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A guide to student rotations on neonatal units in Zambian hospitals

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Abstract: Clinical attachment is a crucial component in the training of health professionals, particularly nursing, midwifery and medical students. It accords students an opportunity to put into practice what they have learned in theory; thus, it involves the integration of theoretical knowledge and practical skills. Having been taught the theory in class enables a student to learn, assimilate and store knowledge for future use and to apply it in the care of patients and clients. It therefore, requires critical thinking, problem-solving abilities, specialised psychomotor, and technological skills, and a professional value system. In other words, classroom teaching goes hand-in-hand with clinical teaching. The aim of clinical teaching in the training of nursing, midwifery and medical students is to produce competent professionals capable of providing expert patient care, which is based on sound knowledge and practiced skills.

Clinical teaching is defined as teaching and learning focused on, and usually directly involving patients and their problems. It occurs in real life situations, translates theory into reality and centres around patient care. Hence, it is an integral part of providing patient care that accords a student with opportunities for observations and decision making. Patient care becomes a reality, and a student can observe the responses of patients to illness and care provided. Since it is a small group activity in which a student is an active participant, each student is

given an opportunity to develop self-confidence by performing under expert guidance. Therefore, there is need to have qualified personnel to guide, support, stimulate and facilitate student learning by designing appropriate activities in appropriate settings that allow learning.

One of the clinical sites where clinical teaching and learning takes place in Zambia is the Neonatal Unit which consists of the Intensive Care Unit (NICU), Kangaroo Mother Care (KMC), High Care (HC), Special Care Baby Unit (SCBU) also called Standard in-patient care (SIC) unit, where newborns who require special attention are nursed. The NICU is a highly specialised place that caters for the complex needs of small and sick newborns.

Keywords: Student rotation, Neonatal Intensive Care Unit, Medical students, Nursing students, Health Professionals, Midwifery students

Résumé: Les stages cliniques constituent un élément essentiel dans la formation des professionnels de santé, en particulier les étudiants infirmiers, sage-femme et en médecine. Ils offrent aux étudiants l'occasion de mettre en pratique les connaissances théoriques acquises, intégrant ainsi savoir et compétences pratiques. L'enseignement théorique permet à l'étudiant d'apprendre, d'assimiler et de mémoriser les connaissances pour les appliquer ensuite dans la prise en charge des pa

patients. Cela requiert donc un esprit critique, des capacités de résolution de problèmes, des compétences psychomotrices et technologiques spécialisées, ainsi qu'un système de valeurs professionnelles. En d'autres termes, l'enseignement en classe est indissociable de l'enseignement clinique. L'objectif de l'enseignement clinique est de former des professionnels compétents capables d'assurer des soins de qualité fondés sur des connaissances solides et des compétences exercées.

L'enseignement clinique se définit comme un apprentissage centré sur les patients et leurs problèmes, se

déroulant dans des situations réelles, traduisant la théorie en pratique et plaçant le soin au cœur de l'apprentissage. Il offre aux étudiants des occasions d'observation et de prise de décision, et leur permet de développer leur confiance en eux en agissant sous la supervision d'experts. Pour cela, il est nécessaire de disposer de personnel qualifié pour guider, soutenir et stimuler l'apprentissage des étudiants en concevant des activités adaptées dans des contextes appropriés.

En Zambie, l'un des sites de formation clinique est l'unité néonata-

le, composée de l'Unité de Soins Intensifs Néonataux (NICU), du Kangaroo Mother Care (KMC), du High Care (HC) et de la Special Care Baby Unit (SCBU), où sont soignés les nouveau-nés nécessitant une attention particulière. La NICU est un lieu hautement spécialisé répondant aux besoins complexes des nouveau-nés petits et malades.

