conducted in the clinical area (Neonatal Unit and Postnatal Ward) and ensure that the participants see and practice clinical and procedural skills.

LINC CDROM

The CDROM contains the following

- LINC Course Director Guide
- LINC facilitator Guide and Lesson Plans
- LINC Management of Sick and Small Newborn Learner Manual and Workbook
- LINC Routine Care Learner Manual and Workbook
- LINC Power Point Presentation for training
- LINC tools for use in training
- LINC CPAP guideline and workshop
- LINC PPIP guideline and workshop

PERINATAL EDUCATION PROGRAMME (PEP)

This is a self-study, distance education programme. It does not require tutors, and the only cost is the purchase of the manuals. There are two relevant manuals for newborn care: Primary Newborn Care, and Newborn Care. The Primary Newborn Care manual is suitable for staff working in Clinics, Health Centres and Midwife Obstetric Units. The Newborn Care manual is for staff working in hospitals.

The quality of health care provided by nurses and doctors depends largely on their ability to access a high standard of both basic and continuing training. This is particularly important for health care workers in under-resourced, rural areas where educational support and opportunities for in-service learning are very limited. Traditional methods of centralised teaching with formal tutors and small classes often cannot be provided to meet their need as they are expensive, depend on adequate numbers of competent trainers and require participants to leave their place of employment. All these factors are major obstacles to improving the quality of patient care in many under-served areas of South Africa.

In order to address the challenges of better prevention, diagnosis and management of common and important medical conditions, a package of cost-effective and practical training methods is needed. This should include a system of self-study and co-operative, group learning to enable health care workers to take partial responsibility for their own education and professional growth. It is particularly important to provide a good background knowledge and understanding of the essential steps used in a protocol-driven approach to training and health care. Unless a participant knows why a step in management is important, they are unlikely to incorporate what they learn into their clinical practice.

A well-balanced programme of facilitated training should have components of both individual study and group learning as well as tutored exercises in clinical skills. In this way a limited number of trainers can manage many participants as each group only needs limited face-to-face teaching. With the emphasis on learning rather than teaching, traditional trainers become facilitators who encourage the development of self-confidence and competence.

The Perinatal Education Programme has presented appropriate learning material in maternal and newborn care for the past 20 years and has enabled both nurses and doctors, as well as medical and nursing students, to play an active role in their own learning process. Course books use a problem-based approach to address a wide range of topics and are helpful for both self-study and group discussions. Using a

question-and-answer format, together with case studies and management protocols, they provide a logical approach and clear understanding of all steps in patient care. Multiple choice tests before and after each chapter enables participants to monitor their own progress. Recently the learning material has also been made available on the internet for easy access. A number of prospective studies have documented the significant improvement in knowledge, clinical skills, attitudes and patient care practices when midwives and neonatal nurses use this self-help learning method to manage their own training programmes. The content of the Perinatal Education Care books has been incorporated into other parts of the Newborn Care package. It is strongly recommended that this becomes an essential part of neonatal education, especially in under-resourced settings.

More information on PEP is included in the Implementation Tool on Training in the next section.

NEONATAL EXPERIENTIAL LEARNING

Neonatal Experiential Learning is a supportive comprehensive learning programme based on clinical governance structure. NELS utilises the Newborn Care PEP manual during a 2 week contact session. More information on NELS is provided in the additional resources section Chapter 4.

NEWBORN ICU TRAINING

Few universities currently offer Neonatal ICU training as the Nursing Council does not currently register the course. The skills provided in this course will benefit nurses at level 2 and 3 facilities and it is hoped that the council will soon register NICU training.

IMPLEMENT PRE-SERVICE TRAINING

Newborn care is required to be part of pre-service nursing and medical training. Province need to ensure that this is happening and that they are up to date.

CLINICAL MENTORING

Clinical mentoring as mentioned previously is an important part of learning and helping health workers who have been trained implement what they have learned.

3. MONITORING AND AUDIT

A system of monitoring and audit should be established at each facility. This will include

1. Supportive supervision
2. Clinical Audit
3. Perinatal Audit
4. Monitoring key newborn indicators

SUPPORTIVE SUPERVISION

Everybody who has some role in overseeing health care is responsible for supervising at least some part of the system. The clinical manager is responsible for clinical care in the hospital. He / she needs to be clear about what the requirements for newborn care are, to assess these and to make the necessary changes to ensure that the unit is able to function optimally. He / she, particularly, should be the chairperson of the perinatal review meetings, and take responsibility for checking that the action plans are being implemented.

The nurse manager ensures that there are adequate nursing staff and that the staff have the appropriate knowledge and skills to be able to provide a high quality of care. He / she needs to take responsibility, with the medical manager and other staff, for clinical audit of records and for assessing quality of care in the ward.

The facility CEO has overall responsibility for ensuring that all the requirements for providing quality care are provided. He / she needs to be advised by the clinical managers and clinicians on what is needed and what the outcome of evaluations are, so that appropriate action can be taken.

The doctor is responsible for the patient care on a day to day basis. He / she needs to evaluate carefully clinical outcomes – morbidity and mortality, looking specifically for avoidable factors / substandard care. He / she needs to act in an advisory capacity for other clinical managers, particularly in matters which affect the day to day patient care and the running of the ward.

All health workers with a supervisory function should strive to:

- Demonstrate the right way to perform tasks rather than pointing out errors
- Provide an enabling environment in which their junior colleagues feel free to use their own initiative rather than creating a controlling environment that, through the excessive use of directives, stifles initiative
- Promote the professional development of staff under their supervision
- Assume as much responsibility and accountability as is justifiable

CLINICAL AUDIT AND QUALITY OF PATIENT CARE

Clinical audit reviews how guidelines are implemented. There are a number of ways to perform clinical audits.

1. A paediatrician conducting ward rounds will review all aspects of the patient's care and immediately identify good and bad clinical practices and discuss these with the medical and nursing team. This audit requires an experienced clinician available for ward rounds.
2. Clinical audit form. A checklist of good practice, which can be applied to a number of patients at intervals to monitor compliance with guidelines. This may be useful for the clinical manager who may not be an expert in newborn care as an aid to identifying compliance with guidelines.
3. Record review. The LINC situation assessment and accreditation utilises a record review of patients who have been cared for in the neonatal unit. The care for each condition is scored against standard care for that condition. The scores are totalled and a percentage for standard

care for each condition is achieved. The record review must be conducted by skilled clinicians often from outside the facility.

PERINATAL AND NEONATAL MORTALITY AND PERINATAL REVIEW MEETINGS

The Perinatal Problem Identification Programme (PPIP) is a good tool for perinatal audit, and one endorsed for use by the Department of Health. It provides tools to assist in collecting baseline data and auditing the cause of perinatal deaths.

Perinatal review meetings should be held every month in each facility. The cause of a perinatal death must be assessed within 24 hours of the death.

ABOUT PPIP FROM (WWW.PPIP.CO.ZA)

PPIP WILL TAKE CARE OF THE NUMBERS, WHILE YOU TAKE CARE OF MOTHERS AND THEIR BABIES

The Perinatal Problem Identification Program (PPIP) is a tool to make your perinatal and maternal death audit easier. It does not do the audit for you, but it takes the tedious paperwork out of the process. The moment you enter the basic data, you can instantly do extensive data analysis, and even present your data in graphs and print reports - all with the press of a button.

Let there be no doubt: medical audit (and certainly perinatal and maternal death audit) is not a process that happens without dedicated individuals spending time and effort to make it happen. Furthermore, audit is a futile process if it doesn't 'close the loop' by changing the practice it is auditing. The purpose of audit is not the audit, or the figures, or the reports it generates, but the improvement of practice. If you do not intend to change the way you care for mothers and their babies, PPIP will do nothing for you. If, on the other hand, you want the quality of your care to be weighed and measured because you want to do better, PPIP will provide you with an instrument to make sense of your data without spending hours going through data sheets.

AUDIT SUPPORT PROVIDED BY PPIP

Medical audit includes a number of actions. PPIP makes sense of this process by providing you with three 'levels' of data entry:

DOING THE NUMBERS

PPIP allows you to collect numbers of deliveries, stillbirths, early and late neonatal deaths and maternal deaths. This allows the calculation of different rates (e.g. a perinatal mortality rate) and is used as denominator in various calculations. A selection of 'miscellaneous' data fields allows entry and analysis of specific detail, e.g. mode of delivery.

IDENTIFYING CAUSES

Each perinatal, neonatal and maternal death is entered in more detail. PPIP allows entry of basic demographic data, after which a primary obstetric cause of death and a final cause of death must be identified. Obviously these causes can then be analyzed in detail.

AVOIDABLE?

Lastly, PPIP allows for the identification of specific avoidable factors. These are incidents related to the actions of the mother or health care personnel, or the health care system, which may have altered the outcome of the specific case had it been managed differently. Again, these avoidable factors can be included in data analysis.

Further information about PPIP can be found on their website www.ppip.co.za

NEONATAL MORBIDITY AND SERVICES

Additional data and information is required to monitor the neonatal service. This includes

- The number and percentage of admissions to the neonatal unit and the reasons for the admission
- The trends in admissions
- Transfers in and out of the neonatal unit and outcome from transfers
- Neonatal transport response times and outcomes
- Number and nature of birth abnormalities
- Outcome of specific conditions

See the attached tools in Appendix 3, Neonatal registers and summary data

STEP FIVE: TRACK PROGRESS AND UNDERTAKE ACCREDITATION ASSESSMENTS

Input	Human and financial resources	District team in place	Number of district teams, regional and tertiary human resources
Process	Advocacy Action plans	Action Plans Teams in place Visits to facilities Equipment and facility needs identified	Equipment needs Transport needs Training needs
Output	Norms and standards Guidelines Tools used Number of health workers trained	Norms and standards Trainings conducted Referral and transport policies Neonatal ambulance in place	Provincial job aids
Outcome	Facilities accredited for newborn care Well equipped and staffed facilities Date properly collected	Quality of training No of facilities accredited Referral patterns Ambulance response times	Accreditation
Impact	Neonatal mortality rates Perinatal mortality rates Admissions percentages and case fatality rates	Neonatal mortality rates Perinatal mortality rates Admissions percentages and case fatality rates	Neonatal mortality rates Perinatal mortality rates Admissions percentages and case fatality rates

Progress should be monitored at facility, district and provincial level. The choice of indicators will vary according to the point of monitoring and unique circumstances. It is useful to aggregate indicators into the 5 categories shown in the table above. This will provide for a continuum of monitoring during implementation. An example of this process is provided in the table and subsequent discussion below.

An Accreditation System forms part of the LINC programme in Limpopo. It enables the implementation of the Newborn Care Initiative to be tracked and provides an incentive for participating facilities. This is described at the close of this chapter.

	Input	Process	Output	Outcome	Impact
Facility Level	Human and Financial Resources	Team in place at facility with change agent Action plans are drawn up in facility Advocacy workshops Community Health workers	Norms and standards for newborn care identified Guidelines in place Job aids in place and being used Number of health workers trained	Facilities accredited for excellent newborn care Well equipped facilities Improvement in newborn care noted on record reviews	Neonatal mortality rates Perinatal mortality rates Admission rates and case fatality rates
National, Provincial and District level	Team in place in x number of districts Advocacy programme	Action plans in place Number of teams in place Number of visits to facilities	Norms and standards and Guidelines in place Trainings conducted Appropriate transfer policies Neonatal ambulances in place No of functional regional hospitals	No of facilities accredited for excellent newborn care Response times Quality of training Improved referral patterns	Neonatal mortality rates Perinatal mortality rates Admission rates and case fatality rates
Means of verification		Number of teams in place Visit reports	Training reports	Record reviews Clinical Audit Accreditation visits Equipment audits	PPIP data DHIS Data Stats SA Data

INPUT INDICATORS

Monitor the budget and human resources for Essential Care. Have provinces and facilities allocated adequate resources for essential newborn care at province, district, regional and district hospital level?

- Has the hospital revitalisation programme included neonatal units?
- Has the province identified staff for neonatal improvement?
- Have the facilities identified staff to provide newborn care?
- Has the province identified district support teams or external facilitators and mentors?

PROCESS INDICATORS

This will depend on the plan that was drawn up but may include the following:

- Is the situation assessment complete, and communicated to relevant stakeholders?
- Has there been advocacy at community, health worker and management level?
- Have action plans been developed at each facility for immediate action, medium and long term activities?

OUTPUT INDICATORS

What are the results of action plans related to facilities, staffing, and training?

- How many training courses were conducted and people trained?
- Have the norms and standards been completed and adopted by facilities?
- Are provincial guidelines in place?
- Is there a referral guideline and transport policy?
- Are other provincial job aids in place, for example, admission book, newborn record, monitoring charts?

OUTCOME INDICATORS

Outcome indicators assess the outcome of actions in terms of quality.

- What is the quality of the training provided?
- What is the quality of patient care, is standard clinical care being provided at facilities?
- What is the response time of the neonatal ambulance?
- Are referral patterns appropriate?

This can be assessed by clinical audit, and community satisfaction. The accreditation system developed by LINC includes an assessment of the quality of the service provided.

IMPACT INDICATORS

The impact indicators measure whether the service has had an impact and achieved its objectives. If the objective was to decrease neonatal mortality trends in the neonatal mortality rates must be measured.

