



ZAMBIA COLLEGE OF MEDICINE & SURGERY

Advancing Specialist Care & Professional Growth

Specialty Training Programme

Curriculum & learning guide

for

POSTGRADUATE DIPLOMA IN NEONATOLOGY

FOREWORD

This postgraduate diploma curriculum is prepared for doctors post internship as well as Paediatricians post training in the Specialist Training Programme (STP) or Masters of Medicine (MMed) Paediatrics and Child Health who have chosen to specialise in Neonatology. Training these doctors will provide an opportunity to graduate human resource specifically dedicated, prepared and skilled in providing quality neonatal care.

According to the Central Statistical Office [CSO], (2018), Neonatal Mortality Rate (NMR) in Zambia continues to be unacceptably high with a rise from 24 to 27/1000 live births in 2014 and 2018 respectively. The Government of the Republic of Zambia, through the Ministry of Health, under the National Health Strategic Plan (NHSP) 2017 - 2021, targeted to reduce the NMR to 10/1,000 live births by 2021. To achieve this target, the seventh National Development Plan Strategy number four that promises to undertake a continuous review of the existing curriculum and development of new ones to meet the identified needs, must be adopted if Zambia is to improve neonatal health care delivery.

Against this background, the Zambia Paediatric Association under the auspices of the Zambia College of Medicine and Surgery (ZACOMS) embarked on the development of this curriculum for the Postgraduate Diploma in Neonatology training to produce competent doctors in an effort to significantly contribute to reduction of the high neonatal mortality. The curriculum focuses on strengthening skills acquisition, promoting family centered care approach and Community Health.

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President – Zambia Paediatric Association

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Acronyms and Abbreviations

ABG	- Arterial Blood Gas
ACTH	- Adrenocorticotrophic Hormone
CAH	- Congenital Adrenal Hyperplasia
CCAM	- Cystic Adenomatoid Malformation
CDH	- Congenital Diaphragmatic Hernia
CLD	- Chronic Lung Disease
CPAP	- Continuous Positive Airway Pressure
CTG	- Cardiotocography
CVP	- Central Venous Pressure
EEG	- Electroencephalography
EPI	- Expanded Immunisations Program
FCC	- Family Centered Care
HIE	- Hypoxic Ischaemic Encephalopathy
HIV	- Human Immunodeficiency Virus
IUGR	- Intrauterine Growth Restriction
INA	- Infant Neuromotor Assessment
KMC	- Kangaroo Mother Care
LGA	- Large for Gestational Age
MBD	- Metabolic Bone Disease
MPDSR	- Maternal and Perinatal Death Surveillance and Response
PPHN	- Persistent Pulmonary Hypertension of the Newborn
QI	- Quality Improvement
RDS	- Respiratory Distress Syndrome
ROP	- Retinopathy of Prematurity
SBAR	- Situation, Background, Assessment, Recommendation
SDGS	- Sustainable Development Goals
SGA	- Small for Gestational Age
TORCH	- Toxoplasmosis, Others (Syphilis, varicella-zoster and parvovirus), Rubella, Cytomegalovirus (CMV) and Herpes infections
TTN	- Transient Tachypnoea of the Newborn

GENERAL INTRODUCTION

This Curriculum and Learning Guide describes the work and competence-based professional training programme for the Specialty Training Programme (STP) Postgraduate Diploma in Neonatology (PGDN) in Zambia. The intended readership for the curriculum and guideline include the following:

- ✦ Trainees, host departments and managers of neonatal healthcare services;
- ✦ STP PGDN trainers, which includes all those involved in supervising, coordinating, assessing and delivering specialist education and training on the Postgraduate Diploma in Neonatology programme;
- ✦ Academic, administrative and professional staff within Higher Education Institutions (HEIs), the Higher Education Authority (HEA), and the Zambia Qualifications Authority (ZAQA);
- ✦ Strategic partners involved in supporting neonatal care and the training of healthcare practitioners in all its various related fields.

Zambia College of Medicine and Surgery (ZACOMS) advances professional training of medical specialists using the professional competence-based certification model beyond traditional university-based specialist training. It promotes specialist training as a vital pursuit for a successful professional medical career. The ZACOMS also promotes the increase of universal health coverage (UHC) by promoting equitable access to cost-effective quality specialist care as close to the family as possible for people in Zambia at all levels of socioeconomic status and geographical location. The ZACOMS certifies and admits members and/or fellows as specialists in a medical and/or surgical specialty in any of the various specializations of medicine and surgery.

The Zambia College of Medicine and Surgery (ZACOMS) oversees the training on the postgraduate diploma in neonatology programme working through the Zambia Paediatric Association (ZPA).

Neonatology encompasses the diagnosis, assessment and medical management of various disorders of the neonatal systems. The STP PGDN training provides training in Neonatology at Postgraduate diploma level. This is a relevant programme because of the critical shortage of doctors skilled in neonatal care. This is crucial to the survival

of neonates. This skill-based Postgraduate Diploma programme will therefore reduce the pressure on the very limited tertiary beds available throughout Zambia and ultimately have a significant impact on national neonatal morbidity and mortality.

The STP PGDN will equip trainees with core competencies reflecting the wide array of skills required of one who is focused on neonatal care. This will mean for every trainee who completes this programme, the population they serve will have gained access to a doctor with key competencies in neonatal care. Furthermore, the graduate of this programme will offer support to the various medical and surgical specialties involved in neonatal care thereby improving outcomes in the management of a broad spectrum of pathology of the neonate.