Mots-clés: Rotation des étudiants, Unité de soins intensifs néonataux, Étudiants en médecine, Étudiants en soins infirmiers, Professionnels de santé, Étudiants sage-femme

Background

Zambia continues to battle the high neonatal mortality. According to the Zambia Demographic Health Survey (ZDHS) 2024, neonatal mortality is around 17/1,000 live births.¹ The United Nations-Inter-Agency Group for Child Mortality Estimation (UN-IGME) statistics show approximately 21.99 per 1,000 live births.² This is against the Sustainable Development Goal (SDG) target of 12/1000 live births by 2030². The leading causes of mortality are asphyxia, prematurity, sepsis and congenital anomalies.¹ Babies with these conditions are regarded as small and sick newborns and require specialised care at three distinct levels from I, II and III depending on the severity of the condition.^{3,4}

The Neonatal Intensive Care Unit (NICU) is a highly specialised place that caters for the complex needs of the small and sick newborns. This group of vulnerable patients, often with a series of life-threatening problems arising from the underdeveloped central nervous system (CNS), immature lungs, immature digestive system and a very low immune system, makes them highly prone to infection.⁽⁵⁾

The underdeveloped neurological system means that developmentally supportive care is cardinal to preserving and promoting normal function in infancy and beyond. This requires promotion of optimal sleep patterns that require a controlled lighting system, minimal noise, optimisation of skin-to-skin care with the mothers, and certain skills such as nesting and appropriate positioning, to create boundaries that improve neuromotor development.⁶

The immature respiratory system requires a period of respiratory support with close monitoring. This may be in the form of nasal prong oxygen, continuous positive airway pressure (CPAP) or mechanical ventilation. These require skilled personnel who are specifically trained to care for these babies and intervene or resuscitate where necessary.⁷

The immature digestive system for premature babies requires cautious build-up of feeds whilst the baby is also receiving intravenous fluids. Staff on the unit usually use a nasogastric or orogastric tube or cup to feed the baby before the baby can breastfeed effectively and adequately. For very sick babies with sepsis or asphyxia, build-up of feeds is also cautious and requires strict monitoring of input and output according to the neonatal protocol for Zambia.⁸

Babies receive antibodies from their mothers towards the end of pregnancy. If a neonate is born prematurely, they lose out on complete accretion of antibodies from the mother making them very vulnerable to infections. Term babies are also still vulnerable as the cell mediated immunity is yet to develop adequately. On the neonatal unit, hand washing and use of alcohol hand rub are mandatory to prevent cross infection and transmission of infections to the most vulnerable babies.^{9,10} Therefore, the unit requires a team of highly skilled, multidisciplinary healthcare providers to ensure timely and effective care for critically ill newborns.

Purpose of the Guide

The purpose of this document is to guide the regulatory bodies; Health Professions Council of Zambia (HPCZ) and Nursing and Midwifery Council of Zambia (NMCZ), health institutions and training institutions on students' rotation in the neonatal unit to help regulate the flow of traffic and optimise the care of neonates. This collaborative approach aims to alleviate the current staffing burden in neonatal units, which has made it challenging to effectively manage and coordinate clinical training. The resulting congestion and lack of structure compromise both the quality of care and learning outcomes, ultimately affecting neonatal health outcomes across the country.

Neonatal Intensive Care Unit personnel

In Zambia, training of neonatal nurses and paediatricians is ongoing. These healthcare workers are trained to

identify, monitor and make decisions on critically ill neonates. Other cadres include critical care nurses and paediatric nurses, who are important in closing the gap in the care of the critically ill neonates. Midwives are the first point of call when babies are born and are required to continue caring for the sick newborns before referral to the NICU. All these programmes are at postgraduate level and are offered to students who can recognise a sick neonate requiring specialised care.

Current Situation in Zambia

Currently, NICUs country-wide accommodate a high volume of students from various institutions, including undergraduate nursing and midwifery students, medical students from different universities, and postgraduate trainees in nursing, midwifery and medicine. Despite that many of these students do not require advanced neonatal clinical exposure, they are still placed in the NICUs. This overcrowding compromises the quality of care, disrupts clinical workflows, and increases the risk of infection, due to congestion. Consequently, despite advancements in neonatal care protocols and technology, the ongoing shortage of human resources, coupled with overcrowding in the unit, continues to undermine the quality and consistency of neonatal care delivery.