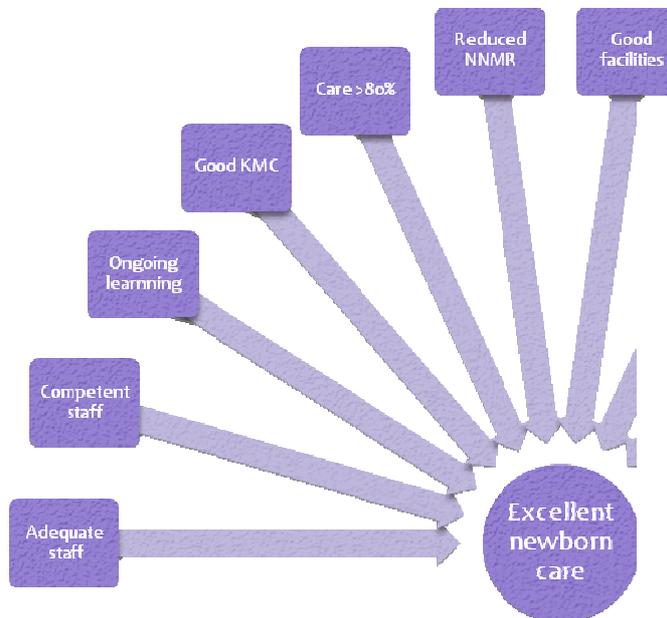
Impact indicators will not show the desired improvement if a project has not been implemented to scale, or if aspects of the implementation have been incomplete.

The impact measures for essential newborn care include:

- Neonatal mortality rate
- Intrapartum asphyxia rates (SB rates)
- Cause specific mortality rates

ACCREDITATION

The accreditation process in Limpopo was set up to motivate the set norms and standards for neonatal services, and a set accreditation system includes a number of components



Accreditation assesses all aspects of newborn care.

In Limpopo Hospitals apply for accreditation once they are ready. Accreditation assessors (internal members) visit and assess facilities, services, staffing, record review and clinical audit.

Hospitals that have achieved accreditation did so mostly because of good facilities and equipment. Those that did not often had facilities and equipment of a low level of clinical care.

In the first round of accreditation facilities achieved Silver, a 3-point system described below. The intention is that these will be a good starting point.

Accreditation is valid for a period of 2 – 5 years.

The accreditation utilises the comprehensive situation assessment tool.

SILVER

Each of the items in the Hospital Visit check-list must be in place. Criteria areas that are non-negotiable are:

- Check list scored 65% plus
- 12 steps to KMC implemented
- Admission records used
- Observation records used
- Oxygen monitoring
- Statistics available in the 1000 – 1999g birth weight
- Evidence that the neonatal mortality rate in this ward is low

- Level II facilities must have CPAP
- Patient records (quality of care) score more than 60%

GOLD

All the criteria as for Silver

Additional items which are essential:

- Check-list scores 75% plus
- CPAP available and being used appropriately
- Multi-parameter monitoring
- Infusion pumps
- Decreased mortality rate in 1500 – 1999g birth weight group to less than 50 / 1000
- Ability to interpret the perinatal statistics
 - • Patient records (quality of care) score more than 70%

PLATINUM

All of the criteria for Silver and Gold

Additional essential items are:

- Check-list scores 85% plus
- In-service training for staff in the hospital
- Out-reach to the District – clinics
 - hospitals
 - training
 - perinatal audit meetings

Patient records (quality of care) score more than 80%

Appendix 3.1

Essential Newborn Care Situation Assessment Tool: Hospitals

The Essential Newborn Care Situation Assessment Tool is for use by:

- *Hospital Newborn Care Improvement Teams to assess the situation in their own facilities, and to then develop action plans for improvement*
- *District or Provincial Paediatric Support Team to Assess the Essential Newborn Care in Hospitals*

A complete assessment will take a full day. Elements of the assessment can be done at different times.

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Key Role Players

Hospital: _____

Designation	Name	Contact number	Email
CEO			
Clinical Manager			
Nursing Service Manager			
Area manager maternity			
Sr in charge Neonatal Unit			
Paediatrician District paediatrician			
Dr in charge Neonatal Unit			
Neonatal Improvement Team			

Summary of situation assessment

Area	Denominator	Actual	Score (%)	Weighting	Final score	Comment
1. Perinatal and Neonatal Data						
2. Neonatal facilities						
2.1 Neonatal bed numbers and space						
2.2. Neonatal administrative and utility areas						
2.3 Infection Control						
2.4 Mechanical and Technical support						
3. Neonatal unit equipment and supplies						
3.1 General						
3.2 Oxygen therapy						
3.3 Fluids and cardiac monitoring						
3.4 Consumables						
3.5 Resuscitation						
4. Quality of Neonatal Care						
4.1 Observed care practices, Neonatal Unit						
4.2 Observed care, KMC						
4.3 Quality of care: record review						
5. Neonatal unit support services						
6. Routine newborn care labour and postnatal ward						
6.1 Resuscitation Labour ward						
6.2 Resuscitation Theatre						
6.3 Postnatal ward care and practice						
6.4 Postnatal ward record review						
7. Supervision, monitoring & audit						
8. Transport						
9. Staffing and staff development						

Comments

1. PERINATAL AND NEONATAL DATA

1.1 Perinatal Mortality Statistics

Year: Data from PPIP, can also compare with DHIS data

	Births (total)	Live births	Stillbirths		Neonatal deaths		
			Fresh	Macerated	ENND	LNND	NND
500 – 999g							
1000 – 1499g							
1500 – 1999g							
2000 – 2499g							
> 2500g							
Total							

LBW %		SB / NND		ENND / 1000	
SB Rate /1000		CS Rate %		LNND / 1000	
PNMR /1000		PCI		NND / 1000	
PNMR / 1000(BW > 999g)		ENND / 1000 (BW 1000 – 1499g)		ENND / 1000 (BW > 999g)	
ENNDR /1000 (BW > 2500g)		ENND / 1000 (BW 1500 – 1999g)		ENND / 1000 BW 1000 – 1999g)	

Primary Obstetric cause of death (top 7)

	Number	%
Spontaneous preterm labour		
Intrapartum hypoxia		
Unexplained intrauterine death		
Infection		
Antepartum haemorrhage		
Intrauterine growth restriction		
Hypertensive disease		

Final neonatal cause of death (top 4)

	Number	%
Immaturity		
Hypoxia		
Infection		
Congenital abnormality		

Avoidable factors (top 10)

	Number	%

Year: Data from PPIP, can also compare with DHIS data

	Births (total)	Live births	Stillbirths		Neonatal deaths		
			Fresh	Macerated	ENND	LNND	NND
500 – 999g							
1000 – 1499g							
1500 – 1999g							
2000 – 2499g							
> 2500g							
Total							

LBW %		SB / NND		ENND / 1000	
SB Rate /1000		CS Rate %		LNND / 1000	
PNMR /1000		PCI		NND / 1000	
PNMR / 1000(BW > 999g)		ENND / 1000 (BW 1000 – 1499g)		ENND / 1000 (BW > 999g)	
ENNDR /1000 (BW > 2500g)		ENND / 1000 (BW 1500 – 1999g)		ENND / 1000 BW 1000 – 1999g)	

Primary Obstetric cause of death (top 7)

	Number	%
Spontaneous preterm labour		
Intrapartum hypoxia		
Unexplained intrauterine death		
Infection		
Antepartum haemorrhage		
Intrauterine growth restriction		
Hypertensive disease		

Final neonatal cause of death (top 4)

	Number	%
Immaturity		
Hypoxia		
Infection		
Congenital abnormality		

Avoidable factors (top 10)

	Number	%

1.2 Annual Neonatal Admission Data:

Year _____

Total Births in Hospital		Neonatal admission	
Total Births in feeder clinics		% Admissions	
Total Births Sub- district		No transfers out (%)	

Admission and Death by place of birth, birth weight, HIV status and cause of death. Calculate CFR and % of admissions.				
Admissions	Admission to neonatal unit	Deaths in Neonatal unit	Case Fatality rates	% of admissions
1.From Labour ward or Postnatal				
2. From Clinic or Home				
3. Referred from other hospital				
4. Back from referral hospital				
5. Total Admissions:				
Admission Weights				
6. < 999				
7. 1000 – 1499g				
8. 1500 – 1999g				
9. 2000 – 2499g				
10. > 2500g				
HIV exposure				
10. HIV Exposed				
11. HIV Negative				
12.HIV unknown				
No HIV Prophylaxis		% prophylaxis		
Main problem requiring baby to be admitted				
13. NE / HIE / Low apgars				
14. Infection				
15. Jaundice				
16. For Observation				
17. Cong Abnormality				
18. Respiratory Distress(not HMD)				
19. Other				
20. LBW or prematurity				
Cause of death in neonatal unit				
Immaturity		%		
Hypoxia		%		
Infection		%		
Congenital Abnormality		%		
Other		%		
Unknown		%		
Neonatal death not in neonatal unit		Comment		
No of deaths labour ward				
No of deaths theatre				
No of deaths in postnatal ward				
No of deaths in casualty				
Total deaths outside the neonatal unit				

1.3 PMTCT

Year	No of deliveries	HIV +ve		HIV - ve		HIV unknown		N° of mothers on ARV treatment		N° of mothers on ARV prophylaxis		Infants getting post-exposure prophylaxis	
		number	%	number	%	number	%	number	%	number	%	number	%

Assessment	Standard	Score
HIV status	95% know status	
Mothers on ARV Rx	>25% of pos	
Mothers on ARV proph	The remaining pos	
Infants getting PEP	100 % infants getting PEP	
Total		

1.4 Summary Data and Targets

	Year	Year	Year	Provincial Target	Hospital Target for
	_____	_____	_____		_____
Total live births for facility		-			
Total live births in facility and clinics					
Total live births in district (regional hospitals)					
ENND / 1000 > 999g				8	
ENND / 1000				10	
LNND / 1000				2	
NND / 1000				10	
ENND /1000 (BW >2500g)				4	
ENND / 1000 (BW 1500 - 1999g)				50	
ENND / 1000 (BW 1000 -1499g)				150	
% Admissions to Neonatal Unit				15%	
% Admissions from Referral Area (RH)				5%	
LBW %					
SB Rate /1000					
PNMR /1000					
PNMR / 1000 (BW > 999g)					
PCI					
% Caesarean sections					

2. NEONATAL FACILITY

Review all the facilities for caring for sick and small newborns, the neonatal unit, KMC unit and in bigger hospitals a high care and ICU. Comment on the design, measure the space and calculate the space per bed, assess lighting, temperature and hygiene. Assess adequate provision for electric points, oxygen as well as nurses, doctors, counselling and mother lodger space

Area	Standard	Requirement	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
2.1 Neonatal Unit Beds and Space					
% of inborn neonates admitted to NNU	15%				
% of babies admitted from the referral area	5%				
District Hospital Neonatal Beds	4/1000				
Additional Regional Hospital Beds	3/1000 per district birth for regional Hospital				
Total Beds					
High care (HC)	20% D 33% R				
High care (HC)	Space (7.2 -10m ² / bed)				
Standard Inpatient care	40% D 33% R				
SIC	Space (6 m ² / bed)				
KMC Unit	Adjoining and interleading				
KMC	40% D 33% R				
KMC	Space (7.2 m ² / bed)				
Lodger mothers	30-40% of neonatal beds				
		Total	_____	Actual _____	_____ %
2.2 Neonatal Unit Administrative and Utility area					
Counselling room	1 counselling room in NNU				
Doctor's office	1 office (More level 2, 3)				
Unit manager's office	1 office				
Nurses station	Appropriate stations in the ward				
Clean utility area	Adequate spaces for consumables and linen				
Equipment storage	Adequate storage for clean equipment				
Dirty utility area	Storage for dirty linen, bins, cleaning materials				
		Total	_____	Actual _____	_____ %

2.3 Infection Control in the neonatal unit

	Standard	Actual	Assessment	Comment
Hand washing	1 basin at entrance			
	1 basin per cubicle or per 6 beds and within 6 m			
	Elbow controls			
	Soap available at each basin			
	Clean towels at each basin			
	Hand wash chart at each basin			
	Alcohol hand wash at each basin			
	Alcohol hand wash at each bed			
Cleaning	Routine acceptable			
	Unit Clean			
Space	Adequate space between beds			
	Total		Actual	%

2.4 Mechanical, gas and electric requirements

Temperature of unit	24°C +/- 2°C			
Wall thermometer	1 in each room			
Temperature control / heating	Good Air conditioner, no draughts, Windows covered			
Lighting	Daylight, Procedure lights, No direct light			
Electric points				
High care	6 -8 per service point			
Intermediate care	4 -6 per service point			
KMC	1 per bed + 1 per room			
Oxygen				
Oxygen Source	Piped			
Oxygen points: HC	1 per bed			
IC	1 per bed			
KMC	1 per room			
Air				
Air source	Piped			
Air Points: HC	1 per high care bed			
IC	1 per 2 beds			
Suction				
Suction Points: HC	1 per bed			
IC	1 per 2 beds			
KMC	1 per room			
Total score	Max		Actual	Score (%) :

3. NEONATAL UNIT EQUIPMENT

3.1 General Equipment

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Open Incubators	1 per high care bed				
Std Incubators	1 per bed (SIC)				
Transport incubator	1 per unit				
Basinette - washable	1 per 3 NNU beds				
Suction unit: wall	1 per wall point				
Suction unit: mobile	1 per unit				
Glucometer	1 per cubicle				
Hb meter	1 per cubicle				
Calculator	1 per cubicle				
Chair for mother	1 per bed				
Diagnostic set*	1 per cubicle				
Phototherapy units	1 per 2 beds 1 per Open incubator				
Bilicheck	1 per unit				
Infant scale digital	1 per care cubicle				
Mobile X Ray unit	1 per unit / hospital				
Total score	Max possible		Actual		Score (%):

3.2 Oxygen therapy

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial =1 No = 0, N/A = X	Comment
Oxygen cylinders portable and standby	1 per cubicle				
Oxygen flow meters (double)	1 per wall point / cylinder				
CPAP	1 per high care bed				
Ventilators	1 per bed ICU 1 per unit Level 2				
Blood gas analyser	1 per hosp level 2 1 per unit level 3				
Head Boxes	1 per IC / HC bed				
Pulse Oximeters	1 per high care bed 1 per 2 IC beds				
Oxygen blenders	1 per high care bed				
Venturis	1 set (24 – 60%) per O ₂ point				
Transillumination light	1 per unit				
Total score	Max possible		Actual		Score (%):

3.4 Fluids and cardiac monitoring

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Drip stand	1 per bed				
Infusion pumps	1 per bed				
Cardiac / bp monitors (multiparameter)	1 per high care bed				
Syringe pumps	1 per HC / ICU bed				
Total score	Max possible		Actual		Score (%):

3.5 Consumables for equipment

Item	Standard	Should have	Actual	Assessment Yes =2, Partial =1 No = 0, NA = X	Comment
Oxygen tubing	Available in unit				
Nasal prongs	Neonatal and preterm				
CPAP circuits	4 circuits / machine available for re-use				
Ventilator circuits	4 circuits / machine available for re-use				
Neonatal probes	Neonatal probes for pulse oximeter				
Drip sets for infusion controllers	Correct set for infusion controller				
Infusion sets	60 dpm				
Dial-a-flow	Dial-a-flow as backup, not routine				
Jelcos	24, 22				
Strapping	Appropriate strapping and solvent				
Glucostix	Appropriate to glucometer				
Urine Dipstix	Urine dipstix				
Consumable for bilicheck	Bilicheck				
IV fluids	Neonatalyte, Normal Saline, 10% Glucose				
Total score	Max possible		Actual		Score (%):

Total score (equipment)	Max possible		Actual		Score (%):
--------------------------------	---------------------	--	---------------	--	-------------------

Comments:.....
.....
.....
.....