BACKGROUND

According to the Central Statistics Office (CSO-2018), Zambia continues to record unacceptably high levels of neonatal mortality with a rise from 24 to 27/1000 live births from 2014 to 2018 respectively. The Government of the Republic of Zambia, through the Ministry of Health, under the National Health Strategic Plan (NHSP) 2017 - 2021, targeted to reduce the NMR to 10/1,000 live births by 2021. To achieve this target, the seventh National Development Plan Strategy number four that promises to undertake a continuous review of the existing curriculum and development of new ones to meet the identified needs, must be adopted if Zambia was to improve the neonatal health care delivery.

Against this background, the Zambia Paediatric Association (ZPA) embarked on the development of this curriculum for a Postgraduate Diploma in Neonatology (PGDN) under the Specialist Training Programme (STP) of the Zambia College of Medicine and Surgery (ZACOMS) so as to produce competent doctors with enhanced skills in neonatology in an effort to reduce the high neonatal mortality in the country.

This Specialist Training Programme Postgraduate Diploma in Neonatology (STP PGDN) curriculum consists of learning objectives that trainees are expected to meet; the course content and the methods of learning; the books and other material used in the course; and the modes of assessment.

VISION

Our vision is to be innovative in providing a teaching and support structure that will empower every trainee to excel in Neonatology knowledge and skills through internal and external collaboration.

MISSION STATEMENT

The mission of the Postgraduate Diploma in Neonatology training programme in Zambia is to equip medical doctors with competencies focused on delivering high level neonatal care who shall endeavour to improve the health care services to neonates in an efficient and proficient manner so as to meet the needs of the Zambian community, and contribute to the field of Neonatology in the region and globally.

VALUES

In line with our vision and mission, we affirm the following values:

- Professional excellence
- Integrity
- Sensitivity to reproductive health needs
- Interdisciplinary, inter institutional collaboration
- Continuous professional development
- Innovation
- Academic Excellence
- Self and peer review
- Service to the community with respect to neonatology
- Evidence-based medical practice
- Mentorship of fellow clinicians
- Leadership in primary care

RATIONALE FOR THE SPECIALTY TRAINING PROGRAMME POSTGRADUATE DIPLOMA IN NEONATOLOGY

The STP PGDN aims to equip medical doctors with competencies in Neonatology focused on delivering high level neonatal care in the healthcare system. The STP PGDN aims to bridge the critical shortage of Neonatologists by advancing professional training of the Postgraduate Diploma in Neonatology using the competence-based

certification model beyond traditional university-based specialist training. Simply put, this model works on the principle that every health facility equipped well enough to support a Neonatology practice has the basic requirements to train a Neonatologist.

Although doctors learn neonatology at undergraduate level, certain skills and intricate details are not emphasized because of other competing topics. This course provides key competencies in Neonatology a detailed understanding of life saving critical skills in neonatology as well as cheap strategies that have been shown to reduce neonatal mortality. It will therefore help bridge the gap in the shortage of Neonatologists by providing a cadre who although not a fully-fledged Neonatologist will provide Neonatal care to a level way above that provided by a general practitioner.

The STP PGDN curriculum is informed by the training requirements of the Health Professions Council of Zambia (HPCZ) and the professional creed of the Zambia Paediatrics Association (ZPA) and is alive to the unique opportunities obtaining across the various training sites. The training programme encourages self-directed, life-long learning, and student-centred training approaches while providing robust and structured guidance.

This curriculum provides a framework for the one year postgraduate diploma training and educational curriculum in Neonatology. Trainees who successfully complete the requirements and meet the minimum standards set out in this curriculum should be expected to demonstrate competence in Neonatal Care at Postgraduate Diploma level.

GOAL OF THE TRAINING PROGRAMME

To enhance the capacity of health professionals in the management and delivery of neonatal services at health facilities conducting deliveries and nursing small and sick newborns.

PROGRAMME OBJECTIVES

1. Provide comprehensive care to critically ill infants on the Neonatal Intensive care unit whilst ensuring the care of well term infants on postnatal ward.
2. Understand foetal circulation and newborn transition as relates to advanced neonatal resuscitation and demonstrate appropriate steps in neonatal resuscitation
3. Identify high risk deliveries and understand the effects of maternal complications and treatment on the neonate in management of a neonate at delivery
4. Understand and apply ethics associated with issues of viability and palliative care
5. Perform appropriate neonatal clinical assessment, gestational age assessment, identification of congenital abnormalities in order to provide an accurate account of the infant's status to the parents
6. Understand the embryological, physiological and pathophysiological basis of common neonatal conditions and the required management
7. Identify challenges and opportunities in the care of neonates and develop strategies for optimal care
8. Understand and apply the tenants of clinical governance including antibiotic stewardship, infection prevention and family centred care in the NICU and beyond
9. Understand the basics of quality improvement, mortality audits and case reports and formulate a publication ready manuscript to enhance evidence based neonatal care practice
10. Understand the environment outside the NICU and provide mentorship to junior colleagues

The key outcomes of the STP PGDN training are twofold as stipulated in Outcomes 1 and 2 below:

Outcome 1. Apply, at Postgraduate Diploma level, Biomedical Sciences, Behavioural & Sociology, and Scientific Principles to the Practice of Neonatology

1. The graduate should be able to apply to Neonatology practice biomedical scientific principles, method and knowledge relating to anatomy, biochemistry, cell biology, genetics, immunology, microbiology, nutrition, pathology, pharmacology and physiology. The graduate should be able to:
 - a) Explain normal human structure and function relevant to the neonate
 - b) Explain the scientific basis for common diseases and conditions' signs, symptoms and treatment relevant to Neonatology.
 - c) Justify and explain the scientific basis of common investigations for diseases and conditions relevant to Neonatology.
 - d) Demonstrate knowledge of drugs, drug actions, side effects, and interactions relevant to Neonatology.