Neonatal units in Zambia are usually small (far below the expected minimum of one square metre around each cot)⁴ and packed with patients and their parents. Mothers are allowed in the unit every two hours and spend an hour or less with their babies. During this time, they are expected to express milk, feed and spend some time doing skin-to-skin to provide warmth and transfer antibodies to their babies. The neonatal units also accommodate a high volume of students from various training institutions, including undergraduate and postgraduate nursing and midwifery students, medical students from different universities, and postgraduate trainees in nursing, midwifery and medicine. These students are often not conscious of the lack of space, the habit of washing hands, and thus, they touch babies when doing procedures such as taking temperature, feeding or changing diapers! Although they are mostly just assigned to taking vital signs, which is a welcome relief for the overworked staff due to the shortage of trained health workers, the observations are often only recorded but not interpreted by the students and hence, sick babies continue to deteriorate before they are identified by a trained staff. Inevitably because of the overcrowding, the units are also unbearably noisy as health personnel and students talk above the alarm noises! This situation is worse at the University Teaching Hospital (UTH) Women and Newborn Hospital neonatal unit because of its status of being the highest referral tertiary institution in the country. On a given day, there are 15 entry level nursing students, five to seven paediatric nursing students, seven Master of Science (MSc) students, 30 medical students from various Universities and five nutrition students from Levy Mwanawasa Medical University (LMMU).

Although the World Health Organisation (WHO) does not specify a single patient-to-student ratio for NICUs, the Organisation's guidelines emphasise the need for appropriate staffing levels to ensure safe and effective care for newborns. The specific ratio for staff depends on the level of care required by infants, ranging from 1:1 for the most critically ill to 1:4 for stable infants requiring special care.⁴ The overcrowding in Zambia's neonatal units is way above the acceptable teacher-to-student ratio. This situation further compromises the teaching and learning in the facilities.

What is the result?

The current scenario contributes not only to high cases of sepsis, but also suboptimal care of all babies admitted to the neonatal unit. These include the following:

1. The high neonatal deaths due to sepsis

- 1.1. Poor infection prevention due to poor hand washing culture
- 1.2. Cross infection as hand washing is not observed stringently in between patients

2. Poor developmentally supportive care

- 2.1. Poor sleep patterns due to the excessive noise
- 2.2. Large crowds on the NICU results in poor coordination regarding lighting leading to disruption in the sleep-wake pattern of the neonate

3. Poor learning for students

- 3.1. Inadequate skills transfer to the students rotating in the unit due to lack of dedicated teaching staff.
The question is; is it possible to achieve the target in terms of neonatal mortality with this kind of practice?

The Case of South Africa

South Africa has an overall neonatal mortality of 11/1,000 live births.² Granted, there are more neonatologists and the investment in neonatal care is much more as compared to the level of care in Zambia's NICUs.

The University of Cape Town (UCT) trains undergraduate, postgraduate and super specialist level cadres. Undergraduate medical students rotate on the neonatal unit in their final year to orient themselves with the equipment and join a few ward rounds to have a glimpse of the neonatal care system. Most of the teaching and learning takes place in the skills laboratory with organised sessions. When the students go to the neonatal units, they are accompanied by their supervisors, always observed, get oriented in hand washing, and the maximum at a time is five.

For nursing students specialising in neonatology, five are attached to the unit at any given time. They are attached to an experienced nurse who shows them how to

care for the neonate. No undergraduate nursing students do clinical rotations in the NICU. For instance, general undergraduate nursing students at Dora Ngiza Hospital (Port Elizabeth) do their clinical rotations in the low-risk areas such as Kangaroo Mother Care (KMC) and the triage unit. Undergraduate with honours midwifery students, Neonatal Nursing Science, Master's Midwifery and Neonatal Nursing Science students are the ones that rotate in the high dependency unit (300 hours) and NICU (300 hours) for a specified period during the training.

assigned to alternative neonatal care settings such as the triage, pre-KMC, KMC, Special Care Baby Unit (SCBU) or Standard in-patient care (SIC) unit. The primary neonatal intensive care unit should be reserved for postgraduate nursing and post graduate medical students specialising in neonatal practice. This strategy would enhance the quality of advanced clinical training, ensure clinical safety, uphold infection prevention standards, and maintain the integrity of care delivery within the neonatal units.