3.5 Resuscitation Equipment in Neonatal Unit

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Basic					
Resuscitaire	Available				
Spare oxygen source	Cylinder				
Self inflating bag and mask	Laerdal neonatal size 1 per resuscitaire and 1 per high care bed				
Oxygen tubing	Tubing connected and clean				
Face masks	Correct sizes: 00, 0, 1				
Suction unit	Working				
Suction catheters	Smallest f10				
Connected to suction apparatus	Suction connected				
Advanced					
Laryngoscope	Laryngoscope working				
Blades	Straight blades: 00, 0				
Extra bulbs and batteries	Available				
Endotracheal tubes (sizes)	Range 2.0 – 4.0 mm				
Introducer	Neonatal Introducer				
McGill forceps	Neonatal McGill				
IV admin sets, jelco	Appropriate available				
IV fluid: N saline, neonatalyte					
Drugs for resuscitation	Adrenaline, Naloxone, Glucose, N Saline				
Wall chart on resuscitation	Correct chart up and visible				
Daily equipment check	Book present and checked daily				
Total score	Max possible		Actual		Score (%):

Comments.....

4. QUALITY OF NEONATAL CARE

4.1 Observe care practices during the visit Neonatal Care

Observe care and the following practices while you are in the unit. If you are not able to observe these, question the staff in the unit about the practices. If you are unsure of the practice mark as N/A

Item	Standard	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Intermittent KMC	Practised during and after feeds in NNU before in KMC		
Use of CPAP	CPAP safely used where necessary		
Monitoring HC patient	Continuous monitoring of unstable patient		
Resuscitation	Correctly done		
Infusion controllers	Every baby on IV fluid has an infusion controller in use		
Fluid volumes	Correct fluid volumes prescribed		
Oxygen delivery	Oxygen delivery according to guidelines		
Oxygen saturation monitoring	Correct Saturation monitoring		
Temperature monitoring	Appropriate for child's condition		
Phototherapy	Lights correct, eyes correctly covered		
Neonatal Record	Front page correct		
Observation charts used	Observations correctly charted		
Weight, treatment summary	Weight and treatment correctly plotted		
Feeding methods	Correct methods for gestation, wt, ill		
Feeding volumes	Correct feeding volumes for babies		
Antibiotics	Correct use of antibiotics		
Supplements	Supplements correctly prescribed		
Medical care	Adequate medical assessment and review		
Nursing care	Adequate response to baby's condition		
*			
Total score	Max possible		Score (%):

4.2 Kangaroo Mother Care Unit

Item	Standard	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Situation	Adjoining neonatal unit		
Beds	Enough beds		
Ablutions	Adequate showers, baths and toilets.		
Oxygen point	1 – 2 Oxygen points in unit		
Meal table	Table and chairs for meals (doing KMC)		
Easy chair	Easy chairs for mothers to relax		
Fridge, microwave and kettle	Fridge, microwave, kettle		
Admission policy	Adherence to safe admission policy		
Staffing	Adequate – always someone present		
Observations	Observations done 6 hourly on infants		
Feeding	Supervised, where necessary		
Doctors ward rounds	Daily doctors ward rounds, PN rounds over weekend		
Babies in correct KMC position	Babies correctly tied to mothers, no babies on beds		
Mothers mobility	Mothers walk around with babies in KMC position		
TV and reading	TV, DVD, reading material, radio		
Structured activities	Structured activities for mothers		
Discharge Policy	Adherence to safe discharge policy		
Discharge score sheet	Discharge score sheet is used and weight 1.8kg		
Follow up arrangements	Weekly Follow up clinic, records kept		
Mothers practising KMC at follow up	Baby brought in KMC position		
Total score	Max possible		Score (%):

Record Scoring Tool: New Admission

Record I/D:

i/p = incomplete / partial: n/a = not applicable

	yes	i/p	no	n/a	
Newborn admission record used					
Baby identified					
Maternal information reflected:					
- ANC					
- Labour					
- Delivery					
Perinatal risk factors recorded					
Baby information					
Date, time of birth, weight, HC recorded					
Apgar score recorded					
Details of resuscitation recorded					
Diagnoses					
Reasons for admission recorded					
Problem list completed					
Routine care					
IMI Vitamin K given at birth					
Chloramphenicol eye ointment at birth					
HIV exposure documented					
Clinical recording					
Initial assessment done					
Clinical findings recorded					
Observation charts completed					
Appropriate management plan					
Total					

18 items

Score: yes = 2; i/p = 1; no = 0

	Actual	Maximum	%
Score			

Record Scoring Tool: HIE / Asphyxia

Record I/D:

i/p = incomplete / partial: n/a = not applicable

	yes	i/p	no	n/a	
HIE score done daily and plotted					
Observations					
Appropriate observations done					
Oxygen therapy					
Appropriate oxygen therapy if needed					
SATS in normal range (92%) if on O ₂					
Temperature					
Temperature not more than 36 degrees Not in warm incubator					
Fluids and feeds					
Baby kept nil per mouth for the 1 st 24 hours					
Fluids and feeds correctly calculated					
Daily intake and output recorded					
Assessment					
Diagnosis					
Severity					
Management					
Phenobarbitone given if seizures					
Correct response to abnormal observations					
Discussed with the family					
Follow-up arrangements recorded					
Total					

16 items

Score: yes = 2; i/p = 1; no = 0

	Actual	Maximum	%
Score			

Record Scoring Tool: Infection

Record I/C:

i/p = incomplete / partial: n/a = not applicable

	yes	i/p	no	n/a
Risk factors identified				
Preterm labour				
Rupture of membranes more than 18 hours				
Observations				
Correct frequency				
Clinical findings				
Localised lesion				
Abdominal distension				
Oxygen given if appropriate				
SATS in normal range for age of baby				
Oxygen stopped appropriately				
Temperature Maintained in normal range				
Blood glucose done appropriately				
Feeds and fluids Correctly calculated				
Appropriate IV / oral feeds given				
Investigations				
CRP				
X-ray				
Others				
Assessment				
Suspected infection				
Specific infection (system recorded)				
Management				
Antibiotics correctly used				
Appropriate response to abnormal observations				
Appropriate referral				
Follow-up notes				
Total				

19 items

Score: yes = 2; i/p = 1; no = 0

	Actual	Maximum	%
Score			

Record Scoring Tool: Low Birth Weight

Record I/D:

y = yes; i/p = incomplete / partial; n = no; n/a = not applicable

	y	i/p	n	n/a	comments
Admission assessment					
Ballard score done					
Growth chart completed					
Daily weight chart completed					
Observations					
Correct frequency					
Oxygen therapy					
Correct amount of oxygen given if needed					
If O ₂ given, were SATS in normal range (88 – 93%)					
Temperature					
Infant's temperature					
Incubator temperature					
Blood glucose					
Blood glucose done appropriately					
Investigation and drugs					
Antibiotics prescribed					
Antibiotics given					
CRP done at 48 hours					
Theophylline given					
Assessment					
Gestational age					
Fetal growth pattern					
Other					
Management					
Response to abnormal observations					
Oxygen					
Temperature					
Blood glucose					
Other					
Feeds and fluids					
Nil per mouth appropriately					
Feeds / fluids correctly calculated (ml/kg/day)					
Actual intake for 24 hours recorded					
Total					

24 items

Score: yes = 2; i/p = 1; no = 0

	Actual	Maximum possible	%
Score			

Record Scoring Tool: Neonatal Jaundice

Record I/C:

i/p = incomplete / partial: n/a = not applicable

	y	i/p	n	n/a	Comments
Risk factors					
Maternal blood group recorded					
Maternal RPR recorded					
Observations					
Day of onset					
Bilirubin levels (correct frequency)					
Assessment					
Cause of jaundice					
Severity (Graph used)					
Management					
Phototherapy started correctly					
Duration correct					
Appropriate feeding					
Appropriate investigations					
Appropriate referral					
Follow-up notes					
Post discharge follow-up					
Total					

13 items

Score: yes = 2; i/p = 1; no = 0

	Actual	Maximum	%
Score			

Record Scoring Tool: Respiratory Distress

Record I/D:

i/p = incomplete / partial: n/a = not applicable

	yes	i/p	no	n/a	
Risk factors identified					
Gestational age					
Fetal hypoxia / meconium					
Observation					
Appropriate on-going observations done					
Oxygen therapy					
Method of administration correct					
Amount (%) recorded					
SATS in normal range (if on oxygen)					
Oxygen stopped appropriately					
If Baby required CPAP					
CPAP started timeously					
CPAP correctly provided					
Feeds and fluids					
Baby kept nil per mouth appropriately					
Fluids and feeds correctly calculated					
Intake and output recorded daily					
Investigations and drugs					
Chest x-ray					
CRP					
Results available					
Theophylline (GA < 35 weeks)					
Assessment					
Specific diagnosis					
Severity (amount of O ₂ vs SATS)					
Management					
Appropriate management plan					
Appropriate response to abnormal observations					
Adequate follow-up notes					
Total					

20 items

Score: yes = 2; i/p = 1; no = 0

	Actual	Maximum	%
Score			

5. STANDARD GUIDELINES AND JOB AIDS

Item	Standard	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comments
Standard neonatal guideline available in neonatal unit	LINC guidelines and charts or equivalent			
Evidence of use of guidelines	Evidence that they are used and followed			
Important policies and local protocols	Displayed in the neonatal unit			
Breastfeeding advocacy	Poster and pamphlets for support			
Accreditation status	Displayed			
Referral policies and contacts	Readily available			
Standard neonatal record	Available and used			
Useful neonatal charts	Available in record or on wall or workstation			
Resource material	Additional neonatal resource books available in the unit			
Total score	Max possible	Actual		Score (%):

6. SUPPORT SERVICES

Review the support services provided in the facility

Item	Standard	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comments
Portable X-ray Machine	1 for the unit / hospital, working			
Time for X-ray to be done	Less than an hour for emergencies			
Lab turn around Bilirubin	1 – 2 hours			
Lab turn around CRP, FBC, U & E	Same day			
Microcontainers	Range of micro containers available for neonatal specimens			
Pharmacy	Availability of drugs in newborn care guide			
Speech therapy	Involvement in prevention, follow up and screening			
Physiotherapy	Involvement in treatment and follow up clinic			
HCT and comprehensive HIV service available for mothers	Daily HIV Counselling and Testing, infant feeding counselling and adherence counselling			
Milk pasteurization facilities	Flash heat treatment of breast milk available			
Nutrition service – Breast feeding	Dieticians available to support breastfeeding, and BFHI			
Baby friendly hospital status	Baby friendly hospital accreditation is current			
Nutrition service -	Dieticians support safe supply of replacement feeds to NNU when required			
Neonatal follow	Neonatal follow up			

up clinic	clinic run every week			
Total score	Max possible	Actual		Score (%):

Comments:

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7. ROUTINE NEWBORN CARE IN LABOUR WARD AND POSTNATAL WARD

7.1 Resuscitation equipment in labour ward and theatre

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Basic					
Resuscitaire	Available				
Spare oxygen source	Cylinder				
Self inflating bag and mask	Laerdal neonatal size 1 per resuscitaire and 1 per high care bed				
Oxygen tubing	Tubing connected and clean				
Face masks	Correct sizes: 00, 0, 1				
Suction unit	Working				
Suction catheters	Smallest f10				
Connected to suction apparatus	Suction connected				
Advanced					
Laryngoscope	Laryngoscope working				
Blades	Straight blades: 00, 0				
Extra bulbs and batteries	Available				
Endotracheal tubes (sizes)	Range 2.0 – 4.0 mm				
Introducer	Neonatal Introducer				
McGill forceps	Neonatal McGill				
IV admin sets, jelco	Appropriate available				
IV fluid: N saline, neonatalyte					
Drugs for resuscitation	Adrenaline, Naloxone, Glucose, N Saline				
Wall chart on resuscitation	Correct chart up and visible				
Daily equipment check	Book present and checked daily				
Total score	Max possible		Actual		Score (%):

Comments.....

7.2 Resuscitation equipment in theatre

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Basic					
Resuscitaire	Available				
Spare oxygen source	Cylinder				
Self inflating bag and mask	Laerdal neonatal size 1 per resuscitaire and 1 per high care bed				
Oxygen tubing	Tubing connected and clean				
Face masks	Correct sizes: 00, 0, 1				
Suction unit	Working				
Suction catheters	Smallest f10				
Connected to suction apparatus	Suction connected				
Advanced					
Laryngoscope	Laryngoscope working				
Blades	Straight blades: 00, 0				
Extra bulbs and batteries	Available				
Endotracheal tubes (sizes)	Range 2.0 – 4.0 mm				
Introducer	Neonatal Introducer				
McGill forceps	Neonatal McGill				
IV admin sets, jelco	Appropriate available				
IV fluid: N saline, neonatalyte					
Drugs for resuscitation	Adrenaline, Naloxone, Glucose, N Saline				
Wall chart on resuscitation	Correct chart up and visible				
Daily equipment check	Book present and checked daily				
Total score	Max possible		Actual		Score (%):

Comments.....