2. Apply Behavioural and Sociology Principles to the Practice of Neonatology.
 - a) Explain normal human behaviour relevant to Neonatology.
 - b) Discuss psychological and social concepts of health, illness and disease relevant to Neonatology.
 - c) Apply theoretical frameworks of psychology and sociology to explain the varied responses of individuals, groups and societies to Neonatology.
 - d) Explain psychological and social factors that contribute to illness, the course of the disease and the success of Neonatology interventions.

3. Apply Population Health to the Practice of Neonatology
 - a) Discuss population health principles related to determinants of health, health inequalities, health risks and surveillance relevant to Neonatology.
 - b) Discuss the principles underlying the development of health and health service policy, including issues related to health financing, and clinical guidelines relevant to Neonatology.
 - c) Evaluate and apply basic principles of infectious and non-communicable disease control at community and hospital level relevant to Neonatology.
 - d) Discuss and apply the principles of primary, secondary, and tertiary prevention of disease relevant to Neonatology.

4. Apply Scientific Method and Approaches to Neonatology Research.
 - a) Evaluate research outcomes of qualitative and quantitative studies in the medical and scientific literature relevant to Neonatology.
 - b) Formulate research questions, study designs or experiments to address the research questions relevant to Neonatology.
 - c) Discuss and apply appropriate research ethics to a research study relevant to Neonatology.

Outcome 2. Competence, at Postgraduate Diploma level, in Neonatology Clinical Practice.

On successful completion of the work-based Neonatology Postgraduate Diploma STP:

1. The trainees should have clinical and specialist expertise in Neonatology, underpinned by broader knowledge, skills, experience and professional attributes necessary for independent practice;
2. The trainees should be able to undertake complex clinical roles, defining and choosing investigative and clinical options, and making key judgements about complex facts and clinical situations.
3. The trainees should contribute to the improvement of Neonatology services in the context of the national health priorities, by means of outstanding scientific research and application of safe, high quality, cost effective, evidence based practice within the Zambian health system.
4. The trainees should possess the essential knowledge, skills, experience and attributes required for their role and should demonstrate:
 - ✦ A systematic understanding of clinical and scientific knowledge, and a critical awareness of current problems, future developments, research and innovation in Neonatology practice, much of which is at, or informed by, the forefront of their professional practice in a healthcare environment;
 - ✦ Clinical and scientific practice that applies knowledge, skills and experience in a healthcare setting, places the patient and the public at the centre of care prioritizing patient safety and dignity and reflecting outstanding professional values and standards;
 - ✦ Clinical, scientific and professional practice that meets the professional standards defined by the Health Professions Council of Zambia (HPCZ);
 - ✦ Personal qualities that encompass self-management, self-awareness, acting with integrity and the ability to take responsibility for self-directed learning, reflection and action planning;
 - ✦ The ability to analyse and solve problems, define and choose investigative and scientific and/or clinical options, and make key judgments about complex facts in a range of situations;
 - ✦ The ability to deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and to communicate their conclusions clearly to specialist and non-specialist audiences including patients and the public;
 - ✦ The ability to be independent self-directed learners demonstrating originality in tackling and solving problems and acting autonomously in planning and implementing tasks at a professional level;
 - ✦ A comprehensive understanding of the strengths, weaknesses and opportunities for further development of Neonatology as applicable to their own clinical practice, research, innovation and service development which either directly or indirectly leads to improvements in clinical outcomes and scientific practice;
 - ✦ Conceptual understanding and advanced scholarship in their specialism that enables the graduate to critically evaluate current research and innovation methodologies and develop critiques of them and, where appropriate, propose new research questions and hypotheses;
 - ✦ Scientific and clinical leadership based on the continual advancement of their knowledge, skills and understanding through the independent learning required for continuing professional development.
5. Once registered as a Postgraduate Diploma holder in Neonatology, a range of career development options will be available including further specialist training in Neonatology. Alternatively, others may opt to undertake further career development in neonatology, through structured Continuing Professional Development (CPD), provided by Accredited

CPD providers. Postgraduate Diploma in Neonatology trainees who have successfully completed the STP PGDN will be eligible to compete for available General Medical Officer (GMO) Positions in Neonatology.

The outcomes of the STP PGDN training are affiliated to the following curriculum outcome categories:

Category I: Scientific foundations

- Goal 1:** Understand the normal structure and function of the human body, at levels from molecules to cells to organs, to the whole organism.
- Goal 2:** Understand the major pathological processes and their biological alterations.
- Goal 3:** Understand how the major pathologic processes affect the organ systems.
- Goal 4:** Integrate basic science and epidemiological knowledge with clinical reasoning.
- Goal 5:** Understand the principles of scientific method and evidence-based medicine including critical thinking.

Category II: Clinical Skills

- Goal 6:** Obtain a sensitive, thorough medical history.
- Goal 7:** Perform a sensitive and accurate physical exam including mental state examination.
- Goal 8:** Establish and maintain appropriate therapeutic relationships with patients.

Category III: Communication and Interpersonal Skills

- Goal 9:** Develop the knowledge, skills, and attitudes needed for culturally- competent care.
- Goal 10:** Participate in discussion and decision-making with patients and families.
- Goal 11:** Work effectively with other providers in the health system.
- Goal 12:** Clearly communicate medical information in spoken and written form.

Category IV: Prevention

- Goal 13:** Develop knowledge, skills, and attitudes to practice the basic principles of prevention.
- Goal 14:** Practice personalized health planning for long-range goals.
- Goal 15:** Understand the planning for communities and populations.