Way forward for Zambia-Recommendations

To address these challenges, it is proposed that students equiring only basic neonatal clinical competencies be

Table 1: Medical student rotations

Category of students	Clinical attachment	Main area of training/learning
Undergraduate 5 th Year or equivalent	Orientation and familiarisation to different areas of the neonatal unit with maximum supervision of 1 hour in small groups of 5 to 10	Lecture theatre Skills laboratory SCBU and Postnatal wards
7 th Year /Final year	Re-familiarisation to different areas of the neonatal unit with maximum supervision of 1 hour in small groups of 5 to 10	SCBU/Pre-KMC/KMC unit/ triage These students can go to the NICU in the presence of a consultant for teaching purposes only
Postgraduate Post graduate Diploma in neonatology doctors	Should be allowed to take part in the care of all patients with supervision	NICU, High Care, Pre-KMC, KMC, SCBU, Triage and Postnatal wards Referral facilities
Paediatric resident student (Registrars)	Should be allowed to take part in the care of all patients with oversight from a senior paediatrician	NICU, High Care, Pre-KMC, KMC, SCBU/Triage and Postnatal wards Referral facilities
Paediatric Surgeon Residents	Should be allowed to take part in the care of all patients with oversight from a senior paediatrician	High Care, Pre-KMC, KMC, SCBU and Triage
Obstetrics and Gynaecology Residents	Should be allowed to take part in the care of all patients with oversight from a senior paediatrician	High Care, Pre-KMC, KMC, SCBU, Triage and Postnatal wards

Table 2: Nursing student rotations

Category of students	Clinical attachment	Main area of training
Registered Nurses/Midwives	Orientation and familiarisation to different areas of the neonatal unit with maximum supervision of 1 hour in small groups of 5 to 10	Lecture theatre Skills laboratory SCBU and postnatal wards
Bachelors' midwives	Orientation and familiarisation to different areas of the neonatal unit with supervision-maximum 1 hour in small groups of 5-10	KMC unit, SCBU, Triage and Postnatal wards
*Advanced Diploma in neonatal Nursing	Should be allowed to take part in the care of all patients with supervision	NICU, High Care, Pre-KMC, KMC, SCBU, Triage and Postnatal wards
*Bachelor of Nursing in Neonatology	Should be allowed to take part in the care of all patients with supervision	NICU, High Care, Pre-KMC, KMC, SCBU, Triage and Postnatal wards
*Masters Neonatal Nurses	Should be allowed to take part in the care of all patients with supervision	NICU, High Care, Pre-KMC, KMC, SCBU, Triage and Postnatal wards
Paediatric Nurses (post-basic, Bachelor's, and master's programs)	Orientation to different areas of the neonatal unit with maximum supervision of 1 hour in small groups of 5	NICU, High Care, Pre-KMC, KMC unit, SCBU, Triage and Postnatal wards, Referral facilities
*Critical Care/Cardiac Nurses	Should be allowed to take part in the care of all patients with supervision	NICU, High Care, Pre-KMC, KMC, SCBU and Triage

*While they can support in cases of inadequate manpower, trainees are not on the unit to take vital signs but to learn and fulfil their learning objectives

All students training in any course that requires them to manage neonates should also be available to help resus

resuscitate babies in the labour ward and theatre as part of their rotation.