7.3 Routine Essential Newborn Care: Postnatal Ward

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Neonatal beds	Basinette next to each bed				
Rooming in	Babies with mothers all the time				
Bathing	Not routine, top and tail or in own bassinette				
Feeding Support	Baby friendly practices, and support to mothers				
Newborn Care Record	Newborn record in maternity record used				
Newborn care observation chart	In maternity record – used				
Caesarian section babies	Monitoring and feeding support in postnatal ward				
PMTCT policy	Adherence to PMTCT policy				
Discharge policy	Clear discharge procedure				
RTH Booklet	Documentation of info on RTHC				
RTH Booklet					
*					
*					
Total score	Max possible		Actual		Score (%):

* Additional items assessed

Comments:.....

7.4 Record review: Routine care postnatal ward

Select 5 maternity records and RTHC booklets of babies currently in the postnatal, who are about to be discharged

Summary of record review findings

Record Number	Score	Denominator
Total		
Percentage		

Comments.....
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Record I/D:

	yes	i/p	no	n/a	
Newborn care record used (as part of Maternity record)					
Newborn observation Chart used					
Baby identified					
Birth wt, gender, HC, GA documented					
Apgar and resuscitation recorded					
Delivery documented					
Breastfeeding within 1 hour of birth					
Risk factors identified					
Appropriate action for Pos RPR					
Appropriate action for Blood group o or neg					
Appropriate action of HIV unknown					
If HIV pos appropriate prophylaxis given to baby					
If maternal diabetes appropriate action					
IMI Konakion given at birth					
Chloramphenicol eye ointment at birth					
Polio given					
BCG given					
Appropriate follow up date given					
Road to health booklet issued					
Neonatal information documented					
Immunisation documented					
HIV exposure documented					
HIV treatment documented					
Feeding at discharge documented					
Total					

i/p = incomplete / partial: n/a = not applicable yes i/p no n/a

24 items

Score: yes = 2; i/p = 1; no = 0

Actual Maximum %

Score			
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8. SUPERVISION, MONITORING AND AUDIT

Item	Standard	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Ward Admission register kept	Admissions, discharges, diagnosis,			
Admission statistics	Admission statistics kept			
Supervision and clinical audit	Monthly audit and review of service			
PPIP	Being used			
Perinatal statistics kept	3 years of perinatal (PPIP) stats available			
Perinatal review meetings	Monthly perinatal review meetings held			
Minutes of meetings	Available			
Perinatal and neonatal data interpreted	Head of unit able to interpret perinatal data			
Downward trend in mortality	Downtrend in mortality especially in newborns			
Meeting targets for mortality reduction	Achieving LINC targets for mortality			
PMTCT	> 95% of moms are tested and mothers and babies receive appropriate care			
Total score	Max possible	Actual		Score (%) :

Comments:.....

9. REFERRAL AND TRANSPORT

Item	Standard	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Referral policy	In place and communicated			
Neonatal priority	Neonatal transport prioritised			
Ambulance base	On site			
Time to get ambulance	Less than ½ hour			
Ambulance well equipped	Transport Incubator			
	Portable oxygen			
	CPAP and ventilator			
Personnel	Orientated to newborn care			
Advanced training	EMS personnel trained in newborn transfer			
Total score	Max possible	Actual		Score (%):

Comments:

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Include list of equipment here for ambulance and more on training

10. STAFFING

10.1 Doctors

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Paediatricians	5 per regional hospital 1 District paediatrician				
Registrars					
Medical officers					
Community service					
Interns					
Sessional					
Medical officers					
Allocated to newborns	1 full time per 18 babies				
Rotated	No rotation unless in paediatrics				
<i>Training</i>					
LINC	Basic Course				
Resuscitation	HBB plus				
Other					
Total score	Max possible		Actual		Score (%):

10.2 Nursing staffing norms

Professional nurses / Midwives

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Maternity (ANC / LW / PNC)					
Total	16 per 100 deliveries per month				
Permanently allocated	80%				
Advanced midwives	50%				
LINC Routine care	90%				
Resuscitation	HBB 90%				
Neonatal unit					
Total	HC 1 / 2-3 SIC 1 / 4 – 6				
Permanently allocated	80%				
NICU	Unit manager				
LINC Routine and MSSB	80%				
Resuscitation	HBB 80% 50% HBB +				
Other					
Total score	Max possible		Actual		Score (%):

Enrolled Nurses (EN) / Enrolled Nursing Assistants (ENA)

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Maternity (ANC / LW / PNC)					
Total	10 – 12 per 100 deliveries per month				
Permanently allocated	80%				
LINC RC	80%				
Resuscitation	HBB 80%				
Neonatal unit					
Total	1 per 4 – 6 babies				
Permanently allocated	80%				
LINC RC and MSSN for EN	80%				
Resuscitation	HBB 80%				
Other					
Total score	Max possible		Actual		Score (%):

10.3 Staff training

Item	Standard	Should have	Actual	Assessment Yes = 2, Partial = 1 No = 0, N/A = X	Comment
Training plan					
LINC RC and MSSN	80%				
HBB	80%				
Quarterly update	1 per unit				
Clinical mentoring	1 per month				
“Fire drills”	1 per month				
Total score	Max possible		Actual		Score (%):

ACTION PLANS FOR IMPROVED NEONATAL CARE

1. Targets for improving neonatal mortality

	Current level	Target for next year	Target for 3 years	Provincial Target	
ENND / 1000 > 999g				8	
ENND / 1000				10	
LNND / 1000				2	
NND / 1000				10	
ENND /1000 (BW >2500g)				4	
ENND / 1000 (BW 1500 - 1999g)				50	
ENND / 1000 (BW 1000 –1499g)				150	
% Admissions to Neonatal Unit				15%	
% Admissions from Referral Area (RH)				5%	

2. Action plans

Area requiring action	Problems identified	Actions to be taken	Resources required	Time line and person responsible	Follow up on progress
Advocacy					
Neonatal Resuscitation					
Routine care in postnatal ward					
Neonatal Facility					
Infection control					
Equipment					
Kangaroo care facility					
Medical staffing					
Nursing Staffing					
Staff development					
Policies					
Guidelines and protocols					
Training and learning					
Neonatal referral					
Neonatal transport					

Appendix 3.2

Essential Newborn Care Situation Assessment Tool: District and Provincial Newborn Services

For use by district and provincial neonatal coordinators and lead clinicians to evaluate Essential Newborn Care Services and plan and prioritize improvement and support

If using it at provincial level, then print additional pages for the evaluation of each district

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ESSENTIAL NEWBORN CARE: PROVINCIAL OR DISTRICT IMPROVEMENT TEAM

List the key role players in neonatal improvement in your province and districts. Include external members, and assessors who will do neonatal accreditation

	Name	Telephone Fax	Email address
Head of Health			
MCWH manager			
Child Health Manager			
Tertiary and Regional Hospitals			
District Hospitals			
Provincial Paediatrician			
Paediatrician at Tertiary Centre			
Regional Paediatrician			
Neonatal Nurse co-ordinator			
Neonatal Nurse trainers			
PPIP and DHIS data coordinator			
Neonatal nurse			
Advanced midwife			
Community representative			
What else does the provincial neonatal coordinator do?			
External assessors			

1. NEONATAL AND PERINATAL DATA

Perinatal and Neonatal Summary Data for each Hospitals in a District

(Duplicate for each district)

District _____

Regional Hospital							
District Hospital							
Total live births for facility							
Total live births in facility and clinics							
Total live births in district							
ENND / 1000 > 999g							
ENND / 1000							
LNND / 1000							
NND / 1000							
ENND (BW >2500g)							
ENND (BW 1500 - 1999g)							
ENND(BW 1000 – 1499g)							
ENND (BW > 999g)							
% Admissions to Neonatal Unit							
% Admissions from DH							
LBW %							
Cause of death in babies > 999g (% of deaths)							
1. Immaturity							
2. Hypoxia							
3. Infection							
4. Cong abnormality							
5. Other							

Summary data for all districts

							Total
District							
Total live births							
ENND / 1000 > 999g							
ENND / 1000							
LNND / 1000							
NND / 1000							
ENND (BW >2500g)							
ENND (BW 1500 - 1999g)							
ENND(BW 1000 – 1499g)							
ENND(BW > 999g)							
% Admissions to NNU							
LBW %							
Cause of death in babies > 999g (% of deaths)							
1. Immaturity							
2. Hypoxia							
3. Infection							
4. Congl Abnormality							
5. Other							

	Provincial Target	District Target				
ENND / 1000 > 999g	8					
ENND / 1000	10					
LNND / 1000	2					
NND / 1000	10					
ENND /1000(BW >2500g)	4					
ENND / 1000 (BW 1500 - 1999g)	50					
ENND / 1000 (BW 1000 –1499g)	150					
% Admissions to Neonatal Unit	15%					
% Admissions from Referral Area (RH)	5%					
SB Rate /1000						
PNMR /1000						
PNMR / 1000 (BW > 999g)						
PCI						
% Caesarean sections						

2. FACILITIES AND BED NUMBERS

List the following for all facilities. (Make additional copies for each district)

District							
2.1 Bed number and facilities							
Hospital Name							
No of Deliveries in last year							
Level of care							
Required beds							
Actual HC/ICU							
Actual SC/KMC							
Total							
Deficit of beds							
2.2 Additional facility requirements for neonatal unit							
Air-conditioning required							
Electrical requirement							
Oxygen requirements							
Medical Air requirements							
Infection control needs							
Administrative and utility areas							
What are the immediate and long term plans for facility							
1. No Changes							
2. Small structural changes to be done locally							
3. Minor extensions							
4. Addition of new unit							
Estimated costs:							
Priorities							

3. EQUIPMENT REQUIREMENTS

Hospital							
Incubators							
Phototherapy units							
Bilirubin meters							
Electronic scales							
Ventilators							
Nasal CPAP							
Pulse oximeters							
Oxygen blenders							
Apnoea monitors							
Transillumination light							
Infusion controllers							
Resuscitaires							
Neonatal Bag Valve Mask							
Priorities for the district							
Estimated cost							

4. TERTIARY NEONATAL UNIT

Bed Numbers	
Bed requirements	
Facility requirements	
Equipment requirements	
No of paediatricians and neonatologists	
Recruitment and advertisement required for specialists	
Neonatal Nurse requirements and recruitment plan	

5. REGIONAL NEONATAL UNITS

Bed requirements	
Beds available	
Facility requirements	
Equipment requirements	
Paediatric recruitment strategy	
Costs	

6. NEONATAL TRANSFER AND TRANSPORT

Dedicated neonatal transport in the province	
Are all ambulances equipped for neonatal transfers	
Training and skill of EMS staff in neonatal transfer	
Are there referral guidelines in place	
Are the referral guidelines implemented and if not what are the constraints.	
Plans for neonatal transport	
Cost implications	

7. NEONATAL IMPROVEMENT PROCESS

What neonatal improvements teams are in each district?	
What advocacy is planned in each district For community For managers For health workers	
What neonatal improvement activities are in place in each district to improve newborn care?	

8. NEONATAL JOB AIDS IN THE PROVINCES

Comments on what is in place, and what plans are to develop these

Provincial Neonatal norms and standards, consultation and agreement	
What neonatal guidelines are to be used at level I,II, III facilities?	
Provincial Neonatal record? Include transfer form?	
Provincial observation charts	
Other Job Aids	

9. NEONATAL TRAINING

Neonatal skills development and training plans	
HBB Master trainer	
HBB training needs and plans	
HBB facilitator needs	
HBB Workbooks and mannequins required	
Advanced neonatal resuscitation Master trainer	
Advanced Neonatal resuscitation needs and plans	
Mannequins and material required	
LINC Routine care and MSSN master trainers	
Plans for LINC Routine care training	
Plans for LINC MSSN PN training	
Plans for LINC MSSN EN training	
Plans for LINC Doctors Training	
Plan for neonatal ICU training	
Arrangement for in-service training and mentoring in each district	

10. ACCREDITATION

Accreditation team in place	
Accreditation standards set	
Process of Accreditation determined	
Hospital preparation and support	
Accreditation visits	

SUMMARY OF ACTION PLANS

Area	Activities	Steps	Time line and person responsible	New resources	Progress
Targets for districts					
District Hospital Facilities					
Equipment					
Regional Facilities					
Tertiary facilities					
Training					
Job Aids					
Referral policies					
Neonatal improvement process					
District specialists					
Accreditation					

Appendix 3.3

Essential Newborn Care

Newborn Admission Record

CHAPTER FOUR: ESSENTIAL NEWBORN CARE: ADDITIONAL RESOURCES

ESSENTIAL NEWBORN CARE

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1. LINC TRAINING MATERIALS

Limpopo Initiative for Newborn Care has developed a number of training materials on Routine and Basic Newborn Care that can be used to run training courses, to conduct in-service training and do self study.

THE MANAGEMENT OF SICK AND SMALL NEWBORN CHARTS AND TRAINING MANUAL

Provide an approach to the assessment, classification and management of sick and small (i.e. preterm and low birth weight) babies from birth, during their stay in a health care facility up to the time of discharge, and follow up.

The purpose of the training is to acquire the competencies to care for newborns. A range of adult learning methods are used, these include reading and self study, discussion, and case based learning, group discussions, visual presentations and clinical practice. The training manuals are intended for in-service training of health care workers who already have basic training in maternal and newborn care. However the material can be adapted for pre-service training, and self-study.