Category V: Diagnosis

- Goal 16:** Elicit and correctly interpret symptoms and signs of Neonatology conditions.
- Goal 17:** Diagnose and demonstrate basic understanding of common disease and conditions.
- Goal 18:** Appropriately use testing to help guide diagnostic and therapeutic decisions.
- Goal 19:** Demonstrate sound clinical reasoning.

Category VI: Treatment, Acute and Chronic

- Goal 20:** Understand therapeutic options and participate in the multidisciplinary care of patients with complex problems.
- Goal 21:** Recognize acute life-threatening medical problems and initiate appropriate care
- Goal 22:** Acquire the knowledge and skills necessary to assist in the management and rehabilitation of chronic diseases.
- Goal 23:** Participate in care in a variety of settings; including knowledge about palliative care.

Category VII: Patient Safety

- Goal 24:** Identify and remove common sources of medical errors.
- Goal 25:** Understand and apply models of Quality Improvement.
- Goal 26:** Appreciate the challenges associated with reporting and disclosure.

Category VIII: Information Management

- Goal 27:** Use information and educational technology to facilitate research, education, and patient care.

Category IX: Ethics, Humanities, and the Law

Goal 28: Develop a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to diversity.

Goal 29: Develop a critical understanding of the multiple factors that affect the practice of medicine, public health and research.

Goal 30: Incorporate ethical principles in clinical practice and research.

Category X: Professionalism

Goal 31: Develop healthy self-care behaviours and coping skills.

Goal 32: Model service to patients and community.

Category XI: Leadership & Management

Goal 33: Develop interpersonal and communication skills that result in leadership in patient health service delivery and health human resource management.

Category XII: Child Protection (safeguarding) and Advocacy

Goal 34: Recognizes and consults appropriately in cases where neonates are at risk of harm or need protection for harm.

Goal 35: Works with other professionals in assessing, reporting and taking appropriate action to protect neonates from harm.

Category XIII: Education and Training

Goal 36: Teaches and mentors junior medical staff

Goal 37: Plans, coordinates and participates in teaching undergraduates, interns and junior health workers

Entry Requirements to the Postgraduate Diploma in Neonatology

Duration of programme:

The Postgraduate Diploma in Neonatology programme will be completed over **one year** of full-time study.

Eligibility

To be eligible for consideration for admission, a candidate shall

- (a) Have a minimum of an **approved MBChB degree** from an accredited national or international institution with at least 18 months internship. A letter of completion of internship will be required.
- (b) Be fully Registered as an independent practitioner with **Health Professions Council of Zambia (HPCZ)**
- (c) Have a **written undertaking from the relevant referring institute** that the candidate will receive adequate support for the implementation of the neonatal programme, also granting the candidate study leave

- (d) Have **proven proficiency in written and spoken English**. Fluency in English may be tested if necessary.
- (e) Have an **acceptable level of computer literacy**, and access to a computer and the internet
- (f) Applicants may be asked to attend an interview
- (g) An Updated Curriculum vitae
- (h) A recommendation letter
- (i) 3 referees with their contacts

Teaching Methods in the Specialty Training Programme Postgraduate Diploma in Neonatology

The Neonatology diploma programme is a work-based, professional competence-based training and should encompass diverse teaching and learning approaches that are appropriate for the target educational domain. These include skill (practical) and clinical student centered learning, cognitive (knowledge) and affective (attitude) domain. Blended learning with online lectures are encouraged especially that the trainees may be busy with clinical duties or may not be physically available at the same time.

During the Neonatology Postgraduate Diploma programme, the specialty trainee is an integral member of the clinical work of the department in which they are training to gain the required clinical experience and competence. The work experiences should help a trainee achieve the competencies outlined in the curriculum.

Self-directed learning is an important aspect of learning in the programme and trainees should manage their time efficiently to accomplish this. This involves reading around patients; reading topics raised during various discussions with senior doctors and colleagues, and from the curriculum; preparing for presentations at various fora and when teaching junior staff.

Learning should occur during various work-related activities such as:

	Activities	
1.	Ward rounds and bedside teaching	Daily ward rounds independently Daily ward rounds with consultant input
2.	On-call duties	24-hour calls as the second on-call as part of a team of three (3) unit doctors (consultant and

		Junior resident medical officer) with nights spent in the hospital
3	Handovers	Handover of patients to the consultants and neonatal unit staff post call
4	Specialist neonatology and high risk follow-up clinics	Minimum of one clinic per week
5	Expository lectures	<p>Lectures will be given at designated times throughout the academic year</p> <p>Pre-recorded audio and video lectures of all the topics especially those prepared by external faculty.</p> <p>The trainee should have gone through all the lectures before the end of the academic year</p> <p>Questions and clarification arising from lectures can be raised with the trainers on a particular topic</p>
6	Clinical meetings	Minimum of one clinical meeting per week
7	Tutorials	Minimum of one student led tutorial per week
8	Journal Club	Minimum of one journal club meeting per week
9	Morbidity and Mortality audit	Minimum of one audit per month
10	Interdepartmental meetings	As need arises based on patients seen in the department
11	ICT supported learning experiences	<p>Lectures on the lecture schedule will recorded in audio or video format by experts in the particular field and made available to all trainees</p> <p>A learning group on email or a social platform e.g. A WhatsApp group will be created for lecturers and trainees.</p>
12	Field and community based learning	The students will be part of the mentorship teams that will be providing support to the surrounding delivery sites to improve quality of care given to neonates post-delivery and before referral to the Neonatal Intensive Care Unit (NICU) at the tertiary hospital
13	Administrative and management meetings	Attendance of administrative meetings as and when required