1. Neonatal units should endeavour to categorise care in their unit to help optimise skills and monitoring.
2. No under graduate students, both medical and nursing should be allowed in the NICU. Universities should invest in skills laboratories and arrange to have staff teaching these students outside the NICU.
3. Training institutions should endeavour to provide qualified preceptors and clinical demonstrators for students rotating in neonatal units.
4. Only a maximum of 10 students should be allowed to rotate in the neonatal unit at any giving time.

Training institutions should book with administrations of neonatal units for a rotation slots.

5. The categorisation of rotation areas means that rotations can be decentralised from the bigger hospitals to smaller facilities providing the required services
6. Protocols on handling patients in various sections of neonatal areas that everyone is oriented to when they first rotate should be established.
7. All post - basic students rotating in neonatal units are expected to have a certificate in Advanced Newborn Care training package from recognised institutions such as the HPCZ and NMCZ CPD (World Continuing Education Alliance) platforms.

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Appendix 1 Description of terms specific to neonatal care	
Term	Description
Kangaroo Mother Care Unit	An area in the neonatal unit where babies are nursed in skin-to-skin position with the mother for 24 hours
Pre-KMC Unit	An area where prolonged KMC is done as the baby waits to graduate to the KMC unit. Although some babies may be on minimal supplemental oxygen, they are generally stable
Special Care Baby Unit (SCBU)/ Standard In-Patient Care Unit (SIC)	An area where babies requiring antibiotics, feeds, warmth and establishment of breastfeeds are nursed. These babies are not too sick but require special care to avoid deterioration
High Care Unit	Sick babies who are stabilising are nursed here. They may be on respiratory support such as CPAP but require continuous monitoring by specialised staff
Neonatal Intensive Care Unit (NICU)	This is for very ill babies that require 24 hours presence of specialised staff. Babies requiring mechanical ventilatory support, CPAP, Surfactant administration are cared for in this unit

Appendix 2 Categories of Newborn care at facilities				
	Routine Care	Standard In patient Care/ Special Baby Care (includes also Pre-KMC, KMC)	High Care	Intensive and highly specialised care (NICU)
Category of baby requiring care	Most full-term infants Most low birth weight infants >2000g	Low Apgar score of 7 and below requiring further observation Stable neonate with congenital abnormalities Low birth weight 1500-1999g Birth weight >4000g Meconium staining Wasting Possible infection Jaundice requiring phototherapy	VLBW<500g Gestational age<32 weeks Encephalopathy (deranged CNS function due to various causes that include jaundice, sepsis, asphyxia) Meconium aspiration syndrome Septicaemia/meningitis Recurrent apnoea Moderate and severe respiratory distress Convulsions Severe or worsening jaundice Simple neonatal surgical problems	Need for assisted ventilation Complex surgical problems Persistent hypoglycaemia Persistent hyperglycaemia Cardiovascular problems with haemodynamic instability Multisystem problems Problems requiring specialist intervention e.g. Ambiguous genitalia with cardiovascular collapse
Care provided	Safe clean delivery Apgar Score Basic Newborn resuscitation Initiation of breastfeeding at birth and further support Maintenance of warmth Emergency care before referral Vitamin K, eye care, immunisation, cord care Measurement-weight, head circumference, length Examination of the newborn Caring of the baby whose mother has HIV, tuberculosis (TB) or syphilis Skin to skin care and KMC	In addition to routine care: Maintenance of thermoneutral environment Nasal prong/mask oxygen administration and monitoring Monitoring glucose and correcting abnormalities IV fluid administration Breastfeeding, tube feeding Bilirubin monitoring and phototherapy Drug administration	In addition to routine care and standard care: Cardio-respiratory monitoring Oxygen therapy>40% Nasal prong CPAP Short term IPPV Blood transfusion Chest drains Exchange blood transfusion	In addition to other neonatal care: Intermittent Positive Pressure Ventilation (IPPV), advanced techniques for respiratory support Total Parenteral Nutrition (TPN) Arterial catheterisation Therapeutic cooling Advanced neurological monitoring Ultrasound and Echocardiograph Sophisticated diagnostic investigation Sub-specialist consultation Neonatal surgical intervention