ROUTINE CARE OF NEWBORNS

The Routine care charts are intended for the management of all newborns in labour ward, and postnatal ward, and provide the health worker with a step by step guide to care of neonate, from resuscitation to discharge home. Helping Babies Breathe is incorporated as essential neonatal resuscitation training for all health workers.

The module on Routine care is intended for use at facility level either as a one day course, in-service training or self learning.

THE FACILITATOR MANUAL will assist the facilitator to;

- Identify competencies required by the health workers in the district or facility
- Determine who in the district needs training
- Plan training for the facility or district to meet this need
- Draw up a course schedule for the training
- Prepare for the training course
- Review facilitator skills
- Monitor and evaluate the individual learners on the training course
- Monitor and support trained health workers after training

The facilitator's manual is supported by a CDROM that contains all the training materials, trainee manuals, exercises, pre and post tests, monitoring tools, and Power Point and video presentations.

1. ASSESS TRAINING NEEDS

1.1. Identify the staff working in the maternity and newborn care section in your health facility or district:

- Paediatricians
- Doctors
- Neonatal Nurses
- Midwives
- Enrolled nurses and Enrolled Nursing Assistants

Establish if the staff are permanently placed in maternity or newborn care, or do they rotate. If they rotate what percentage of staff are permanently placed? If a large percentage of staff rotate, then address this problem before planning for training.

The situation assessment done on facilities as part of the broader newborn care improvement plan will also assist you to determine who needs to be trained.

2. Determine what maternal, newborn, paediatric, PMTCT and infant training the staff have already had. The training that they might have attended or courses completed include:

Doctors:

- Diploma Child Health
- 2 day LINC training course
- Mother and Infant HIV course
- PMTCT training and updates
- Self study of PEP Newborn Care Manual
- Newborn resuscitation: Advanced, and “Helping Babies Breathe”

Professional Nurses

- Diploma in Advanced Midwifery
- Diploma in Neonatal Nursing
- LINC training for Professional nurses
- PMTCT training and updates
- Mother and Infant HIV course
- Lactation management / BFHI course
- Self study of PEP Newborn Care Manual
- Newborn Resuscitation: Helping Babies Breathe

Enrolled nurses

- LINC training course
- Lactation management / BFHI course
- Self study of PEP Newborn Care Manual (At least the Primary Newborn Care Manual)
- Newborn resuscitation: “Helping Babies Breathe”

3. Evaluate the newborn care competency requirements. “A competency is a blend of skills, abilities, and knowledge needed to perform a specific task.” Identify the competencies required by different health workers, and plan the training to ensure that these competencies are met. Acquiring and sustaining the competency require repetition of the activity and follow up. A programme of mentoring and support is suggested. The list below identifies the competencies addressed by the charts and training package. It also lists the competencies required for different categories of staff. The staff and competencies may differ in your situation, so a blank chart is included for your use.

Competency	Sub competency	MO	Paed MO	Advance midwife	Neonatal Professional Nurse	Midwife	Neonatal EN/ENA	MSSN module and lesson number	Other material
		✓	✓	✓	✓	✓	✓		
Resuscitate the newborn at birth	Basic resuscitation	✓	✓	✓	✓	✓	✓		Helping Babies Breathe
	Provide Advanced resuscitation	✓	✓	✓	✓				NRP APLS PALS SAMA/FM
Provide routine care to newborns at birth	Provide routine care and triage in labour ward			✓	✓	✓	✓	Mo	
	Assess the newborn after birth	✓	✓	✓	✓	✓		Mo	PEP
	Provide routine care in postnatal ward	✓		✓	✓	✓	✓	Mo	PEP
	Discharge and make a follow up plan	✓	✓	✓	✓	✓	✓	Mo	
	Assess and support breastfeeding	✓	✓	✓	✓	✓	✓	Mo	IMCI, Lactation management
Assess and classify the sick and small newborn	Assess and Classify need for emergency care	✓	✓	✓	✓	✓	✓	M1, L2	
	Assess and Classify priority signs in newborns	✓	✓	✓	✓	✓	✓	M1, L2	
	Assess abnormalities	✓	✓		✓	✓	✓	M1, L3	PEP
	Assess local infections	✓	✓		✓	✓	✓	M1, L3	PEP
	Assess risk factors	✓	✓	✓	✓	✓	✓	M1, L4	PEP
Provide supportive care to newborn to maintain homeostasis	Observe for, prevent, and manage hypothermia	✓	✓	✓	✓	✓	✓	M2, L5	PEP
	Observe for, prevent, and manage hypoglycaemia	✓	✓	✓	✓	✓	✓	M2, L7	PEP
	Provide safe Kangaroo Mother Care	✓	✓	✓	✓	✓	✓	M2, L5	
	Provide safe oxygen therapy	✓	✓	✓	✓	✓	✓	M2, L6	PEP
	Provide safe feeds and fluids to babies	✓	✓	✓	✓	✓	✓	M2, L8	PEP
	Safely transfer babies	✓	✓	✓	✓	✓	✓	M2, L10	
Diagnose and manage common specific newborn problem	Manage babies with respiratory distress	✓	✓	✓	✓			M2, L11	PEP
	Manage babies on CPAP	✓	✓	✓	✓			Additional Lessons	
	Manage low birth weight babies	✓	✓	✓	✓		✓	M2, L12	PEP

	Manage babies with infections	✓	✓	✓	✓			M2, L13	PEP
	Prevent and manage neonatal encephalopathy	✓	✓	✓	✓			M2, L15	PEP
	Prevent and manage neonatal jaundice	✓	✓	✓	✓	✓	✓	M2,L16	PEP
	Manage congenital abnormalities	✓	✓	✓	✓			M2,L17	PEP,
	Manage exposure to HIV, TB and syphilis	✓	✓	✓	✓	✓	✓	M2, L18	PMTCT
Counsel mother to care for her newborn	Assess feeding and growth and counsel on feeding	✓	✓	✓	✓	✓	✓	M3, L19, L20, L21	IMCI Lactation management
	Counsel mother on care, when to return	✓	✓	✓	✓	✓	✓	M3, L22	
Ensure a clean, safe and friendly newborn environment		✓	✓	✓	✓	✓	✓	M2, L9	

2. Plan for training courses, or in service training

Based on your training needs and the resources you have for training (facilitators, clinical care load, classrooms, accommodation and meal budget), plan training that will be feasible in your area. Some of the considerations are as follows;

METHOD OF TRAINING AND LEARNING

A number of training methods are proposed, with the requirements for each and the advantages and disadvantages. Select training that will meet the need, in order to ensure competent care of newborns in your facility or district.

1. Training courses for 2 – 5 continuous days

The training course will run for 2 – 5 continuous days, depending on who will be attending. The number of days required are;

- Doctors: 2 days
- Professional Nurses in Neonatal unit: 5 days
- Professional Nurses in Clinics and Maternity Ward: 2 – 3 days
- Enrolled Nurses in the Neonatal unit: 5 days
- Enrolled Nurses in the Maternity Ward: 2 - 3 days

The Facilitator / participant ratio for the different courses is as follows:

	Enrolled nurses	Professional Nurses	Doctors
Facilitator / Participant ratio	1 : 4	1: 4	1: 5 -6

It is not advisable to train more than 16 participants at any one time, which would require 4 facilitators. The number that can be trained will also depend on the case load in the neonatal unit. The course includes 2

hours of practical work in the ward each day, and it is essential that there are enough sick and small babies for participants to get adequate clinical exposure.

No of clinical cases in the neonatal ward

	Enrolled nurses	Professional Nurses	Doctors
Clinical Case Load in Neonatal unit	12 cases:4 participants	18 cases :8 participants	18 cases:6 participants

Continuous doctors and nurses courses can only be run at large regional or tertiary facilities to ensure an adequate number of clinical cases for learning.

Training is done in small groups of up to 8 so a separate classroom is required for every 8 participants.

Overnight accommodation is required unless participants are able to travel to and from the venue, without compromising 8 hours of daily training time.

The advantage of the continuous training is that participants are away from their work and can focus on the training content. The disadvantage is that they do not integrate the training into their work as they learn.

2. Training course for 1 day a week, until training completed

The training courses offered in the continuous course can be offered, according to the same training schedule, but participants come for training for one day every week, until the training is complete.

The requirement for this training is similar to the above facilitator ratio, but does not require accommodation or necessarily meals (participants could bring their own food if there is no budget for this) Courses can possibly be run for fewer people, perhaps 8 with one facilitator and the case load in the ward can be reduced to 12, as participants will see different cases each week they attend. An essential requirement is that participants be on time and have 8 hours of training time, and commit to attend every session.

Advantages of this method are that it is less expensive and can be done with fewer participants and in the context of a small case load (a larger district hospital and smaller regional hospital). As training happens over a number of weeks, participants have the opportunity to integrate their learning into the work they do.

The only disadvantage is that regular attendance by participants may be difficult to ensure.

3. Distance based learning

The training can be done on distance based learning method, and in future we hope to introduce an e-learning component.

Participants can read the material, go through the presentations on a computer and watch the videos on a computer and then answer the exercises. They can either check the answers against the correct ones, or send them to a facilitator for correction.

The full 5 day course includes 15 hours of practical training, so it is suggested that participants doing the distance learning, come in for 2 continuous days or 2 separate days for overview and discussion with a facilitator and clinical practice. The clinical practice will need to be done at a hospital with a large case load, to ensure adequate clinical practice.

Requirements will include reading skills, access to a computer or DVD and self motivation. The advantage is that health workers who are far away from a main centre can access this training, without having to be away from their clinical station for too long.

4. In-service training

An in-service training programme can be developed for a facility. Using this approach 2 hours would be set aside each week or month for in-service training. Participants would have pre-reading to do before the in-service training. 40 minutes would then be spent on summarizing the reading and going through the exercises, there would then be two 40 minute practical sessions.

The in-service training approach would usually require an on-site or visiting facilitator. An interested doctor could also facilitate and participate in preparing and presenting the practical sessions. All categories of health worker would participate

The advantage of this model is that all health workers at the facility learn together and it also represents an opportunity for problem solving and quality improvement.

COURSE SCHEDULES

Attached are a number of suggested course schedules dependent on the course you choose. You can select one of these schedules or adapt it to the requirements of your training

Management of sick and small newborns (MSSN)

A1 - 5 day course for Professional Nurses (PN) and Midwives

A2 - 2 day course for Doctors

A3 - 5 day course for on MSSN and RCN for Enrolled Nurses (EN)

A4 - 5 day course (1 day / week) for Professional Nurses (PN)

A5 - In-service training course for the Newborn team

Basic Newborn Resuscitation (BNR)

B1 - Facility based resuscitation course

B2 - Resuscitation drill

Routine Care of Newborns (RCN) in maternity and PHC facility

C1 - 2 day course (incorporating resuscitation) for Maternity and PHC staff

Course	Description	Facilitators	Classroom	Practical	Suggested venue	Material for Classroom	Equipment for classroom
A1: MSSN 5 day course Prof Nurses / midwives	5 day central course 8 hours per day Accommodation may be required	Newborn Care Facilitator: Participant 1: 4	Classroom for 20 Break away room for 8	Neonatal unit with 30 + SS newborns	Tertiary regional hospitals if adequate facilities	Newborn Charts Trainee Manual MSSN Exercises & Practicals	Laptop & Speakers Data Projector & Screen TV and DVD video Whiteboard / Flipchart Pens Posters & Prestik
A2: MSSN 2 day course Doctors	2 day central course 8 hours per day Accommodation may be required	Neonatologist & Paediatrician NCF or doctor for practical 18:3	Classroom for 20	Neonatal unit with 30 + SS newborns	Tertiary Regional	Newborn Chart Trainee Manual Exercises / Practical for doctors	As above
A3: MSSN and RCN 5 day course Enrolled Nurses	5 day central course 8 hours per day Accommodation or run one day a week x 5	NCF 1:6 2:12 3:18	Classroom	Neonatal unit with 15 +SS babies	Regional hospitals	Newborn Chart Trainee Manual	As above
A4: MSSN 1 day a week for 5 weeks Facility based course	Regional hospital or facility based course 5 separate days 5 hours per day 3 hours per week self study	Newborn Care Facilitator Paediatric doctor	Classroom	Neonatal unit with 10+ SS babies	Regional and large district hospitals	Newborn Chart Trainee Manual	As above
A5: MSSN Facility based in-service training	Facility based course 2 contact hours per week for 10 weeks, 2 hours of self study / week	NCF Paediatrician or Paed MO	Classroom	Neonatal unit with 10+ SS babies	Regional and large district hospitals	Newborn Chart Trainee Manual	As above
B1: BNR Half-day course	4 hour course to be run in the district and at facilities	Newborn Care Facilitator	Classroom	-	All facilities District		
C1: RCN 2 day course Prof Nurses / midwives	2 day district based course 6 hours per day on 2 separate days with reading OR 2 full days	Newborn Care Facilitator	Classroom	Neonatal unit with 10+ SS	District Regional hospital	Newborn Chart Trainee Manual	As above

2. PERINATAL EDUCATION PROGRAMME

INTRODUCTION

Each year approximately 4 million infants die worldwide in the first four weeks of life. The vast majority of these neonatal deaths take place in under-resourced countries such as those of Southern Africa. Enormous disparities exist between rich and poor countries with an estimated neonatal mortality rate of 44 per 1000 live births in Africa compared to 4 per 1000 live births in high income countries. The fourth Millennium Development Goal calls for a two thirds reduction in child deaths under the age of 5 by 2015. In South Africa almost a third of these deaths occur in the neonatal period. Therefore, a substantial improvement in neonatal mortality is needed to meet this challenge of improving childhood survival in South Africa.

NEONATAL DEATHS IN SOUTH AFRICA

An estimated 1 million births and 25 000 neonatal deaths occur annually in South Africa with a neonatal mortality rate of 21/1000 live births. Two thirds of these deaths fall in the first week of life. The main causes of these early neonatal deaths are low birth weight, intrapartum hypoxia, infections and congenital malformations. A review of avoidable factors identified inadequate clinical assessment and management of newborn infants by health professionals as major contributors to preventable mortality.