		<p>Participation in the planning cycle of a hospital (Action Plan)</p> <p>Reading the administrative handbooks for Public Service, e.g. Conditions of Service for Public Service book, Disciplinary Code of Conduct, Code of Ethics etc.</p>
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Certain concepts and skills are taught from early years of undergraduate training to final. However, the subject is taught in an upward spiral of difficulty and complexity, such that the competency of the practitioner becomes demonstrably more proficient. Apart from taking part in all academic activities in the department and joining in postgraduate activities of the department such as Journal Club, clinical meetings and grand rounds, the trainees should function as senior house officers (SHO)/senior Registrar within the department with clinical duties including:

- Supervision of interns and other junior health workers
- Teaching of undergraduates, interns and junior health workers

Postgraduate Diploma Programme in Neonatology Curriculum Structure and Map

Curriculum Map for the postgraduate diploma in Neonatology Programme

Module 1 (3 Months)	Module 2 (3 months)	Module 3 (3 month)	Part 4 (3 months)
General principles in Neonatology	Respiratory system	Central Nervous System	Basics of clinical governance and Quality Improvement
Prematurity, complications and strategies to improve outcomes	Cardiovascular System	Genital Urinary system	Presentation of Quality Improvement project/clinical audit/ Case Report
Advanced Neonatal Resuscitation	Gastrointestinal/ Hepatobiliary system	Musculoskeletal system and Skin	Publication ready manuscript
Foetal Maternal Medicine	Nutrition	Haematological	
Health Care Ethics and Professionalism	Endocrine system	Growth and Development	
Maternal Perinatal Death Surveillance and Response (MPDSR) Training		Genetics	
		Immunology	
		Microbiology	
		Pharmacology	
		Mentorship to district hospitals	
		Community newborn training	
Ongoing clinical management practice	Ongoing clinical management practice	Ongoing clinical management practice	Ongoing clinical management practice
Test/Assessment	Test/Assessment	Test/Assessment	Test/Assessment
<i>Continued neonatology and neurology (Children's Hospital-University Teaching Hospital) specialist outpatient clinics</i>			

ARCP – Quarterly Review of Competence Progression; CCST – Certificate of Completion of Specialist Training Examination

The trainees will attend programs in the district and at national level to have a broader understanding of neonatal care. These rotations and trainings will be organised by the convenors and will be supported by Ministry of Health and partners. The rotations and exposure should be completed before the ZACOMS CCST Exam.

Fees structure

Refer to the ZACOMS Website

Positions

A maximum of Ten (10) trainees will be admitted each year

Certification

Certification of the trainees will be by the Zambia College of Medicine and Surgery (ZACOMS)

Progression of an STP Postgraduate Diploma in Neonatology trainee

Training in the STP Postgraduate Diploma in Neonatology will take one year. The period will be divided into four parts based on the activities of the training as highlighted above.

- A candidate shall be allowed a maximum of three attempts for ZACOMS Examinations. The maximum period that a trainee can complete the programme is two (2) years. A trainee can be allowed an additional one year to attempt the final exams after which s/he cannot remain in the programme.
- For ease of tracking progress and planning for Paediatrics and Child Health care, all neonatology trainees will be registered with ZACOMS and ZPA for the duration of their training and will be allocated a ZACOMS Specialty Registrar Number.
- On successful completion of the programme, the trainee will obtain an award of the Certificate of Completion of Specialty Training (CCST) by the Zambia College of Medicine and Surgery (ZACOMS). Graduates will continue sitting on the Health Professions Council of Zambia Register of medical practitioners albeit that they will have the extra qualification of Postgraduate Diploma in Neonatology.

MBChB only entrants

- Entrants with only MBChB will obtain a neonatology diploma certificate which will be recognised by the Health Professions Council of Zambia.
- Graduates will continue sitting on the Health Professions Council of Zambia Register of Medical Practitioners albeit with the added qualification of Postgraduate Diploma in Neonatology and will be able to compete for available General Medical Officer Positions with the Ministry of Health.
- The STP-trained postgraduate diploma neonatology fellow can obtain a Masters of Medicine in Paediatrics and Child Health qualification from a university by undertaking the STP in Paediatrics and Child Health fellowship and a research as per specification of the university.

Paediatrics Specialist entrants

- Entrants with Master of Paediatrics and Child Health or fellows of the Paediatrics Specialist Training Program will be encouraged to apply to a University offering a neonatology fellowship to become certified neonatologists.

Assessment

The assessment framework is designed to provide a coherent system of assessing both formative and summative assessment which are work-place based and in examination settings.

The ZACOMS Paediatric and Child Health (PCH) training committee has valid, reliable and appropriate methods for assessing the knowledge, clinical skills and attitude domains that should be applied in all training sites.

The assessment are weighted at:

Continuous assessments- 40%

Final annual assessments- 60%

of the final mark of Annual Review of Competence Progression.

Assessment are both formative and summative.

Formative assessment

Formative assessments are on-going evaluations of the performance of the trainee during the learning process to modify teaching and learning activities to improve

trainee attainment. It is not graded. Learning must be demonstrated in all the learning outcome categories. A trainee must document these learning events in the portfolio of training and the logbook.