In a three year study of perinatal mortality in the Western Cape Province of South Africa it was found that early neonatal mortality rates varied widely between different districts and were highest in those districts furthest away from metropolitan areas where training support was weakest. Some rural areas with relatively few low birth weight infants had a higher than average perinatal mortality rate suggesting inadequate health care services. Therefore, any attempts to reduce neonatal deaths would have to concentrate on rural areas where living standards are often poor and health needs greatest.

Neonatal care is largely dependent on adequate numbers of well trained midwives and neonatal nurses as they provide most of the primary health care in South Africa. They should be supported by doctors and administrators who can optimize the service they provide. In addition, easy community access to good health facilities, sufficient and appropriate equipment and medication, and an integrated, regionalized system of planning, management, communication and transport are needed. But the most important element is well trained, motivated and compassionate nurses. This demands both excellent basic training and an efficient system of continuing education.

Traditional methods of in-service training rely on centralized teaching of small groups of health professionals in the academic units of large city hospitals. Much of what is taught in these tertiary hospitals is not put into practice as it is inappropriate to the needs in peripheral hospitals and clinics and may not be applicable due to a lack of the necessary equipment, medication and support systems. Centralized courses are also expensive and need accommodation, depend on a scarce resource of competent trainers, and require participants to travel long distances and leave their families and places of employment for variable periods of time. Many health professionals are denied study leave due to staff shortages. While there is still a place for centralized training in advanced courses, this does not meet the needs of most primary health care professionals in South Africa.

Many years back the provincial system of bringing nurses and doctors to regional hospitals for update courses was changed to regular visits by teams of trainers to rural districts where one and two day update courses were conducted. Formal lectures were given, discussion groups facilitated, audit sessions arranged and selected skills taught. Although this system of taking the teachers to the rural areas was

partially successful, it was limited by travel costs and excessive demands on a few teachers. Occasional teaching sessions by visiting experts are no substitute for a well planned programme of ongoing education. The pernicious system of rotating staff also prevents the retention of knowledge and skills within a paediatric unit.

The experience with staff exchanges and a cascade approach to train-the trainers has been disappointing while computer-based internet training is not practical in most under resourced areas.

In order to avoid these obstacles, what is needed is a simple, cheap, decentralized and effective means of learning which does not depend on large numbers of formal tutors, avoids moving participants away from their homes and work stations, and provides appropriate and applicable ways of improving knowledge, clinical skills, attitudes and service delivery. Every effort should be made to encourage confidence and self-reliance rather than foster dependency and self-doubt.

THE VISION OF SELF-EMPOWERED CONTINUING EDUCATION FOR PRIMARY HEALTH CARE WORKERS

To address these many challenges in South Africa, the Perinatal Education Programme (PEP) was developed by a team of midwives, neonatal nurses, obstetricians and neonatologists to empower both nursing and medical personnel to take responsibility for their own continuing learning and professional growth. The Programme is based on the belief that health professionals can, with support and encouragement, manage their own training programmes. This very cost-effective community-based method of peer assisted learning used in PEP has many advantages and can rapidly be rolled-out to large numbers of professional health care workers.

STRUCTURE OF THE PERINATAL EDUCATION PROGRAMME

The PEP courses are written by members of a multidisciplinary editorial board and then review by invited experts in the field. New developments in care practices and feedback from participants are used to regularly update the learning material.

The 15 most important topics in both maternal and newborn care are addressed in the basic programme which is used as two separate courses over 2 years. Each chapter covers the epidemiology, prevention, causes, presentation, danger signs and management relevant to that topic. Using a simple question-and-answer format, the relevant content of each condition is presented in “bite sized chunks”. Each answer leads the learner to the next question. In this stepwise fashion all the important information is mastered. Case studies at the end of each chapter give clinical scenarios followed by further questions and answers. This pulls all the newly learned knowledge together into “real life” situations. Flow diagrams summarize important diagnostic and management protocols.

Twenty multiple choice questions at the start of each chapter allow the participant to identify knowledge gaps while a post test indicates what information has still not been learned. In this way, participants can monitor their own progress through the course and be encouraged by the measured amount they have learned. Most chapters have an attached skills workshop which uses clear instructions and simple line drawings to explain important clinical skills to be learned.

The courses are presented as study books which are most practical for learning at home, at work or while travelling by bus or train.

A formal multiple choice examination is offered at the end of each course. The study group has to find a local invigilator to manage the examination and a mark of 80% is required to pass. Candidates using the

internet-based programme can complete the final examination on the website. Successful candidates are given a certificate of course completion.

IMPLEMENTING THE PERINATAL EDUCATION PROGRAMME

PEP uses a system of peer tuition and co-operative learning where participants encourage and support each other in study groups while learning most of the material on their own at a convenient time. These self-directed learning groups, which meet every few weeks, should be supported by regional facilitators who can introduce the programme and encourage participation, obtain consent from health managers, help to arrange a suitable venue and time for the meetings, order the study books, provide guidance in the study method, assist with hands-on skills training, field queries and give support, and manage the final examination. It is important that the facilitator does not take on the role of teacher and control the process as this disempowers the participants and returns them to the position of passive students. The additional help of a local mentor is invaluable.

The development of PEP courses is funded through the not-for-profit Perinatal Education Trust and Eduhealthcare and published by Electric Book Works.

ASSESSING THE IMPACT OF THE PERINATAL EDUCATION PROGRAMME

Initial field studies showed that groups of midwives and neonatal nurses, both in urban and rural hospitals, could significantly increase their knowledge of perinatal care when using PEP in self-study groups. This was followed by prospective trials of the Maternal Care book, by Professor Gerhard Theron, and the Newborn Care book, by Dr David Greenfield, with midwives and nurses in district hospitals and local antenatal clinics in the Eastern Cape Province. Groups of participants, who supported each other, without a formal trainer, significantly improved their knowledge, clinical skills, attitudes and quality of patient care.

A multiple choice test of 74 questions plus 5 case studies with a further 35 questions was used to determine their cognitive knowledge of newborn care. Without prior warning, the same evaluation was used at the end of the study. There was a highly significant improvement of knowledge from a mean pretest score of 55% to a mean post test score of 88%. An objective structured clinical evaluation (OSCE) was used to assess five practical skills before and after the course. The skills, chosen from the skills workshops in the course, were the physical examination of an infant, scoring gestational age with the Ballard method, endotracheal intubation of a manikin, inserting a venous catheter into a segment of umbilical cord to simulate umbilical vein catheterization, and the measurement of blood glucose concentration with a reagent strip. There was a highly significant increase from 45% to 83% in the mean total score. There was also a highly significant improvement for each skill tested.

Finally patient care practices were assessed by chart reviews of clinical records over a period of 6 months before and after the course. Records of infants weighing less than 2000 g or 4200 g or more at birth were chosen as were infants with an Apgar score below 7 at 1 minute plus any other newborn infant admitted to the special care nursery. In addition, the record of a normal infant was selected for every four infants selected for each of these high risk categories. The 4 criteria assessed in each record were observations made on the infant, quality of notes written, identification of problems, and management given. Criteria were scored at less than 12 hours and then again at 12 to 72 hours. There was a highly significant improvement in both the individual categories and the total scores.

This systematic evaluation documented that a group of nurses, without formal tuition, could successfully use the Newborn Care book of PEP to improve their knowledge, skills and provision of newborn care.

THE PROMISE OF SELF-HELP LEARNING FOR ALL HEALTH PROFESSIONALS

It is now possible for all nurses and medical officers providing primary healthcare for pregnant women and their newborn infants to access on-site continuing education courses. Most of the previous obstacles of traditional training have been removed. The promise of this self-help method is that newborn care should improve and morbidity and mortality will fall. This education opportunity must be incorporated as an integral part of a wider programme to address the needs of primary health care in South Africa. A well structured network of regional facilitators to assist with group education should greatly enhance the implementation.

The Perinatal Education Programme has been used by over 70 000 nurses, doctors and under graduate students in South Africa in the past 20 years. Common learning material for nurses and doctors, in both basic and in-service training, has helped to correct the previous fragmentation between health professionals in training and practice.

An additional 7 short courses address important maternal and newborn topics such as primary newborn care (clinic based), mother and baby friendly care, maternal and perinatal audit, perinatal HIV, and birth defects. The content of the learning material used in these courses is available on an open website (www.EBWhealthcare.com).

This cheap and successful method of self-empowered learning could be used as part of an integrated package to address the training needs of most nurses in South Africa who care for newborn infants

3. NEONATAL EXPERIENTIAL LEARNING SITE

Introduction

“For the things we have to learn before we can do them, we learn by doing them.” Aristotle^{1,2}

“Tell me and I will forget, show me and I may remember, involve me and I will understand.” Confucius^{2,7}

Currently training of healthcare workers, particularly doctors, is strongly focused on self-directed, experiential learning. Experiential learning in healthcare is learning from experience, focusing on the learning process for the individual. It enables learners to learn from and give meaning to their own experiences, to learn about their own beliefs and values and to apply this in providing meaningful healthcare for their patients.³ According to David Kolb it is dependent on the learner's: willingness to be actively involved in the process; ability to reflect on, analyze and conceptualize the experience; and his possession of decision making and problem solving skills in order to use the new ideas gained from the experience.^{2,4} Effective and passionate facilitation plays a key role in experiential learning by ensuring learners remain stimulated and focused but can be challenging for educators experienced in more traditional methods. On the down side experiential learning can be very time consuming, expensive and in some situations threatening to the learners.³ It is dependent on the learner's confidence in a particular subject at a particular time and his or her own prior experiences and circumstances. Effectiveness of learning therefore, becomes context specific.⁵

“By three methods we may learn wisdom: First by reflection, which is noblest; second, by imitation, which is easiest; and third by experience, which is the bitterest.” Confucius.⁷ According to Keil: “How can I learn what I don't know when I don't know what I don't know?”⁶ Evidence shows that self-directed learning does not necessarily lead to autonomy or improved outcomes but never the less is high quality learning.⁵ When caring for the most vulnerable and fragile in our society –neonates, particularly those at risk or critically ill can we afford the luxury of learning from our bitter mistakes, of trying to “learn what we don't know” albeit quality education?

Objective:

To introduce a Neonatal Experiential Learning Site (NELS) with a clinical governance structure in order to improve the standard of neonatal care in Area Two KZN thereby reducing neonatal morbidity and mortality.

Background:

21 300 babies die in the first month of life each year in South Africa⁸ and about the same number are still born. In 2000 South Africa committed itself to the Millennium Development Goals (MDGs). MDG 4 calls for a 2/3rd reduction in child mortality. Worldwide forty one percent (41%) of child deaths occur in the 1st month of life-the neonatal period.⁹ South Africa is one of only 8 countries worldwide whose neonatal mortality is climbing.⁹ Some countries with similar gross national incomes e.g. Brazil and Egypt have halved their under 5 mortality.¹¹ South Africa needs an average reduction of 14% per year in order to achieve MDG 4.¹¹ In order to reduce child deaths neonatal mortality must be reduced.

According to the Every Death Counts and 6th Saving Babies 2006/2007 reports South Africa's Neonatal Mortality rate (NMR) is 21/1000(est.), Stillbirth rate is 23/1000 and Perinatal Mortality Rate (PNMR) 31.1/1000. ¹²Perinatal Mortality in developed countries is < 10/1000 and developing countries < 50/1000.¹³ As an emerging economy South Africa's rates are unacceptably high in comparison to health expenditure.

Prematurity, sepsis and birth asphyxia have been identified as leading causes of neonatal deaths and stillbirths.¹⁰ Health delivery is hampered by inaccessible services, insufficient facilities, poor physical infrastructure, inadequate equipment and problems with staffing-too few, inexperienced and unsupported with limited skills. Simple inexpensive interventions e.g. Basic antenatal care (BANC), skilled birth attendants, resuscitation, basic care of the new-born and kangaroo mother care (KMC) amongst others have been identified as effective at reducing these deaths.¹⁴ The Saving Babies 2006/2007 report made the following recommendations-Train staff in basic neonatal care including: resuscitation, feeding and fluids, recognition and management of common conditions (especially sepsis); Produce standardised guidelines; Provide essential equipment and sundries including nasal CPAP; Implement KMC; Improve neonatal transport.¹²

Figure 1 Estimated distribution of direct causes of 4 million neonatal deaths for the year 2000. Based on vital registration data for 45 countries and modelled estimates for 147 countries.¹⁰

Context

KwaZulu-Natal (KZN) has a population of ten million people- 3.5 million of which are children under 15 years. There are 3, 300,000 annual births with a neonatal Mortality of 11/1000 (est.) and a life expectancy of 43 years. Of this population 1.1 million earn < R8 (\$1)/day. Of prime importance though- KZN is the epicentre of the HIV pandemic with a prevalence of 38.7:1000.^{13,15}

Area Two is the western most of three areas in KZN. Its population of three million people¹⁵ is divided into five districts. They are served by nineteen hospitals: one level 3 hospital, four level 2 hospitals and fourteen level 1 hospitals.¹⁵ There are about 60 000 children to every one paediatrician.¹⁵ In 2007 The 53 000 babies born annually¹⁵ had access to ten Neonatal ICU beds (ventilated), one neonatologist and one neonatally trained registered nurse. The stillbirth rates (SBR) in three of the districts were above the national average (one of which was the worst in the country at 35/1000¹³), as were the PNMR in a third of districts.¹³

The ability to provide advanced neonatal care was limited due to inadequate facilities. The beds at the tertiary hospital were permanently filled, with a waiting list. It was therefore evident that it was necessary to increase capacity at lower levels. It was assumed that by improving the standard of care at these levels it would decrease the number of inappropriate babies requiring tertiary care. This involved a paradigm shift in focus from in-patient curative care to caring for the catchment population. Holistic care must be provided including preventative, promotive, curative and rehabilitative care. There must be equitable access to uniform standards and levels of care. Norms and standards must be set and monitoring and evaluation must be implemented. This required the introduction of a clinical governance program for neonatal care in Area Two.