Summative assessment

Summative assessment are conducted at the end of the academic year to determine the performance of the trainees and their eligibility to write exams. Exams will comprise a theory paper of multiple choice best answer questions, objective structured clinical examination (OSCE) and viva voce

- Candidates will be assessed by means of **formal assessments undertaken at three-monthly intervals** and a **final written examination**.
- Assessments may be of a practical and/or oral nature.
- Candidates are also required to complete a **logbook of at least 50 procedures** including blood-taking, intubation, management of CPAP and basic ventilator settings, chest drain insertion, intravenous access etc.
- Candidates are required to attend at least 80% of lectures and group supervision sessions.
- A candidate who does not achieve a coursework assessment mark of at least 50% **will not** qualify to write the final examination, except at the programme convener's and the ZACOMS examination committee's discretion. The convenors will submit the portfolio of learning and logbook to ZACOMS Paediatrics and Child Health (PCH) examination committee to update on the performance of the trainee.
- Candidates are required to submit the portfolio of learning and logbook before the student may proceed to write the examination.
- Candidates who obtain 45% – 49% in an examination may be reassessed before the final mark is submitted for approval of the ZACOMS PCH examination Committee, and/or may be granted a supplementary examination at the discretion of the Committee.
- Candidates may be permitted to repeat the course if they fail, at the convener's and the PCH examination committees' discretion. Where a candidate fails the course twice, a recommendation will be made to the ZACOMS PCH Committee by the convenors to refuse readmission.
- Where a supplementary examination is granted, the mark obtained in the supplementary examination constitutes the final mark for the course.

- A candidate may **appeal** to the ZACOMS PCH examination committee through the Country Director of the Specialist training Program in case of any dispute
- The Diploma may be awarded with distinction if a student obtains an average of 75% – 100% passed at first attempt including continuous assessment results.

It must be emphasized that marks from theory examinations **may not** compensate for poor scores in the clinical examinations; Students **MUST** pass the clinical examinations in order to complete the training.

Course Content

Clinical Management in Neonatology

This course provides candidates with foundation skills in clinical neonatology starting from the delivery room, and ensures safe practice as they learn basic principles in management of neonates. The candidate will undertake a combination of dedicated clinical exposure with the neonatal staff and the clinical service. The candidate should gain insight into the current recommended international guidelines relevant to practice in the field of neonatology. The candidate should be confident with the definition, diagnosis, epidemiology, and classification of diseases that affect neonates.

Hands on skills training

The candidate should gain competency in procedures relevant to the care of sick neonates. The candidate should be able to demonstrate the ability to translate knowledge, introduce those skills acquired and implement them across all levels of healthcare – primary to tertiary. The Portfolio of learning and the logbook will record the number of patients, the range of conditions, and will be signed by the clinical supervisor.

Clinical Governance

Clinical governance is paramount to improving the quality of neonatal care as it provides for clinical effectiveness, audit, risk management, education and training, patient and public involvement, information and Technology as well as staff management.

Module 1 (3 months)

UNIT 1: General Principles in Neonatology

- 1.1 Neonatal Intensive Care Unit-Standards and Levels of Care
- 1.2 Sustainable development goals (SDGs)
- 1.3 Communication –Situation, Background, Assessment and Recommendation (SBAR)
- 1.4 Examination of the Newborn
- 1.5 Placental physiology and placental examination
- 1.6 Foetal circulation and circulatory adaptation
- 1.7 Transition to pulmonary respiration in the newborn
- 1.8 Thermoregulation and effects of Hypothermia in a newborn
- 1.9 Assessment of Gestational age-Ballard score/foot length
- 1.10 Small for gestational age (SGA)/IUGR/ Large for gestational age (LGA)
- 1.11 Infant Neuromotor assessment(INA)
- 1.12 Maternal Perinatal Death Surveillance and Response (MPDSR) Training
- 1.13 Family Centred Care(FCC) in the NICU

UNIT 2: Prematurity

- 2.1 Prematurity, complications and strategies to improve preterm outcomes
 - 2.1.1 Respiratory Distress Syndrome (RDS)
 - 2.1.2 Apnoea
 - 2.1.3 Metabolic Bone Disease (MBD)
 - 2.1.4 Retinopathy of Prematurity (ROP)
 - 2.1.5 Anaemia
- 2.2 Neuroprotection
- 2.3 Antenatal steroids
- 2.4 The Late Preterm infant

2.5 Kangaroo Mother Care (KMC) –KMC scoring, discharge planning and follow-up

UNIT 3: Advanced Neonatal Resuscitation

3.1 Basics of Advanced Neonatal Resuscitation

3.2 Physiology of resuscitation

3.3 Immediate Care at Birth

3.4 Approach to resuscitation

3.5 Team work and communication

3.6 Stabilisation before transfer

UNIT 4: Foetal Maternal Medicine

4.1 Antenatal Care, high risk pregnancy

4.2 Intrapartum monitoring: interpretation of Partograph and Cardiotocography (CTG) in relation to the neonatal outcome

4.3 Impact of maternal illness on the foetus/neonate

4.4 Effect of maternal drugs on the foetus

4.5 Foetal development; Environmental Influences and critical periods e.g. Multiple Gestation

UNIT 5: Health Care Ethics and Professionalism

5.1 Principles and values in healthcare ethics

5.2 International and national ethical codes

5.3 Medico-legal issues

5.4 Palliative care

5.5 Viability and End of life issues

Module 2

UNIT 6: Cardiovascular System

6.1 Embryology and anatomy of the heart

6.2 Normal foetal, neonatal circulation and transition to external life

6.3 Common cardiac malformations

- 6.4 Normal cardiovascular physiology
- 6.5 Electrophysiology-arrhythmias and Heart block
- 6.6 Hypotension and Shock in neonates
- 6.7 Congestive Cardiac Failure in neonates
- 6.8 Cardiac studies – ECG, Echo.