Method and results



A full time coordinator was appointed to run the program supported by a team of paediatric and neonatal consultants doing monthly hospital visits. The initial plan was to conduct preliminary visits to two or three hospitals, offer an experiential learning programme, support implementation via regular visits, wean, and then begin again with further hospitals. For the first year, due to the small number of hospitals involved, hospitals received weekly visits. However this plan had to be amended as the program was rolled out. It became apparent that in order to ensure on-going compliance visits could not be stopped as planned. The ability to build on capacity was hindered due to high staff turnover/rotation and poor support from hospital and district management. As hospitals began to show interest they were added to the program. This naturally meant a weaning of the frequency of visits to all the

hospitals in the program. Unfortunately as the frequency of visits decreased so did the rate and maintenance of implementation. The whole program aimed at ensuring the implementation of the 6 tiers of clinical governance at each hospital with specific reference to neonatal care. The program is on-going and continues to enrol new hospitals and support existing ones.

1. Infrastructure development

Infrastructure refers to the provision of appropriate facilities and equipment. Norms were developed for the design of maternity units with nurseries and when new stand alone units were planned or units upgraded the coordinator worked with the provincial architect and local staff to design appropriate facilities. The required number of neonatal beds, spacing, services e.g. gas and electrical points, and equipment required for each bed and unit had all been stipulated based on international norms. Hospital management was encouraged to include gradual achievement of these norms in their five year plans. Hospitals were also assisted with requesting and assessing specifications, and advised on recommended providers and models of equipment. Hospitals were guided in establishing an equipment maintenance system including a daily equipment checklist and an equipment register tracking purchase details, servicing, repair and monthly stock taking. Nurses were regularly supported in developing technical skills to manage the equipment purchased.

Progress to date:

One new neonatal unit has been built, two substantially upgraded and one is in the process of being upgraded. Equipment resources have substantially improved in 5 hospitals (now close to stipulated norms) Funding provided through Fuchs™ helped in the provision of vital equipment to some hospitals in the area. However ongoing problems at the provincial Health Technology Unit (HTU) are greatly affecting hospitals ability to maintain their equipment. Liaison is on going with Central Provincial Stores and the HTU to try and facilitate procurement and maintenance of equipment. There is improved spacing in 5 hospitals. An equipment register has been developed and is awaiting printing and binding. A computerised version is under construction.

2. Staffing

Staffing incorporates both numbers and training of staff. This aspect of clinical governance was the main focus of the programme and involved many challenges.

Internationally, stipulating staffing norms has been problematic as differences in context and staffing and patient profiles make ascertaining evidence based ratios difficult. In addition once stipulated there is an expectation to deliver which many countries or hospitals are unable to do, conversely hospitals that have more staff than the stipulated norms may proceed to decrease their numbers in line with cost containment.

National decentralised post basic neonatal nurse training is not available in the country although Pretoria University is offering residential programme in advanced neonatal care. Doctors, professional nurses and other professional healthcare workers receive very little neonatal focus during their basic training. The implication thereof is that these healthcare professionals are expected to make crucial decisions regarding the neonates' health, without sufficient knowledge or experience of basic neonatal care. The lack of training, knowledge and skills results in inadequate neonatal care and a fear and reluctance of healthcare professionals to practice in units where neonates are cared for. Advanced midwives in general are allocated in labour wards or maternity units and very few choose to develop their neonatal skills. The neonatal units are frequently staffed with junior inexperienced nurses allocated regardless of preference and managed by whichever doctor is available daily. Staff receive very little supervision or guidance from seniors as the seniors are frequently overwhelmed with administrative duties, not present in the unit or lack knowledge and experience themselves.

Addressing the crisis in inadequate staffing numbers (a national If not international problem!) was beyond the purview of the program which instead focussed on encouraging hospitals to realise that neonates require dedicated, trained staff of their own and to assist though training and support with the gradual realisation of this.

2.1 Numbers:

As most of the hospitals in the area fell short of the accepted minimum it was deemed important to provide norms in order to assist hospitals in motivating for more staff and allocating staff appropriately. The following minimum staffing ratios were recommended: General care- 1 professional nurse for every 6-8 patients, Intermediate care -1 professional nurse for every 2-3 patients and Critical care- 1 professional nurse for every 1-2 patients. Hospitals were also advised to retain a minimum of 2/3rds non rotational staff in the nursery and that those that had been trained were to remain in the unit. The realisation thereof is a gradual process. Regional and tertiary hospitals are more likely to maintain

permanent staff in their units but in district hospitals rotation remains entrenched with many hospitals allocating different nurses to the nursery on a daily basis. 4 Hospitals have committed to permanent nursing staff in their neonatal unit including one hospital which initially had no staff allocated at night. 5 others are working on the 2/3rd recommendation-generally retaining a few senior staff and rotating junior staff. Two hospitals have staffed their 24hr KMC units independently from the unit.

2.2 Training

The Perinatal Education Program (PEP), a self-study course was developed to address the need for basic perinatal training in South Africa but unfortunately has little uptake in Area 2. The need for a short, basic in-service neonatal training course for Area 2 was therefore evident. The idea was based on the training offered by The Limpopo Initiative for New-born Care (LINC) but the decision was made to standardise with a 2 week course open to all levels of staff caring for newborns. The program has both in-reach and outreach components.

2.2.1 In-Reach:

Neonatal Experiential Learning Site Training

NELS is a two-week course held over 2 months and offered 4 times per year. The 2 weeks are split between 2 months, e.g. one week in February and the 2nd week a month later in March, to facilitate hospitals releasing staff. It also gives staff time to try and assimilate knowledge gained in the 1st week. Doctors and nurses of all levels are targeted in order to facilitate communication and the implementation of the changes learnt during the training. Initially specific hospitals were invited and attendance averaged about 6 per course (on occasion only 3!). Then it was opened to all hospitals in Area 2 and now attendance averages 10-15.

Originally the plan was to offer experiential learning primarily based in the NICU at the tertiary hospital. The facilitator had little experience with this method of learning and further challenges arose as the program was rolled out. Participants were allocated to buddy with unit staff but these staff were generally unable to effectively teach or demonstrate as they were junior or extremely busy themselves. Participants struggled to prioritise learning needs, were unable to constructively structure their time in the unit, learning was dependant on current cases and activity in the unit and therefore did not necessarily include all the knowledge or experience needed, and facilitation was difficult due to the growing number of students with differing ability and needs, and the changing demands of a busy unit. Theory was poorly covered with very little retention of information. It was evident in order for experiential learning to be effective more time and limited numbers of participants was required. 2 weeks was just not sufficient for this and there was a need to accommodate as many participants as possible in order to address the urgent need for improved neonatal care.

The current curriculum therefore, evolved with a prime focus on theory and classroom-based learning. However 2 hours are spent daily, in the second week, in the neonatal unit for practical demonstrations and experience.

The program encourages interaction, participation and discussion with particular focus on sharing experiences and challenges currently faced in individual units. The use of case studies and group work is incorporated. Participants write down their objectives at the start of the program, are encouraged to assess their current practices, prioritise the need for change and plan their response and interventions on returning in order to insure practical implementation. Open and frank discussions between nurses and doctors in a non-threatening environment facilitate communication and teamwork.

It is loosely based on the Perinatal Education Programme (PEP) with the aim to touch on the most important aspects of neonatal care. It is not an in depth study but raises awareness of the subject, encourages further reading and refers the participants to the relevant guidelines. Basic care of the neonate e.g. resuscitation (a full day workshop), physical and gestational assessment, infection control, fluids and feeds, KMC and developmental care are covered in the first week. In the second a systems based approach is taken covering common conditions and immediate management.

Participants are required to purchase the PEP Newborn manual. They study each chapter on their own (subject material covered during the day), discuss their post test answers the following day and write the final exam at the end of the course.

The course is held at the tertiary hospital due to the availability of venues, and access to a neonatologist and other consultant support. The participants spend practical time the unit and are introduced to the staff. This improves understanding and communication between referring and receiving units. They also visit the regional hospital in order to compare and contrast units and to visit the 24hr KMC unit there. They attend Perinatal Problem Identification Program (PPiP), Child PiP, unit, and paediatric departmental clinical and journal club meetings.

Participants are provided with resource books with detailed information and journal articles on the topics covered, a book of Area 2 Neonatal Guidelines and a set of standardised records (if not already in use in their unit). They are expected to complete a workbook and skills checklists. Originally this was supposed to be signed by the facilitator during follow up visits but due to logistical problems in coordinating the participants' on duty time and the facilitator's visiting schedule, it was decided to allow the doctor responsible for neonates or the unit manager to sign off for them.

Thirteen (13) NELS courses have been held thus far accessed by fourteen (14) hospitals (1 Tertiary, 3 regional and 10 districts) from all five districts. Seventy six (76) nurses (registered or enrolled) and ten (10) doctors have been trained. Awareness of the course and hospitals accessing the course has much improved. Retention of these trained staff within the hospitals remains problematic as doctors and nurses rotate and staff often leave hospitals for career or personal reasons. Feedback from participants has however been very positive including the following comments: "It is interesting, we come here with the wrong practice, but now we are brave and skilled to save babies"; "The course has been very helpful. Practical approaches were offered to handling situations. I am now inspired to improve conditions at my hospital"; "I have gained confidence to practice independently and also to teach my colleagues"; "This course has motivated me to try and improve quality of care in my institution and making sure that what I have learnt should be practiced and taught to others"; "It was an eye opener!!

However 2 weeks is still not sufficient and many participants have requested a third purely experiential week.

In addition sets of PEP self-study manuals have been distributed to all 18 hospitals through external funding.

2.2.2. Outreach:

The outreach component of the programme entails resuscitation training and hospital visits.

2.2.2.1 Resuscitation training

In an attempt to address the large mortality and morbidity due to birth asphyxia, resuscitation training has been prioritised. In addition to the resuscitation workshops given during the NELS courses, the program coordinator and neonatologist run two workshops in each district per year. Doctors and nurses in labour wards, nurseries and 24 hr. clinics that offer a midwifery service are targeted. The workshop content is based on the South African Paediatric Association (SAPA) and American Academy of Paediatrics (AAP) Neonatal Resuscitation Program (NRP) guidelines. Currently the 6 hr. workshop is divided 50:50 between theory and practical experience. Theory includes: background; pathophysiology of asphyxia; preparation for resuscitation; neonatal resuscitation algorithm; initial steps (warm, dry, clear airway, position, oxygen); bag-valve-mask (BVM) ventilation; cardiac compressions; intubation; medications; exit and follow up. The practical session involves hands on practice using manikins of: checking the BVM; BVM ventilation; and cardiac compressions. Groups of participants also participate in resuscitation scenarios and the whole group comments on the effectiveness of the resuscitation given. Intubation practice is offered on request usually during the lunch break. The participants complete a written theory test before and after training to provide a base line and assess the effectiveness of theoretical knowledge transmission.

The course has been amended a number of times to try and optimise the training but the 6hr period remains too short and concern exists that the participants will struggle to retain the knowledge gained particularly if they have little exposure to neonatal resuscitations. With the recent development of the Helping Babies Breathe (HBB) program, (also developed by the AAP) aimed at low resource settings, consideration will have to be given to, possibly, adapting the workshop in line with this program or actually offering the HBB program itself.

Invitations to the workshop are extended by the district Maternal, Child and Woman's Health (MCWH) coordinator to all relevant institutions. Unfortunately often the invitation only reaches the actual units shortly before the workshop resulting in the institutions struggling to release staff or sending junior or inappropriate staff (e.g. students or non maternity staff) just to fill the required numbers. Very few doctors attend mainly due to difficulties in releasing them

for the day. This can cause difficulties in implementing change, as the doctors are sometimes reluctant to change/update their practice based on nursing input. A further challenge is effective time management during the workshop as many participants experience transport problems arriving hours late or having to depart early. There is a need for on-going reinforcement and practice at unit level. Purchase, by hospitals, of inexpensive resuscitation manikins (e.g. an inflatable doll available from *Laerdal International*) would assist with this. Appointing resuscitation champions, at unit level, to support improvement in neonatal resuscitation may strengthen implementation.

To date twenty-five (25) district resuscitation workshops have been held. Four hundred and twelve (412) people have received training including twenty-four (24) Doctors and six (6) paramedics. Average improvement in pre to post test results was 50%.

2.2.2.2 Hospital visits

The Red Cross Air Mercy Service, who provides air or vehicular transport, facilitates these. Paediatric / neonatal consultants, based at the tertiary hospital, visit allocated hospitals monthly. The main focus of their visits is medical support-seeing problem cases, running specialist clinics, ward rounds and teaching and support for implementation of systems and programs.

The NELS coordinator visits hospitals participating in NELS training. Initially a few hospitals were supported intensively on a weekly basis which was very effective. Implementation of recommendations was fairly rapid and sustained as the coordinator was there regularly and frequently to follow up. Standardised record keeping was implemented, infection control practices improved and admission criteria tightened up. As the interest and participation in the NELS program has grown, with more hospitals sending participants for training or requesting support visits, the frequency of the visits has had to be reduced to monthly or bi-monthly. This makes change slower and more difficult to maintain but ensures access for more hospitals.

The NELS visits focus on: motivation and support of staff, teaching and reinforcement of knowledge and skills acquired during NELS training, clinical demonstration, assistance with and supervision of medical and nursing care, case reviews, reinforcement/implementation of norms, systems, practice and guidelines, and record auditing. The teaching provides support for the experiential learning occurring in the units and focuses on the teachable moment. When required, meetings are held with management bodies within the hospital to try and resolve challenges or problems experienced with implementation. The success of these visits is largely dependent on the circumstances in the unit at the time, the availability and busyness of the staff and the support and pro-activeness of the hospital management. The visits are generally well received by the units with evidence of improved morale and commitment in the staff. Hospitals do tend to use them, however, to support clinical practice rather than as a support for training and systems.