UNIT 7: Respiratory System

- 7.1 Normal embryological development of respiratory system
- 7.2 Common congenital respiratory malformations e.g. laryngomalacia, Congenital Cystic adenomatoid malformations (CCAM), Congenital Diaphragmatic Hernia (CDH) etc.
- 7.3 Respiratory physiology: control of breathing, flow and volume parameters
- 7.4 Respiration, oxygen and carbon dioxide transport mechanisms and how they altered in disease states
- 7.5 Types of respiratory failure and interpretation of blood gases
- 7.6 Pathophysiology of common neonatal respiratory illnesses e.g. Meconium Aspiration syndrome, Persistent Pulmonary Hypertension (PPHN), Chronic Lung disease (CLD), pulmonary air leaks, Transient Tachypnoea of the Newborn (TTN), Pulmonary Haemorrhage etc.
- 7.7 Ventilatory support in neonates-invasive and non-invasive

UNIT 8: Gastrointestinal and Hepato-Biliary System

- 8.1 Normal embryological development of GIT
- 8.2 Common gastrointestinal malformations e.g. tracheoesophageal fistula, pyloric stenosis, biliary atresia, intestinal atresia's, gastroschisis, Omphalocele, Hirschsprung's Disease etc.
- 8.3 Normal digestion and absorption of nutrients
- 8.4 Bilirubin metabolism and its abnormalities
- 8.5 Gastrointestinal diseases and malabsorption syndromes

UNIT 9: Nutrition

- 9.1 Nutritional/caloric requirements for normal growth and development in neonates

- 9.2 Breastfeeding and breast milk and breast milk substitutes
- 9.3 Principles of nutrition for premature babies
- 9.4 Vitamins and minerals – normal requirements, sources, its role and deficiencies
- 9.5 Fundamentals to nutrition of a sick neonates
- 9.6 Parenteral nutrition

UNIT 10: Endocrinology

10.1: Hypothalamus and pituitary

- 10.1.1 Embryology of hypothalamus and pituitary glands, normal control and physiological effects of hormones
- 10.1.2 Disorders of hypothalamus and pituitary glands e.g. growth hormone deficiency

10.2 : Adrenal glands

- 10.2.1 The adrenal gland embryology, action of ACTH, aldosterone, cortisone and catecholamines and an understanding of the metabolic pathways involved in the production of these hormones.
- 10.2.2 Disorders of hormone function e.g. Congenital Adrenal Hyperplasia (CAH)

10.3 : Sex hormones and sexual development

- 10.3.1 Ovarian hormones: Embryology, production and actions of ovarian steroidal hormones and their pathway. Process of menarche and menstruation
- 10.3.2 The Testis: Embryology, production of various hormones produced by the testes, their secretory control, metabolic processes, and effects.
- 10.3.3 Disorders of Sex Differentiation

10.4 Thyroid and parathyroid glands function and disorders

- 10.4.1 Normal development of thyroid and parathyroid glands and common malformations
- 10.4.2 Control and secretion of thyroid and parathyroid hormones and their action
- 10.4.3 Disorders of thyroid hormone function

10.5 Pancreas endocrine gland development and disorders

10.5.1 The Pancreatic insulin production and effects of insulin

10.5.2 Disorders of insulin function

10.5.3 Hypoglycaemia and Hyperglycaemia

Module 3

UNIT 11: Neurological System

11.1 Normal embryological development of the CNS and common CNS malformations

(Neural tube defects: Encephalocele, hydrocephalous, Spina bifida etc.)

11.2 Normal CSF circulation and composition and changes in disease in neonates

11.3 Anatomy and physiology of central and peripheral nervous systems in neonates

11.4 Neonatal Encephalopathy

11.5 Pathogenesis and Pathophysiology of Hypoxic Ischaemic Encephalopathy (HIE)

11.6 Neonatal seizures and management

11.7 Neurobehavioral development in the Neonates

11.8 Developmentally supportive Care (Nesting, Positioning etc.)

11.9 Pain management in a neonates

11.10 Neonatal abstinence syndrome

11.11 Foetal alcohol syndrome

UNIT 12: Genitourinary System

12.1 Normal embryological development of genitourinary systems

12.2 Common genitourinary malformations (e.g. Posterior urethral valves, Phymosis)

12.3 Approach to a neonates with acute Kidney injury

12.4 Normal physiology and effect of disease of:

12.4.1 Electrolyte and water homeostasis

12.4.2 Acid –base balance

12.4.3 Renin-angiotensin-aldosterone system

UNIT 13: Musculoskeletal system and Skin

- 13.1 Normal embryological development of MSS
- 13.2 Abnormalities of the MSS and skin

UNIT 14: Haematological System

- 14.1 Haematopoiesis and disorders
- 14.2 Bleeding and coagulation
- 14.3 Haemoglobinopathies e.g. screening for Sickle Cell Anaemia in neonates

UNIT 15: Growth and Development

- 15.1 Normal growth, development and assessment
- 15.2 Abnormalities in growth and development e.g. short stature, tall stature

Unit 16: Genetics

- 16.1 Introduction to genetics and inheritance
- 16.2 Chromosomal and genetic anomalies
- 16.3 Basics of genetic counselling
- 16.4 Approach to the diagnosis and investigations of inborn errors of metabolism

Unit 17: Immunology

- 17.1 The principles of immunology
- 17.2 The development of immunity to infection – active and passive
- 17.3 Expanded Programme in Immunisation (EPI)
- 17.4 Primary and acquired immune-deficiencies
- 17.5 Hypersensitivity reactions
- 17.6 Principles of auto-immune and immune-mediated diseases

Unit 18: Microbiology /Virology

- 18.1 Introduction to common pathogens causing diseases of neonates
- 18.2 The principles of infection control
- 18.3 Notifiable diseases
- 18.4 Emerging Infections in the NICU

- 18.5 The principles underlying the use of chemotherapeutic antimicrobial agents
- 18.6 Viral infections
 - 18.6.1 Epidemiology and Pathogenesis of TORCH Infections
 - 18.6.2 HIV exposure and infections in Neonates
 - 18.6.3 Corona Virus Disease in neonates

Unit 19: Basic Principles of Pharmacology

- 19.1 The principles underlying the mode of action and side effects of the commonly used drugs used in neonates
- 19.2 Safe prescribing
- 19.3 Antibiotics stewardship and Antimicrobial resistance
- 19.4 Drugs and breastfeeding

Module 4

Unit 20: Basics of clinical governance and Quality Improvement

- 20.1 Clinical governance
- 20.2 Introduction of quality improvement
- 20.3 Evidence based medicine
- 20.4 Literature search and how to critique a paper
- 20.5 Identification of topic for QI project or clinical audit or case report
- 20.6 Project presentation
- 20.7 Publication Ready manuscript

Practical Clinical Skills

History and examination. History taking including a thorough newborn examination, including gestation assessment; maintenance of the warm chain, nutritional anthropometry and its assessment, assessment of growth, use of growth charts, neurological assessment, communication with parents, health functionaries and social support groups; and genetic counselling.

Bedside Procedures

Monitoring skills:

Must know: Temperature recording, capillary blood sampling, monitoring on multi-parameter monitor, arterial blood sampling, blood pressure monitoring, blood sugar monitoring and infection prevention techniques.

Should know: CVP monitoring, brain function monitoring

Therapeutic skills:

Must know: Gastric lavage, nasogastric feeding, endotracheal intubation, cardiopulmonary resuscitation, providing respiratory support: Continuous Positive Airway Pressure (CPAP) & mechanical ventilation, exchange transfusion, administration of oxygen, aerosol therapy, venepuncture and establishment of vascular access, umbilical venous cannulation, administration of fluids, blood, blood components, parenteral nutrition, intraosseous fluid administration, common dressings, abscess drainage and basic principles of rehabilitation.

Should know: umbilical arterial access, peripheral arterial line, central vascular access, peritoneal dialysis, ventricular tap.

Investigative skills:

Must know: blood draws for various investigations, Lumbar puncture, and collection of urine for culture, urethral catheterization, and supra-pubic aspiration.

Should know: ventricular tap.

Interpretation of X-rays of chest, abdomen, bone and head; ECG; Arterial Blood Gas (ABG) findings; Echocardiography, CT scan & MRI scan.

Understanding of common Electroencephalography (EEG) patterns.

Approach to Important Clinical Problems:

Growth and development. Small for gestational age , Short stature, obesity, developmental delay.

Nutrition. Lactation management, Breastfeeding, caloric intake and micronutrient deficiencies

Cardiovascular. Murmur, cyanosis, congestive heart failure, arrhythmia, shock and inotropic support.

GIT and liver. Neonatal jaundice, bleeding, abdominal distension, vomiting, constipation, hepatosplenomegaly, hepatic failure and encephalopathy.

Respiratory. Noisy breathing, respiratory distress, cyanosis.

Infections. Pyrexia, hypothermia, recurrent infections, nosocomial infections.

Renal. Haematuria, bladder/bowel incontinence, voiding dysfunctions, inguinoscrotal swelling, renal failure (acute).

Hematology. Lymphadenopathy, anaemia, bleeding.

Neurology. Convulsions, abnormality of posture, large head, small head, floppy infant, cerebral palsy and other neuromotor disability.

Endocrine. Thyroid swelling, ambiguous genitalia, obesity, short stature.

Skin/Eye/ENT. Skin rash, pigmentary lesions, pain/discharge from ear, blindness, cataract, eye discharge, redness, squint, proptosis.

Miscellaneous. Congenital dislocation of the hip joint, multiple congenital anomalies.

Recommended Reading

1. Gleason, C. & Devaskar, S.U. (2012). Avery's Diseases of the Newborn (Ninth Edition). 10.1016/C2009-0-52072-7.
2. Fetal and Neonatal secrets, third Edition. Edited by I. Polin and Alan R. Copyright © 2014, 2007, 2001 by Saunders, an imprint of Elsevier Inc. ISBN 978-0-323-09139-8
3. **Cloherty**, John P, and Ann R. Stark. **Manual of Neonatal Care**. (7th Edition). New York: Lippincott-Raven, 1998. ISBN-13: 978-1-4511-1811-7, ISBN-10: 1-4511-1811-2
4. Kliegman, Robert. **Nelson Textbook of Pediatrics**. Edition 21. Philadelphia, PA: Elsevier, 2020
5. Journal Articles and reviews
6. Zambia Ministry of Health Kangaroo Mother Care guidelines
7. Essential Newborn Care Guidelines
8. Zambia National Neonatal protocols and drug dosages
9. Registrar survival guide on the NICU
10. National Neonatal Standards for facilities looking after newborns
11. National Health Strategic Plan
12. RMNCH Roadmap
13. WHO Bottleneck Analysis for Zambia (2016)

Intubation of preterm infant								
Administration of surfactant								
Basic mechanical ventilator settings								
Needle thoracocentesis								
Insertion of chest drain								
Interpretation of blood gas								
Advanced neonatal resuscitation								
Cardiovascular system								
External chest compression								
Interpretation of blood pressure in neonates								
Use of inotropes								
Renal system								
Urinary catheter insertion								
Neurological system								
Positioning and nesting								

Infant neurological assessment (INA)								
Performs Lumbar puncture								
Cranial ultrasound								
HIE scoring								
GIT system/metabolic								
Interpret serum bilirubin results								
Decide on commencement or stoppage of phototherapy								
Nasal/oral gastric tube insertion								
Calculation of feeds and fluids								
Others								
Placing the baby in Kangaroo Mother care position								
KMC scoring								