The appointment of more coordinators would enable more regular and frequent visits ensuring more sustained improvement in care. However staffing of the nurseries also impacts on the effectiveness of the visits. Acute or chronic staff shortages limit the ability of staff to spend time with the coordinator and rotation of staff inhibits interest in learning, the development of a unit culture, sustained growth and development of the staff and improved care.

Eleven (11) hospitals received outreach visits by the coordinator (10 in Area 2 and 1 in Area 1). In total two hundred and fifty five (255) visits have been conducted. Despite the daily presence of the neonatologist, non rotational staff and a strong unit manager, staff in the tertiary hospital still request and appreciate weekly 2hr. supportive visits by the coordinator which also ensures compliance and standardization with the program.

3. Systems

Systems relate to processes used to ensure the smooth running of the unit and delivery of quality care. The program thus far has focussed on the: procurement, equipment maintenance (as discussed under infrastructure), record keeping, communication and staffing systems

Apart from lack of staff, amongst the problems encountered in improving standards of care, the lack of resources is possibly the most frustrating. It demoralises staff as they are unable to implement the care they have been taught. They may know the importance of hand washing, and how to do it, but if there is no soap or paper towels it's impossible to do. The coordinator therefore spends a lot of time trying to assist and facilitate units with the

procurement system. Staff were taught the basic procurement process, given a list of essential neonatal sundries detailing companies, order codes and approximate costs and encouraged to use a standardised recording system to monitor and track orders. Most of the neonatal sundries required are not routine stock items in hospitals. The coordinator therefore, with CPS, held meetings to try and facilitate getting neonatal products onto the standard stores catalogue. The non stock item (NSI) tracking register is now in use in many hospitals visited which assists with the laborious and lengthy process of procuring surgical, other sundries and equipment. Procurement and maintenance of adequate stock levels remains a challenge.

Standardised record keeping facilitates communication, standardisation and continuity. Good quality records support good quality of care. Following a process of trial and review, discussion and widespread input a standardised record keeping system has been developed and implemented. Thirty (30) standardised records have been developed. These are in regular use in 8 hospitals. Problems with replication and distribution are inhibiting more general usage. It is hoped these records will soon be available through CPS as photocopying at institutional level results in very poor quality records.

Weekly unit team meetings are encouraged in all hospitals in order to improve communication amongst staff, provide in-service training and incorporate auditing.

4. Care

Obviously the whole NELS program, ultimately, is focused on improving standards of neonatal care and each aspect of clinical governance impacts on this. Many aspects of care are taught during NELS training however the following are stressed: use of standardised guidelines to inform care (as recommended in the saving babies report¹²), implementation of developmentally supportive care (internationally considered to reduce neonatal morbidity¹⁷), neonatal resuscitation, provision of kangaroo Mother Care and exclusive breast feeding (all recommended as cost effective interventions proven to reduce neonatal mortality¹⁴).

The development of standardised guidelines and care was a laborious and time-consuming task. The guidelines are two page basic guides to direct care incorporating medical and nursing care. It is believed that this will facilitate more systematic, logical and cooperative care. Nurses are encouraged to refer to these to guide their care particularly in the absence of consistent medical care. Sixty five (65) guidelines and nineteen (19) nursing care plans have been developed. The guidelines require sponsorship to be printed/bound in a professional user-friendly book to be distributed to individuals for easy reference. Additional neonatal resources including posters, perinatal ICD 10 codes, parental hand-outs, pain assessment tools and a photographic clinical guide amongst others have been developed but are awaiting reproduction and distribution.

Developmental care posters have been displayed in 4 hospitals and theoretical and practical training given during the NELS course. However on-going training, reinforcement and support are required to ensure awareness of the importance of developmentally supportive care in the reduction of long term morbidity implementation and its consistent implementation. The use of a SoundEar® (*Drager Medical*) helped raise awareness of the high noise pollution in many units. Sound levels however remain high despite raised awareness. Again the use of champions, within the units, reinforcing these principles daily may have greater impact.

Upon request hospitals have been provided with resources such as duvets, KMC jackets, camp chairs, TV's etc. to establish 24hr KMC units. Intermittent KMC is encouraged from birth in the neonatal units/maternity wards. 11 hospitals now offer 24hr KMC beds including four new 24-hour KMC units, which have been established. However despite the evidence that abounds on the cost effectiveness and importance of KMC in decreasing neonatal mortality, many hospitals will not prioritise the establishment and use of 24hr KMC units. Even when a unit is available it is frequently used for postnatal patients or not staffed at all.

Breast-feeding remains of vital importance in the prevention of infection and reduction in neonatal and infant mortality¹⁴ and is still poorly enforced in many hospitals. The Baby Friendly Hospital Initiative (BFHI) is actively encouraged by the provincial Department of Health and support for implementation offered by the NELS program. Hospitals have been supported in the establishment of central milk kitchens, providing pasteurised breast milk using flash or Pretoria pasteurising methods, promoting exclusive breast feeding and currently plans are under way for expanding access to and support for a donor breast milk bank for the area, based at the tertiary hospital, in order to decrease the incidence of necrotising enterocolitis (NEC) in the premature population.

In addition one regional hospital has commenced ventilating babies and a second is undergoing renovation and should start offering neonatal ventilation within the year. This will increase the number of ventilated beds available to 18.

5. Monitoring and evaluation

Clinical, infection control and record audits have been developed, and graphs produced with which to display monthly audit results. Hospitals are encouraged to include regular auditing as part of their quality improvement process. This should occur with the whole team during weekly unit meetings. Action on the results of the audits is stressed. Units are encouraged to monthly, monitor and display: perinatal, neonatal, and unit mortality: no. of admissions; bed occupancy; infection rates; and infection control, hand washing and record audit results. As teams are small and frequently change, regular, constructive auditing has not yet been achieved in most hospitals and unit managers have therefore been encouraged to delegate responsibility for this to various members of their teams and hold them accountable for its execution.

PPIP is the cornerstone of monitoring and evaluation and is promoted at all visits. Hospitals are supported in identifying a coordinator (usually the labour ward unit manager) and progressing from capturing data purely on paper, to loading it on a computer, and transmitting it to the district and province. Capturing and presentation of morbidity data, in addition to mortality, together with regular, constructive, action based unit and district meetings is encouraged.

PPIP meetings are now occurring in all 5 districts although not reliably in all hospitals. The units that are most successful have: a strong coordinator (usually the labour ward unit manager) driving the process, a reliable paper based system and access to a computer with email. Unfortunately the absence of action plans and accountability at the monthly meetings limits the effectiveness of PPIP in driving change.

More effective and active coordination at hospital, provincial and national level would assist the effectiveness of this program.

Recommendations

There is an urgent need to expand the program. More coordinators with a small group of hospitals to mentor would be more effective. Other areas in the province need to be included and the introduction of a Maternity Experiential Learning Site (MELS) would help address antenatal and intrapartum problems. It is believed that the introduction of a Neonatal Accreditation Program might provide the incentive and motivation for hospitals to comply with the norms and standards set. National decentralised neonatal nurse training urgently needs to be undertaken. Appointment of neonatal nurse practitioners to carry out the role of medical officers needs to be considered in order to address the lack of dedicated doctors to care for neonates.

Conclusion

This article gave an overview of the identified need to address neonatal morbidity and mortality in Area 2 Kwazulu-Natal by implementing a supportive program called NELS based on the clinical governance structure. The aspects addressed included: examining the context, addressing infrastructure development, providing training, implementing systems, improving care and monitoring and evaluating progress. The findings thus far are anecdotal and observational. It is apparent that standards of care have improved but whether this has impacted on mortality needs to be formally investigated. Hospitals visited show a progressive awareness of the need to prioritise neonatal care and to budget accordingly. Staff morale and confidence improved in those trained and supported. Systems, facilities and resources steadily improved with on-going regular supportive visits. Improvements in standards of care were evident when staff were retained in the unit.

There are though remaining challenges that need to be addressed for the on-going success of the program and recommendations were made above.

In conclusion improving neonatal outcomes is a multifaceted global problem, requiring advocacy, and prioritising at all levels. Problems must continue to be highlighted and every effort made to implement evidence based recommendations. The provision, development and support of trained and properly resourced, dedicated neonatal caregivers remains key to this process.

References

1. Bynum, W.F and Porter, R. (eds) (2005) Oxford Dictionary of Scientific Quotations. Oxford University press. 21:9
2. www.en.wikipedia.org/wiki/experiential_learning
3. Valerie Ehlers. Teaching aspects of healthcare. Ch. 11 Experiential Learning. Juta & Co. 2004
4. Smith, M.K (2001). 'David A. Kolb on experiential learning', the encyclopaedia of informal education. Retrieved 12 0111 from <http://www.infed.org/b-explrn.htm>
5. Stephen F. Jennings. Personal development plans and self-directed learning for healthcare professionals: are they evidence based? *Postgraduate Medical Journal* 2007; 83:518-524doi: 10.1136/pgmj.2006.053066
6. Eva K, Cunnington J. How can I know what I don't know? *Personalities. Advances in Health sciences Education* 2004;9: 211-24.
7. Confucius. (n.d.). BrainyQuote.com. Retrieved 12 0111, from BrainyQuote.com <http://www.brainyquote.com/quotes/quotes/c/confucius134717.html>
8. Black, Re, Cousens S, Johnson HL, Lawn JE, Rudan I, Bassani DG, et al Global, regional, and national causes of child mortality in 2008:a systemic analysis. *Lancet* 2010; 375(9730): 1967-87
9. Oestergaard MZ, Inoue M, Yoshida S, Mahanani WR, Gore FM, et al. (2011) Neonatal Mortality Levels for 193 Countries in 2009 with Trends since 1990: A Systematic Analysis of Progress, Projections, and Priorities. *PLoS Med* 8(8): e1001080. doi:10.1371/journal.pmed.1001080
10. Joy Lawn. 4 Million Deaths: When? Where? Why? *Neonatal Survival* 1. The Lancet march 2005 Pg 13
11. Every Death Counts. Saving the lives of mothers, babies and children In South Africa-data supplement
12. MRC Research Unit for Maternal and Infant Health Care Strategies, PPIP Users and the Saving Babies Technical Task Team Saving Babies 2006-2007 Sixth Report on Perinatal Care in South Africa
13. Provincial and district profiles Section B District health Barometer 2007/2008 www.hst.org.za/publications
14. Gary L Darmstadt, Zulfiqar A Bhutta, Simon Cousens, Taghreed Adam, Neff Walker, Lucde Bernis, for the Lancet Neonatal Survival Steering Team Evidence-based, cost –effective interventions; how many newborn babies can we save? *Lancet Neonatal Survival* March 2005 19-30
15. Appendix 3e: KwaZulu- NatalProvincePg 76- 79CoMMCreport 2008/09
16. Marion Stevens Impact Indicators Section A Chapter 6 District Health Barometer 2007/2008 www.hst.org.za/publications/850
17. Symington AJ, Pinelli J. Developmental care for promoting development and preventing morbidity in preterm infants. *Cochrane Database of Systematic Reviews* 2006, Issue 2. Art. No.: CD001814. DOI: 10.1002/14651858.CD001814.pub2.

NELS CURRICULUM

Week One

Monday:

- 0715: Meet in the nurses home foyer.
- Neonatal resuscitation –Full day workshop (PEP Chapter 1)

Tuesday

- 0715: Welcome and orientation.
Workbooks and skills audit
- 0800-1600: Focus for the day:: Assessment and management of a neonate (PEP Chapters 2, 3, 13&14)
- Initial exam
 - Trauma and bleeding
 - Recognition and reporting of Birth Defects
 - Gestational Assessment
 - Routine care

Wednesday

- 0715-0800: Attend NICU unit management meeting
- 0800-0900: Attend Perinatal mortality meeting (2nd week of each month)
- 0900-1600 (PEP Chapters 7&8)
- Temperature control and hypothermia
 - Glucose control and hypoglycaemia
 - Erection of IV therapy /umbilical lines
 - Recognition and management of jaundice (PEP Chapter 9)
 - Recognition and management of anaemia / polycythaemia

Thursday

- 0730-0830: Attend paediatric clinical meeting
- BFHI and Feeding guidelines-pasteurisation of milk (PEP Chapters 4&6)
 - Monitoring of weight
 - Fluid and nutritional requirements and calculation

Friday

- 0800-0900: Journal club
- 0700-1000:
- Developmental care
 - KMC
 - 1300-Depart

Week Two

Monday:

- 0715: Feedback and discussion of problem areas
- Focus for the day: Care of low birth weight/ sick neonates (PEP Chapter 12)
- Preventing Infection
 - Signs of sepsis and management and Infection control
 - Tetanus, conjunctivitis, cong. syphilis

Tuesday:

- Acid base balance (PEP Chapter 5)
- Cardiac abnormalities
 - Fetal circulation
 - PDA
 - PFC
 - Recognition, assessment and immediate management of cardiac. cond.

Wednesday:

- Unit meeting
- Mortality meeting
- Recognition of resp. distress and apnoea (PEP Chapters 10&11)
- Oxygen therapy and Nasal CPAP

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- Resp. abnormalities
 - Pneumonia
 - MAS
 - HMD
 - Diaphragmatic hernia
 - Pneumothorax
 - X-ray interpretation

Thursday:

- Clinical meeting
- GIT abnormalities (PEP Chapter 14)
 - NEC
 - TOF
 - Gastroschisis and exomphalos
 - Obstructions
- CNS
 - Recognition and management of seizures (PEP Chapter 5)
 - HIE
 - Myelomeningocele
 - IVH
 - Hydrocephalus

Friday:

- Journal club
- Communication and monitoring and evaluation-visiting; referral/disch. summary (PEP Chapters 15)
- QI audit
- Repeat skills audit